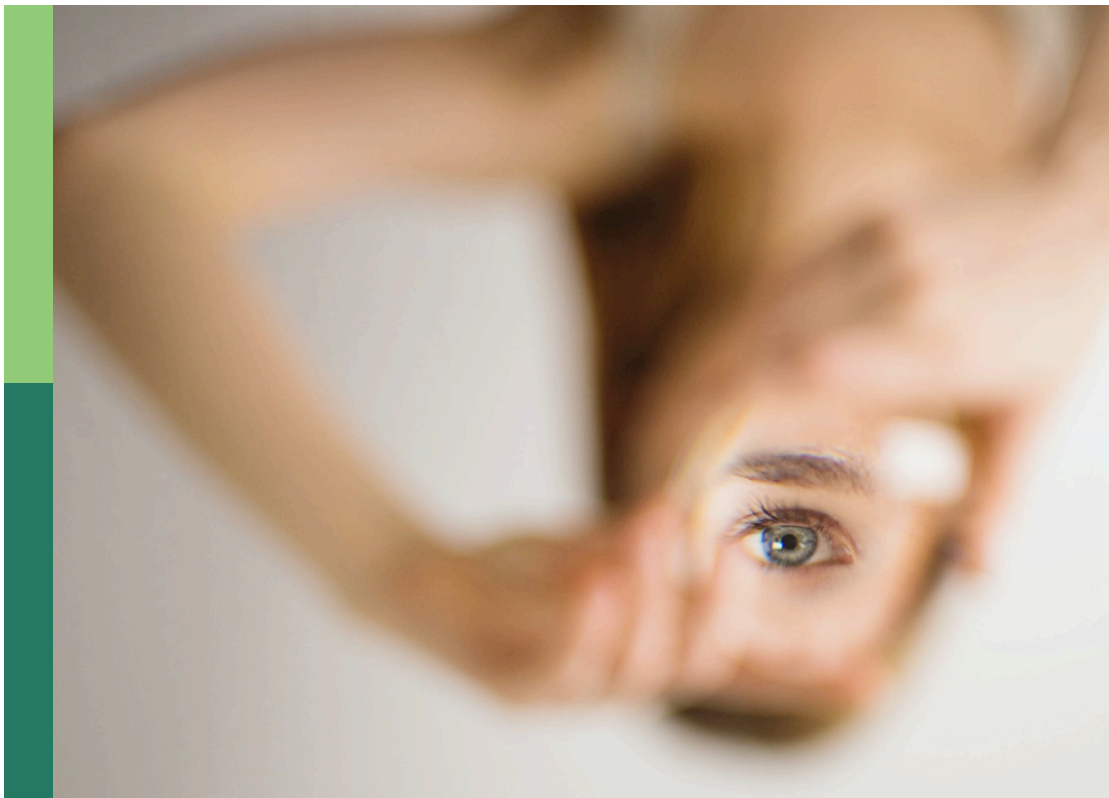
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Education and social factors

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Education and social factors

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Social relationships and grit in English as a foreign language learning among high school students: A three-wave longitudinal study

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This study examined the longitudinal reciprocal relations between students' grit and their perceptions of social relationships (teacher-student and peer relationships) in studying English as a foreign language (EFL). A total of 2,435 students from Grades 10-11 in China (M_{age} = 16.40 years old, 54.2% female) participated in the study on three occasions across 1 year. The three-wave cross-lagged analytic model results indicated that (a) peer relationship and grit reciprocally enhanced each other across both intervals; (b) the teacher-student relationship at Time 2 was influenced by Time 1 grit, but not vice versa. Nevertheless, the teacher-student relationship transactionally facilitated each other during the second interval (from Time 2 to Time 3). The multiple-group confirmatory factor analysis (MG-CFA) results indicated that such relations remained stable across gender. The study's findings contribute to ongoing research delineating the dynamic system between social relationships and grit in EFL learning. It also reveals that males and females benefit similarly during social communications with peers and their English language teachers. Implications for educational practices were discussed.

KEYWORDS

teacher-student relationship, peer relationship, grit, EFL learning, reciprocal relations

Introduction

As the world is experiencing hardship brought by the COVID-19 pandemic, positive psychological elements such as grit become essential for coping with adversities. The burgeoning of research on grit indicates a growing conviction that grit is a vital factor in dealing with adversities and achieving success for academic and

non-academic issues (e.g., Von Culin et al., 2014; Blalock et al., 2015; Buckingham and Richardson, 2020). Grit, articulated by Duckworth and Quinn (2009), is defined as "trait-level perseverance and passion for long-term goals (p.166)." Grit includes two main definitional components: perseverance of effort and consistency of interest. Perseverance of effort refers to people's continuing efforts in pursuing long-term goals, and consistency of interest refers to an individual's ability to insist on the same goal and not be distracted for a long time (Duckworth et al., 2007).

Grit is most relevant to English language learners because the development of English academic language proficiency is a long-lasting practice that requires persistence (Kim and Kim, 2017; Feng and Papi, 2020) and interest (Yamashita, 2018; Chen et al., 2021). In response to the initiative proposed by Teimouri et al. (2020) to verify the domain-specify of grit, some empirical studies were conducted to explore the domain-specific versus the domain-general aspects of grit in various contexts, such as education (Schmidt et al., 2017), and L2 learning (Teimouri et al., 2020; Sudina and Plonsky, 2021). The results have consistently shown that domain-specific grit is a better predictor of achievement than domain-general grit. In the current study, a language domain-specific grit was utilized. The role of grit in foreign language learning environments has captivated scholars' attention in recent years (Teimouri et al., 2020; Alamer, 2021). It refers to the personality traits of grit within specific foreign learning environments (Teimouri et al., 2020). Previous work on EFL learners' grit has emphasized its positive associations with academic performance (Akos and Kretchmar, 2017; Kramer et al., 2018; Nouara and Senoussi, 2020), academic motivation, and emotions (Changlek and Palanukulwong, 2015), classroom enjoyment (Lee, 2020), scholarly persistence (Kramer et al., 2018), self-oriented learning perfectionism (Liu et al., 2021), and negative association with foreign language classroom anxiety (Li and Dewaele, 2021) and English learning burnout (Liu et al., 2021).

Most existing studies mentioned above overly focused on how EFL learners' grit relates to academic-related outcomes while neglecting the effect of grit on other social consequences within the EFL context, such as social relationships, which are also crucial components during the learning period. In addition, grit in school learning also attracts respect and support from others (i.e., friends and teachers), and such encouragement, reflected in good interpersonal relationships, can, in turn, help overcome learning difficulties and achieve a higher sense of well-being (Leung et al., 2021). According to Lee (2020), as a motivational variable, grit encourages language learners to communicate eagerly with their peers inside the classes. Moreover, Lan (2020) demonstrated that high-grit students were more welcome than those with low-to-moderate and low grit.

Furthermore, prior work has often failed to seek the potential antecedents in the development of EFL learners' grit, leading to limited instructions for language researchers and practitioners to promote the grit of EFL learners. School is one vital place where the impact of school capital, such as emotional support on fostering students' positive mental features, can not be overlooked (Kothari et al., 2020). The emotional support teachers provide to their students, as a teacher-student interaction feature, is demonstrated in the way they show genuine care and concern for them, respect them, attempt to understand their feelings and points of view, and have a strong sense of dependability (Pianta and Allen, 2008; Pianta and Hamre, 2009). Such support promotes social and emotional functioning as well as learning for students (Wubbels and Brekelmans, 2005; Pianta and Hamre, 2009). The school's emotional support is created by the interactions between teachers, students, and pupils (Jia et al., 2009). Empirical evidence has indicated that EFL learners who experience more support and care from teachers and their counterparts can utilize these positive features as effective means to surmount the challenge, which makes them more hopeful of achieving the target learning goals and motivates the development of higher levels of gritty features in their language learning (Yuan, 2022).

As mentioned above, the social relationships, including the teacher-student and peer relationships and learners' grit, are closely intertwined within the EFL context. Most existing studies have focused on directional associations from social relationships (i.e., the teacher-student relationship, peer relationship, or both) to EFL learners' grit (Hejazi and Sadoughi, 2022; Shen and Guo, 2022; Yuan, 2022). In contrast, limited studies were conducted to examine the effect of grit on perceived social relationships and the reciprocal associations between grit and social relationships in the EFL context. Consequently, our understanding of the nature of the relations is far from complete.

The current study addressed this issue and used a longitudinal cross-lagged design to seek the reciprocal relationships between social relationships (teacher-student and peer relationships) and grit in the EFL learning context. Unlike the existing studies (e.g., Hejazi and Sadoughi, 2022; Shen and Guo, 2022; Yuan, 2022) that only focused on one specific interpersonal relationship: the teacher-student relationship or peer relationships within the learning environment, we highlighted them synchronously because both types of interpersonal relationships exist concurrently during language learning. In addition, given that gender plays an essential effect in EFL learning (Sunderland, 1992; Ma et al., 2017; Bataineh et al., 2018; Namaziandost and Çakmak, 2020; Van Ha et al., 2021), we also investigated whether the relations between social relationships (teacher-student relationship and peer relationships) and grit within the EFL learning context differ by gender. The study could contribute to the relevant EFL learning literature by investigating the possible bidirectional associations between social relationships and grit and seeking the potential gender differences in this relation.

The predicting effect of social relationships on grit in English as a foreign language learning

Students' language learning can be influenced by social support from teachers and peers (Huang et al., 2010). The frequent teacher-student interactions in language classes highlight the role of teachers as an essential source of support for students during learning activities (Sadoughi and Hejazi, 2021). As a foremost component of any language teaching and learning situation, teachers play a critical role in providing instruments, appraisal, and emotional support to students (Hutchinson and Waters, 1987). Furthermore, the importance of peer support is also recognized by language learners because students study the language together and experience similar difficulties during the communication process when using the language (Huang et al., 2010).

Several possible explanations for the associations of social relationships and grit emerged in the existing literature. The first possibility is that as predictors, social relationships (the teacher-student relationship) are related to EFL learners' subsequent grit. Most studies have addressed the importance of social relationships in fostering grit from the social-ecological perspective (Bronfenbrenner, 1979). It clarifies the underlying mechanism of the development of individuals within the social context where they live. That is, students' context-related personality traits can be shaped within the specific learning environment. In the EFL learning context, bonding with significant others has been noted as essential in promoting grit (Shen and Guo, 2022; Yuan, 2022). Positive interpersonal interactions with teachers in the EFL context can lead to high motivation and positive emotions with more willingness to engage in language learning (Gan, 2021; Karimi and Fallah, 2021; Pishghadam et al., 2021; Sadoughi and Hejazi, 2021, 2022). Such relations can become protective factors in response to adversities and enable students to remain persistent in learning settings, promoting gritty features in EFL learning (Shen and Guo, 2022; Yuan, 2022). Numerous studies have shown that the teacher-student relationship is of great value in influencing EFL learners' grit. For example, Yuan (2022) demonstrated that teacher stroke, referring to any action taken to acknowledge and value another person's worth (Shirai, 2006), and teacher-student rapport, as positive teacher interpersonal behaviors, promote language learners' grit development. What is more, findings in Hejazi and Sadoughi's (2022) study revealed that students' perceived teacher support was positively associated with their L2 grit, which addressed teachers' role as an essential element in language learning to motivate students to exert considerable effort in their learning process and enhance their enthusiasm and persistence.

Positive interpersonal relationships with peers benefit students in school learning (Thapa et al., 2013). It has been shown that good peer relationships contribute to participation and engagement in school-related activities (Geng et al., 2020; Shao and Kang, 2022) and academic success (Thomas and Maree, 2022). Their peers strongly influenced adolescents' behaviors and beliefs (Borgatti et al., 2009). Friendships and encouragement within peer groups not only offer emotional support for students but also contribute to sharing more educational resources through social connections (Chen et al., 2018). *Attachment* is a deep and enduring emotional bond that connects one person to another across time and space (Bowlby, 1969). The attachment theory (Armsden and Greenberg, 1987) demonstrated that attachment to others in social communications could promote healthy psychological characteristics, i.e., grit. Although no specific study was conducted in the EFL context to examine the effect of peer relationships on language-specific grit, the effect of general grit has been widely explored. For instance, research concerning the predicting factors of grit has shown that relatedness to friends is positively associated with the development of grit among student samples (Datu, 2017). In addition, Lan (2019) found that peer attachment is positively related to Chinese college students' grit, indicating that positive relations with peers can promote their gritty features. Given the importance of communications with peers (guanxi, social relationships) in language learning, it is plausible to presume that peer relationships may also affect the development of grit in the EFL context.

The predicting effect of grit on social relationships in English as a foreign language learning

The second possibility is that EFL learners' exhibited grit would influence their subsequent interpersonal relationships with teachers and peers. Studies have found that it is crucial to examine whether EFL learners' grit would further impact their relationships with others. The evocative effect proposed by Scarr and McCartney (1983) may interpret this association. The evocative effect refers to the individuals' possessed features (e.g., grit) that can affect others' attitudinal and behavioral treatment (Silinskas et al., 2015). Furthermore, the characteristics that students exhibit in the learning process (e.g., proactive, persistent vs. resistant, lazy) have been shown to facilitate or discourage interpersonal relationships (e.g., Lan, 2020). Despite the limited findings of the relationship in the EFL context, similar findings concerning the role of grit in interpersonal-related factors have emerged. For instance, studies by Lee (2020) and Lee and Lee (2020) have demonstrated that grit in foreign language learning could predict willingness to communicate, which is of utmost importance for foreign language success (Duckworth et al., 2007; Sparks et al., 2009; Baker, 2014; Keegan, 2017). Such willingness to communicate with others may be conducive to fostering good teacher-student and peer relationships (Lee, 2020).

Reciprocal relationships between social relationships and grit in English as a foreign language learning

The third possibility is that social relationships with teachers and peers reciprocate EFL learners' grit. The transactional theory proposed by Sameroff (2009) can be employed to explore the bidirectional relationship between social relationships and grit. This theory illustrated that students' developmental outcomes could result from the dynamic interactions between themselves and their belonging social contexts (i.e., EFL learning context). It is plausible that social relationships (teacher-student relationship and peer relationship) in the EFL context could help shape students' grit, which in turn, also influences students' social relationships with teachers and peers. However, no existing studies have investigated the reciprocal linkage between social relationships (i.e., teacher-student and peer relationships) and EFL learners' grit. Given the lack of research concerning the association between domain-specific grit and social relationships (such as teacher-student and peer relationships) in the EFL context, it is, therefore, essential to conducting in-depth research on this relationship, which is beneficial for pedagogic practice intervention.

Gender differences in social relationships and grit in English as a foreign language learning

Gender plays a crucial role in learners' foreign language learning (Sunderland, 1992; Bataineh et al., 2018; Namaziandost and Çakmak, 2020; Van Ha et al., 2021), social relationships (Eranil and Özcan, 2019), and the formation of grit (Christensen and Knezek, 2014; Fernández Martín et al., 2020). Studies have suggested considerable differences between boys' and girls' gritty traits in English. Richardson and Woodley's (2003) study noted that females tended to obtain higher academic achievement than males because they worked harder and persisted more than males. What is more, Feng et al.'s (2013) study supported this perspective indicating that girls were more motivated to learn English and willing to demonstrate good learning behaviors. Previous studies have suggested that teachers might treat girls with more leniency than boys. In other words, to improve boys' performance, English language teachers would adopt more discipline and control over boys than girls; thus, boys may perceive a lower positive teacher-student relationship from their English language teachers than girls (Jones and Wheatley, 1990). There has been consistent evidence of gender differences in how people perceive social relationships. For instance, Eranil and Özcan (2019) found that high school female students reported statistically significantly higher scores than male students concerning their social relations with peers. Previous studies on the development of grit, perceived teacher-student, and peer relationships would treat gender as a demographic variable to test gender difference by comparing the mean differences (Christensen and Knezek, 2014; Eranil and Özcan, 2019; Fernández Martín et al., 2020) or treat it as a control variable when testing the associations among variables (e.g., Ma et al., 2017). It is significant to make a meaningful multi-group comparison across gender to determine whether the associations between social relationships and grit differ by gender. The results of such comparison in the structural model could help educators better understand the cross-gender applicability of the cross-lagged analytic model.

The Chinese English as a foreign language context

English as a foreign language learners in China account for a large proportion of English learners in the world because English course is one of the compulsory courses in the compulsory education stage for most Chinese students, and the English language proficiency test is also brought into the high school entrance examination and college entrance examination (Ministry of Education of the People's Republic of China [MOE], 2001). Therefore, the study of the Chinese EFL sample has great relevance to other EFL learners. However, some Western researchers have been concerned that the language learning process for Chinese students is dependent and passive, which may reflect a lack of grit in language learning (Hiver et al., 2021). In other words, students who lack gritty traits are theoretically presumed to be less persistent in learning English and tend to give up when meeting setbacks. Some researchers have asserted that this phenomenon is mainly due to the coercive and repressive teachers (Jiang et al., 2021) during classroom learning and highly competitive peer relationship (Ellicott, 2013; Li, 2017; Chen and Hu, 2022). Given the perspectives mentioned above, it is of importance for Chinese educators to investigate the possible dynamic association between the social relationship in the English learning environment and the development of Chinese EFL learners' grit. The findings of our study may contribute to solving this issue to some extent.

The current study

Most of the existing studies have employed cross-sectional research designs to explore the unidirectional associations between social relationships and grit in EFL learning: concerning social relationships as predictors to influence students' grit (Eskreis-Winkler et al., 2014; Datu, 2017; Jin et al., 2019; Lan, 2019; Hejazi and Sadoughi, 2022; Yuan, 2022) or concerning students' grit to predict social relationship related variables (Lee, 2020). However, such associations might be dynamic and bidirectional. Longitudinal studies should

be an appropriate approach to fully understand how social relationships (teacher-student and peer relationships) and EFL learners' grit influence each other over time. Therefore, the current study examined the reciprocal associations between social relationships and grit within the EFL context among Chinese high school students. We simultaneously addressed the effects of the teacher-student and peer relationships, which could depict a comprehensive picture of social relationships in the EFL learning context. We also employed a three-wave cross-lagged analytic approach, given that the cross-lagged analytical approach provided a more rigorous way to check the constructs' stability across time points and the reciprocal linkage between constructs.

Guided by the above findings, we proposed the study's research hypotheses (RHs). After controlling for auto regressor effects of each construct,

RH1. Time 1 and Time 2 social relationships (teacher-student and peer relationships) would be separately associated with Time 2 and Time 3 grit in EFL learning.

RH2. Time 1 and Time 2 grit would be separately associated with Time 2 and Time 3 social relationships (teacher-student and peer relationships) in EFL learning.

RH3. Such relations between social relationships (the teacher-student relationship and peer relationships) and grit in EFL learning would differ regarding students' gender.

Materials and methods

Participants

We recruited students from four public high schools in a northeast city of China. The students (n = 2,719) in the affiliated schools participated in the study voluntarily. We eliminated 284 students (9.41%) who did not take the test all three times. Among the remaining 2,435 students, 1,116 (45.8%) were boys, and 1,319 (54.2%) were girls. The mean age of the students was 16.40 years old (SD = 0.84). All the students speak Chinese as their first language and are of Han nationality.

Measures

Results of the reliabilities (internal consistency) and the psychometric properties indicated that the following scales were reliable and valid (see **Table 1**) at each time point.

Teacher-student relationship

Students' perceived teacher-student relationship was measured with the Chinese-version questionnaire in the Programme for International Student Assessment ([PISA], Organization of Economic Co-Operation and Development [OECD], 2013). Five items were to examine the interaction between students and their English language teachers. A sample item included "I can get along well with my English teachers." Students responded to the scale using a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores represented better relationships with English language teachers during English class. The test-retest reliability coefficients ranged from 0.29 to 0.42, indicating considerable changes in students' perceived degrees of the teacher-student relationship across three-time points.

Peer relationship

To measure students' perceptions of the closeness between peers during English learning, we used the ten-item Peer Closeness Scale. It was developed by the National Children's Study of China (NCSC) in China and has been used many times in large-scale assessments in mainland China. We chose this scale to measure peer closeness due to its satisfactory reliabilities and psychometric properties among various regional and school-stage samples in mainland China (Dong and Lin,

TABLE 1 The reliability coefficients and the psychometric properties of the tested scales.

	n	α	CFI	TLI	SRMR	RMSEA (90%CI)
Time 1						
Teacher-student relationship	5	0.91	0.99	0.98	0.01	0.074 (0.060–0.088)
Peer relationship	10	0.87	0.97	0.95	0.03	0.070 (0.064–0.076)
Grit	9	0.78	0.98	0.97	0.03	0.057 (0.050–0.064)
Time 2						
Teacher-student relationship	5	0.95	0.99	0.98	0.01	0.076 (0.069–0.091)
Peer relationship	10	0.88	0.98	0.98	0.03	0.061 (0.055–0.067)
Grit	9	0.75	0.98	0.98	0.03	0.059 (0.052–0.066)
Time 3						
Teacher-student relationship	5	0.97	0.99	0.99	0.01	0.073 (0.059–0.087)
Peer relationship	10	0.89	0.98	0.97	0.02	0.070 (0.065–0.076)
Grit	9	0.76	0.98	0.98	0.02	0.057 (0.050–0.065)

2011; Liu and Liu, 2021). Students completed ten items using a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*) to reflect the degrees of peer interactions in English learning. A sample item included, "I am happy when I am with my classmates." The test-retest reliability coefficients ranged from 0.36 to 0.52, indicating substantial changes in students' perceived levels of peer relationship across three-time points.

Grit

The measure of students' grit in the EFL context was deployed by Teimouri et al. (2020). It consisted of 9 items with two dimensions: consistency of interest (e.g., My interests in learning English change from year to year, 4 items) and perseverance of effort (e.g., I am a diligent English language learner, 5 items). It is a newly developed language domain-specific scale regarding the concept of grit, which could better reflect students' language-specific gritty features than using the general Grit Scale (developed by Duckworth et al., 2007). Students responded to 9 items on a 4-point Likert scale ranging from 1 (*not like me at all*) to 4 (*very much like me*). Items in the perseverance of effort dimension were regular-scored, and those in the consistency of interest dimension were reversed-scored. A higher score represented that students possessed a higher level of gritty traits in learning English.

Data collection procedures

We first obtained approval from the target school principals and the English course teachers. Upon support from principals and teachers, students' parents were firstly distributed a consent form to determine their willingness to allow their child to participate in the study. A separate consent form was then sent to students to specify whether they voluntarily answered the online questionnaire; once they agreed, they completed the questionnaire during English class to minimize the external noise. We administered the survey three times, and students were asked to respond to the same measures in each survey. The first survey was administered in November 2020, the second in May 2021, and the third in November 2021. The interval between every two surveys was approximately 6 months, and the investigators did not use any intervention during these dates.

Data analytic procedures

We first calculated preliminary analysis, including the descriptive statistics, the bivariate correlation, and internal consistency reliability (Cronbach's alphas) using SPSS 24.0. Pearson correlation coefficients around 0.10 indicated a small effect size, around 0.03 indicated a moderate effect size, and higher than 0.50 reflected a strong effect size (Cohen, 1992). Second, we conducted cross-sectional Confirmatory factor analysis (CFAs) each time. We employed multiple goodness of fit indices, entailing comparative fit index (CFI), Tucker-Lewis Index (TLI), standardized root mean square residual (SRMR), and root mean square of error of Approximation (RMSEA), to evaluate the CFA models. We considered the values of CFI and TLI greater than 0.90, the value of SRMR less than 0.06, and the value of RMSEA less than 0.08, as the indicators of an acceptable fit to the data (Hu and Bentler, 1999; Hooper et al., 2008; Hair et al., 2010). Third, we conducted a multiple-group confirmatory factor analysis (MG-CFA) across three-time points *via* a maximum likelihood estimation approach to check whether the constructs held the same meaning over time in AMOS 24.0. More specifically, we tested configural invariance (invariance of the overall factor structure), metric invariance (invariance of factor loadings), and scalar invariance (invariance of item intercepts) of the constructs across three-time points. We employed two recommended criteria shown in previous studies to evaluate the longitudinal factorial invariance of the measurement models (e.g., Datu and King, 2018). The changes in CFI value less than 0.01 and in TLI less than 0.05 represented longitudinal measurement invariance (Little, 1997; Cheung and Rensvold, 2002).

Fourth, we tested a longitudinal CFA to determine whether the measurement model across times is valid. The model comprised all the constructs at three-time points. We correlated the residual errors of each latent construct at three-time points, which followed the notion of Marsh and Yeung (1998), indicating that such an approach could gain more precise path coefficients in a structural model. Fifth, we conducted a three-wave cross-lagged path analysis using a maximum likelihood estimation approach to test the associations between the teacher-student relationship, peer relationship, and students' grit in the Chinese EFL context. We also controlled the auto regressor effects of variables in the model. Concerning the effect sizes of the cross-lagged coefficients, we followed the effect size guidelines that were popular in educational research (Keith, 2015), where the standardized coefficients smaller than 0.05 reflected meaningless effects; the standardized coefficients between 0.05 and 0.10 reflected small effects; the standardized coefficients between 0.10 and 0.25 reflected moderate effects, and the standardized coefficients higher than 0.25 reflected large effects. Finally, we performed an MG-CFA to check whether the cross-lagged path model between social relationships and grit differ across gender. We examined the invariance of the structural model with structural weights, structural intercepts, structural means, and structural variances and covariances (Byrne, 2004). The evaluation criteria are the same as above.

Results

Preliminary analysis

The result of the preliminary analysis presents in Table 2. The teacher-student relationship, peer relationship and EFL learners' grit were significantly and positively correlated in each time (Time 1: r ranged from 0.38 to 0.54, $ps < 0.001$; Time 2: r ranged from 0.39 to 0.58, $ps < 0.001$; Time 3: r ranged from 0.37 to 0.63, $ps < 0.001$).

Cross-sectional measurement models

Table 3 presents the results of cross-sectional CFAs concerning the measurement models to be tested at each time point. Each measurement model is composed of three latent factors: one for the teacher-student relationship, one for peer relationships, and one for grit. The CFA model results indicated that the measurement model was valid at all three-time points. All the indicators were shown to be significantly loaded on the corresponding latent factor ($ps < 0.001$).

Multi-group invariance test for the measurement model across time points

Results of MG-CFA regarding the measurement model across three-time points are presented in Table 4. The configural invariance model fitted the data well, with $\chi^2(708) = 6531.99$, CFI = 0.96, TLI = 0.95, SRMR = 0.05, RMSEA = 0.034 (90% CI:0.033–0.034), indicating that the overall factor structure remained stable across three time points. Then, metric invariance model was also satisfied across three time points, with $\chi^2(750) = 6834.34$, CFI = 0.95, TLI = 0.95, SRMR = 0.06, RMSEA = 0.033 (90% CI:0.033–0.034), ΔCFI (M_{metric} - $M_{configural}$) = 0.002, ΔTLI (M_{metric} - $M_{configural}$) < 0.001, representing the invariance of factor loadings was held. Next, the scalar invariance model also fitted the data well, with $\chi^2(798) = 7794.31$, CFI = 0.95, TLI = 0.95, SRMR = 0.06, RMSEA = 0.035 (90% CI:0.034–0.035), ΔCFI (M_{scalar}-M_{metric}) = 0.007, ΔTLI (M_{scalar}-M_{metric}) = −0.004, meaning that the item intercepts were invariant, and the respondents similarly interpreted items across times. The relatively small changes of CFI and TLI abovementioned demonstrated that the measurement model was invariant across the three-time points.

TABLE 2 Descriptive statistics and pearson correlation coefficients among variables.

	M	SD	1	2
Time 1				
1. Teacher-student relationship	4.13	0.84	–	
2. Peer relationship	3.46	0.53	0.41*	–
3. Grit	3.18	0.56	0.41*	0.54*
Time 2				
1. Teacher-student relationship	4.09	0.89	–	
2. Peer relationship	3.34	0.59	0.44*	–
3. Grit	3.12	0.57	0.43*	0.58*
Time 3				
1. Teacher-student relationship	4.17	0.91	–	
2. Peer relationship	3.32	0.61	0.38*	–
3. Grit	3.11	0.63	0.38*	0.63**

*$p < 0.001$.

Longitudinal measurement model

In the longitudinal CFA model, each of the three latent constructs separately represented the teacher-student relationship, peer relationship, and EFL learners' grit at time 1, time 2, and time 3. The final model contained nine latent factors in the three-time points. The model showed adequate fit indices, with χ^2 (2,427) = 11987.38, $p < 0.001$, CFI = 0.93, TLI = 0.93, SRMR = 0.03, RMSEA = 0.040 [90% CI:0.040–0.041]. All the indicators were significantly loaded to the corresponding latent factor at $p < 0.001$. Therefore, the results abovementioned indicated that all the examined constructs showed similar meanings and temporal stability across three-time points.

Cross-lagged panel model

The cross-lagged model fitted the data well, with χ^2 (13) = 227.56, $p < 0.001$, CFI = 0.97, TLI = 0.92, SRMR = 0.05, RMSEA = 0.080 [90% CI:0.073–0.092]. Most of the paths in the model were statistically significant; nevertheless, we found that the teacher-student relationship in Time 1 did not significantly associate with EFL learners' grit in Time 2 ($\beta = 0.01$, $p = 0.388$). Therefore, we tested an alternative model without the non-significant path (from Time 1 teacher-student relationship to Time 2 grit). The alternative model also revealed good model fit to the data, χ^2 (14) = 228.31, $p < 0.001$, CFI = 0.97, TLI = 0.93, SRMR = 0.05, RMSEA = 0.079 [90% CI:0.070–0.089]. Due to the non-significant chi-square test between the hypothesized and alternative models ($\Delta\chi^2 = 0.75$, $df = 1$, $p > 0.05$), we decided to employ the alternative model as our final model due to the more parsimony of that model than the initial one (see Figure 1).

Results of the alternative model showed that all the constructs at Time 1 could significantly predict their Time 2 counterparts, and the constructs at Time 2 could significantly predict their Time 3 counterparts. At Time 1, only peer relationships positively predicted Time 2 grit in EFL learning

TABLE 3 Cross-sectional CFAs for Time 1, Time 2, and Time 3.

	χ^2	*df*	CFI	TLI	SRMR	RMSEA (90%CI)
Time 1 model	1944.12*	236	0.95	0.94	0.05	0.055 (0.052–0.057)
Time 2 model	2193.59*	236	0.96	0.95	0.05	0.058 (0.056–0.061)
Time 3 model	2934.28*	236	0.96	0.96	0.06	0.061 (0.059–0.064)

*$p < 0.001$.

TABLE 4 Testing for factorial invariance across three time points.

	χ^2	*df*	CFI	Δ *CFI*	TLI	Δ *TLI*	SRMR	RMSEA (90%CI)
Configural invariance model	6531.99*	708	0.96		0.95		0.05	0.034 (0.033–0.034)
Metric invariance model	6834.34*	750	0.95	−0.002	0.95		0.06	0.033 (0.033–0.034)
Scalar invariance model	7794.31*	798	0.95	−0.007	0.95	+0.004	0.06	0.035 (0.034–0.035)

*$p < 0.001$.

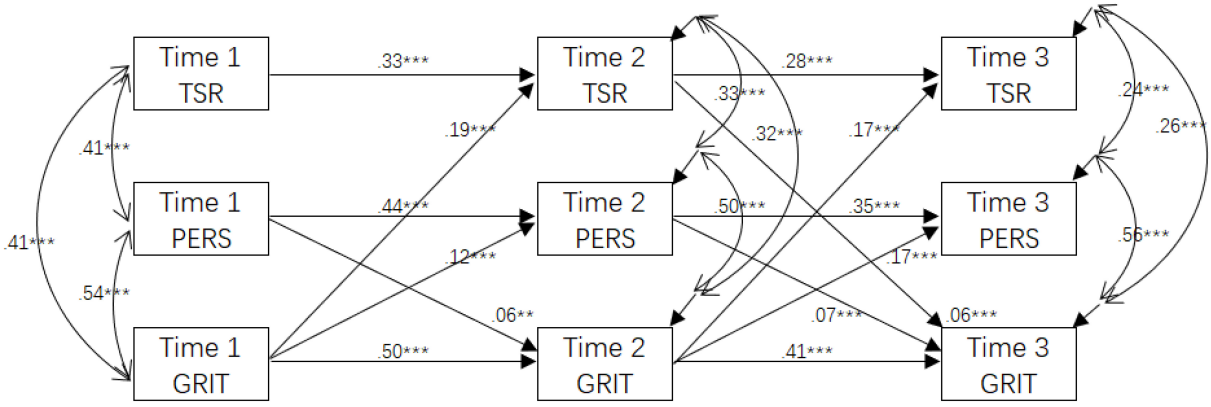


FIGURE 1
Cross-lagged path analysis model on the relationships between social relationship and grit in the English as a foreign language (EFL) context. TSR, teacher-student relationship; PERS, peer relationship. **$p < 0.01$, and ***$p < 0.001$.

(β = 0.06, $p < 0.01$, small effect size). However, in line with our expectations, both teacher-student relationship (β = 0.06, $p < 0.01$, small effect size) and peer relationships (β = 0.07, $p < 0.01$, small effect size) at Time 2 could positively predict Time 3 grit in EFL learning. RH1 was partially supported concerning the association between social relationships (teacher-student and peer relationships) and students' subsequent grit in EFL learning.

Results showed that Time 1 grit in EFL learning could positively predict Time 2 teacher-student relationship (β = 0.19, $p < 0.001$, moderate effect size) and peer relationships (β = 0.12, $p < 0.001$, moderate effect size); Time 2 grit in EFL learning could positively predict Time 3 teacher-student relationship and peer relationships (βs = 0.17, $ps < 0.001$, moderate effect sizes). Findings supported RH2, demonstrating that students' grit in EFL learning is associated with their subsequent social relationships (teacher-student and peer relationships).

In sum, we conclude that the hypothesis of the reciprocal links between social relationships and grit in EFL learning was partially supported: peer relationships showed reciprocal effects with grit in both two-time lags. The teacher-student relationship is influenced by grit in the first-time lags and then showed reciprocal effects with grit in the second-time lags. The effect is slightly more substantial regarding the prediction of grit on the social relationship than the reversed predictive relationship.

Multi-group invariance test for the structural model across gender

Results of MG-CFA regarding the structural model across gender are presented in Table 5. All the invariance models fitted the data well, and the model comparisons demonstrated the relatively small changes in values of CFI and TLI. Findings indicated that the relations between social relationships (the teacher-student relationship and peer relationships) and grit in EFL learning remained stable across gender.

TABLE 5 Testing for structural invariance across gender.

	χ^2	*df*	CFI	Δ *CFI*	TLI	Δ *TLI*	SRMR	RMSEA (90%CI)
Unstrained model	239.552*	28	0.97		0.95		0.05	0.056 (0.049–0.062)
Structural weights invariance model	269.824*	41	0.97	−0.002	0.95	+0.001	0.05	0.048 (0.043–0.053)
Structural intercepts invariance model	321.998*	47	0.96	−0.006	0.95	−0.003	0.05	0.049 (0.044–0.054)
Structural means invariance model	355.964*	50	0.96	−0.004	0.94	−0.003	0.05	0.050 (0.045–0.055)
Structural variances and covariances invariance model	391.337*	56	0.96	−0.004	0.94	+0.002	0.06	0.050 (0.045–0.054)

*$p < 0.001$.

Discussion

The current study used three-wave data to explore the bidirectional relationship between social relationships (the teacher-student relationship and peer relationship) and grit among Chinese EFL students. The cross-lagged model indicated that peer relationships and EFL students' grit were positively and reciprocally related across time points. In contrast, the teacher-student relationship and EFL students' grit only showed positive reciprocal associations from Time 2 to Time 3. During the first time interval, the Time 1 teacher-student relationship was not significantly associated with EFL students' Time 2 grit, yet students' Time 1 grit would positively predict their perceptions of the teacher-student relationship at Time 2. The findings provided evidence to understand better the dynamic associations between social relationships (the teacher-student and peer relationships) and students' grit within the Chinese EFL context.

Our results partially supported the RH1 showing that EFL students perceived peer relationships in Time 1 and Time 2 positively and significantly related to Time 2 and Time 3 grit. However, only Time 2 teacher-student relationship was positively and significantly associated with Time 3 subsequent grit. The findings echoed previous studies (Hejazi and Sadoughi, 2022; Shen and Guo, 2022; Yuan, 2022). When students have positive interpersonal relationships in EFL learning, they may involve in a friendly learning climate and benefit from other's support and care, which not only helps them relieve anxiety and pressure in learning English (Piechurska-Kuciel, 2011; Hung, 2020) but also inspires them to stick to their learning goals (Harter, 1996). It should be noted that the teacher-student relationship at Time 1 was not significantly related to EFL students' grit at Time 2. The possible reason is that our study started 2 months after they entered high school; students and English language teachers are not yet familiar with each other, so the prediction effect is negligible. As the time that teachers interacted with students increased, the influence of English language teachers on EFL students' outcomes gradually increased and started to benefit students' subsequent grit development.

Conversely, peer relationships at Time 1 could significantly predict grit at Time 2. This significant association may be because there was already a degree of familiarity between the peers during the study. One possibility was that before the start of this study, the high school students had already completed military training (a required course in high school). The students got along with each other in the military training process and gradually became familiar with each other. Another possibility was that with only four high schools in the tested district, which is limited in size, many students might have been familiar with each other before entering the high schools. Unfortunately, such information was not available in our background information, so it is just a possibility worth explaining the findings.

Our results fully supported the RH2, showing EFL students' grit in Time 1 and Time 2 related to Time 2 and Time 3 social relationships (teacher-student and peer relationships). It was in line with previous findings demonstrating that grit could predict willingness to communicate with others (e.g., Lan, 2020; Lee, 2020; Lee and Lee, 2020). Our findings verified the notion of the evocative effect, indicating that students' developmental outcomes (i.e., grit) would impact others' (e.g., teachers and friends) subsequent attitudes and behaviors toward them. When students exhibit more positive features in learning, such performance may be satisfied by teachers, and in turn, teachers would treat them in a more friendly manner. Likewise, an old Chinese saying goes, "Jin zhu zhe chi, jin mo zhe hei", a good environment can improve a person; however, a bad environment can worsen a person. Students who possess more grit are good role models among peers. They are also more likely to encourage and drive others to persevere in learning together, leading to closer friendships (Lan, 2020).

In terms of gender difference, the current study found no significant gender difference in the cross-lagged associations between social relationships and EFL students' grit, contrasting RH3, which is consistent with previous studies (Duckworth and Quinn, 2009; Vainio and Daukantaitë, 2016; Lee, 2020). The findings indicated that the strength in such associations for males and females was identical. Although male and female students may perceive interpersonal relationships differently and possess grits diversely, relationship intensity is consistent, which indirectly indicates that interpersonal relationships and grits are correlated to the same degree, regardless of gender.

Limitation and further direction

Several study limitations merit attention. First, the teacher-student and peer relationships we examined were from data collected from a self-reported questionnaire. It might not accurately reflect the relationships they indeed received from teachers of English and peers, leading to a subjective conclusion due to social desirability bias. Further research can include other ratings (e.g., self- vs. teacher- and self- vs. peer- ratings) on these social relationships into the research design to determine the similarities and differences concerning these relations across various raters. Second, the current study was an overpowering correlational research design; thus, we could not draw causal conclusions from the tested factors. Future research might apply an experimental research design to address this concern.

Third, the student samples we recruited in the study only came from one city in China; this was not representative of all Chinese EFL students. Therefore, the generalization of the results will be limited to some extent. In future work, students can be recruited from different types of schools across the country or even from other countries with various cultural backgrounds to ensure the sample's diversity. Fourth, measures that focus on peer relationships in English learning are limited, and this study is one of the first to adopt the general measure of peer relationships in a foreign language learning context. Therefore, we call for researchers to adopt a more valid context-specific instrument of peer relationships that may capture more specific EFL features to replicate our study.

Conclusion

The teacher-student and peer relationships are crucial social relationships that facilitate students' personality development. The current study employed a cross-lagged panel model to better understand the underlying mechanisms in EFL students' personality developmental process to facilitate specific interventions for EFL learning. Our findings suggested a symmetrically positive reciprocal relationship between peer relationships and EFL learners' grit. Such symmetrically positive reciprocal relationships also existed between the teacher-student relationship and grit when the English language teacher and students got familiar with each other, but an asymmetrical pattern that only grit positively predicted the teacher-student relationship when they were unfamiliar with each other.

Practical implications

The findings suggest the vital role of social relationships in positive personality development within the EFL context. Students exhibited performance in the English learning process also has an evocative effect leading to different social relationships with others. English language teachers should establish friendly interactions providing more care and support to students. This support can range from emotional encouragement to pedagogical support to promote persistence and willingness to communicate in English. They can also employ more cooperative learning tasks to promote the close relationship between students. Positive peer interactions can stimulate interest in using and learning English.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the University of Macau Research Services and Knowledge Transfer Office. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

TC significantly contributed to the conception of the study, designed and administered the survey, performed the data analyses, and wrote the manuscript. YY contacted participants, performed the analysis with constructive discussions, and contributed to analysis and manuscript preparation. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The differences in learning motivation of college freshmen in Northwest China

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The study aimed to investigate the learning motivation of freshmen from a university in Northwest China, which can supply a reference for improving their learning quality and objectives. Data were collected from 800 freshmen of different majors with a learning motivation questionnaire. Differences in learning motivation between different majors, genders, regions, and students are studied. The results show that gender, seeking knowledge orientation, and material pursuit have significant effects on students' learning motivation. The gender had a significant impact on personal achievement and the only child or not had an obvious effect on material pursuit, while other factors had no obvious difference in gender, regional, and only child or not, while other factors on the gender, regional, and whether the one-child had no obvious difference. According to the results of the research, measures to improve learning motivation are proposed. Our research results provide a reference for improving learning attitude and the quality of universities.

KEYWORDS

college freshmen, learning motivation, personal achievement, material pursuit, gender

Introduction

With the rapid development of China's economy, the demand of social development for high-quality talents is increasing. Meanwhile, the educational resources are gradually enriched, which provides more learning opportunities for college students with more learning opportunities. In 2020, the number of Chinese college students exceeded 8.74 million (Liu et al., 2021).The learning quality of college students has become the focus of social concern, because college students are the main source of talents.

Learning motivation is a driving force for study and is the key factor that determines the quality of learning (Oudeyer et al., 2016; Chang et al., 2020). It is an important factor to motivate students to improve themselves academically and to affect their academic performance (Hu and McGeown, 2020). In order to improve the quality of training, colleges in China have paid more attention to helping students to form healthy learning motivation (Cao and Meng, 2020). Generally speaking, most students have a positive and healthy motivation, but some students have some problems such as addiction to social software or games to drop out, not caring about academic performance, and lack of confidence in learning.

According to Ryan and Deci (2002), motivations can be divided into intrinsic and extrinsic motivations. The intrinsic motivation is the motivation to participate in activities for the reason of the activity itself, but not for some external reward (Chang et al., 2020). The extrinsic motivation is the motivation to participate in activities as the way to achieve a certain goal, such as money, social advancement, friendship or avoid punishment, etc. (Tranquillo and Stecker, 2016). For students, especially freshmen in China, many factors have an effect on their learning motivations due to change in social environment with the development of the economy and technology. This will bring changes in their intrinsic and extrinsic motivations.

Meanwhile, family is the first environment for students (Octaviany and Usman, 2021), and improvement family socioeconomic status will make parents provide more funds for student's study and opportunities. The only child in a Chinese family will enjoy more opportunities and financial support. Gobena (2018) said that family socio-economic status has an impact on students' academic performance achievement at college of education and behavioral sciences. At the same time, both external and internal learning motivation will be changed compared with the university students in China's backward economy, in especial before reform and opening up. Durdy et al.'s (2020) research suggests that the socioeconomic factor does not have a direct effect on learning outcome. However, Kormos and Kiddle's (2013) research showed that the difference of family and social status has a significant impact on students' learning motivation.

Besides, education background will also have an impact on students' learning motivation (Qi and Zheng, 2010). For example, the training objectives of engineering students and art students from primary school to university are inconsistent, and they have differences in personal ideal pursuit, social orientation, and material pursuit. At the same time, gender is also a factor that cannot be ignored. For example, female students are more worried about failure and take learning more seriously (Chang et al., 2020).

In this article, university freshmen with different professional backgrounds were selected to analyze their learning motivations from the effects of family economy, gender, whether they are an only child or not, and professional education background, which will provide a reference for improving learning attitude and the quality of universities.

Participants and methods

The flow chart of this study is shown in **Figure 1**. The main research objective of this article is to study the differences in learning motivation of college freshmen in Northwest China by questionnaire survey. The participants and the sampling, learning motivation questionnaire, and statistical methods are shown as follows.

Participants and sampling

The participants were chosen from freshmen studying various majors in different colleges in Shaanxi province in China and had a total of 830. A total of 796 valid questionnaires were collected, with a valid response rate of 95.9%.

Learning motivation questionnaire

The questionnaire designed by Huang and Zheng (1999) is used to evaluate college students' learning motivation. According to the survey on the demand structure of Chinese college students by Huang et al., the needs of college students can be divided into six basic types: physiological, safety, communication, respect, development, and contribution. Based on the embodiment of the six needs in learning motivation, 28 kinds of learning motivation are listed and randomly arranged. The college students were required to self-evaluate whether they have such a learning motivation. There are a total of 26 questions about pursuit of knowledge and progress (questions 1–6), social orientation (questions 7–12), material pursuit (questions 13–16), fear of failure (questions 17–20), personal achievement (questions 21–23), and small group orientation (questions 24–26). The choice of each question is the number between 1 to 6, and the number represents the extend of the respondents' approval of the question involved. The bigger the number is, the higher the approval is.

Statistical methods

Factors of learning motivation were evaluated with the principal component analysis method in the SPSS version 23.0 software package, and the significance of the factors and dependent variables was studied. KMO metrics were used to determine whether they can be used as factors to evaluate learning motivation. A number of 0.9 or above means very fit, 0.8 means fit, 0.7 means general, 0.6 means not suitable, and anything below 0.5 is an extremely bad fit. The data were evaluated by ways of mean, variance and t-test, and correlation test were used to evaluate data. A value of $P < 0.05$ was considered statistically significant.

Results

Overall evaluation of learning motivation

The results obtained using the above statistical model are shown in **Table 1**. It can be seen that the factors in the questionnaire have certain significance in learning motivation.

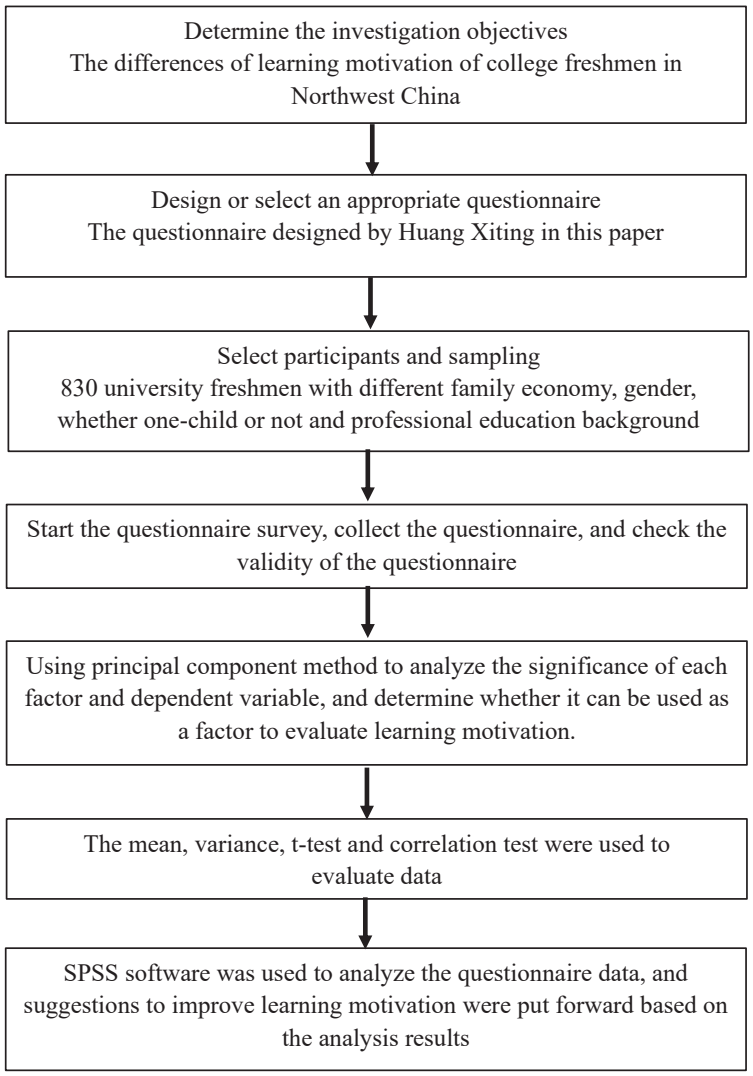


FIGURE 1
Research flow chart.

Among them, material pursuit and learning motivation have appropriate significance, while personal achievement, fear of failure and social orientation have general significance with learning motivation, and small group orientation and personal achievement have weak significance with learning motivation.

Difference analysis of learning motivation

The control variable method was used to analyze the differences in gender, region, being only child or not, and discipline among the components of learning motivation. The Table 2 shows the significance of learning motivation among students between gender, region, and only child or not. The gender had a significant impact on personal achievement ($P = 0.001 < 0.05$), and the only child or not had an obvious effect on material pursuit ($P = 0.004 < 0.05$), while other factors had no obvious difference in gender, regional, and only child or not ($P > 0.05$). Learning motivation is affected by gender and whether or not a student is an only child.

Correlation analysis of the influence of various factors of learning motivation on academic performance

As can be seen in Figure 2, the students of different majors such as metallurgy, mechanical and electrical engineering, and architecture have significant differences in pursuit of knowledge and progress ($P = 0.0003 < 0.05$) and fear of failure ($P = 0.0031 < 0.05$), while there are no significant changes in

TABLE 1 Mean scores of the six motivations of the respondents and their significance in learning motivation.

The serial number	Factors	Learning goals	On average score	Single problem significance	Factor significance
1	Knowledge and progress	Enrich and enrich their own spiritual world	4.226	0.644	0.700
2		Improve own quality	4.675	0.687	
3		To be successful, one should give full play to one's potential and value	4.755	0.752	
4		Be interested in the content or the study itself	3.961	0.653	
5		The pursuit of true knowledge, a thorough understanding of the world	4.134	0.679	
6		Future career success	4.838	0.784	
7	Social orientation	Maintain the honor of the school, win glory for the school	3.942	0.702	0.705
8		Class and department honors	3.962	0.696	
9		To be useful and social	4.727	0.709	
10		To serve others while achieving self-worth	4.672	0.745	
11		Response for teacher's hardworking	4.19	0.718	
12		Human progress and prosperity	4.09	0.657	
13	Material pursuit	Get ahead, get a higher social status	4.621	0.765	0.800
14		Learn to make money	4.737	0.833	
15		To be competent for future work	4.891	0.784	
16		I want to have a rich family after I start a family	4.785	0.818	
17	Fear of failure	Discipline	2.97	0.736	0.725
18		I am afraid I cannot graduate and get a diploma	3.197	0.725	
19		Competition among classmates	3.278	0.711	
20		Afraid of being blamed by friends and relatives for poor grades	3.175	0.727	
21	Personal achievement	Make a career and become famous	4.373	0.662	0.609
22		To gain some kind of power or position in the future	3.706	0.588	
23		Find an ideal life partner	3.991	0.576	
24	Small group orientation	To live up to a man I love very much	4.345	0.766	0.688
25		To repay my benefactor for raising me	4.572	0.707	
26		Argue for a few good friends	3.315	0.59	

TABLE 2 Significance of learning motivation in gender, region, and only child or not.

Factors	Gender	The average	Gender significant	Regional	The average	Regional significant	One child or not	The average	Only child or not significant
Knowledge and progress	Male	4.409	0.483	Rural	4.213	0.768	Yes	4.357	0.096
	Female	4.468	0.483	City	4.445	0.770	No	4.492	0.101
Social orientation	Male	4.281	0.627	Rural	4.293	0.428	Yes	4.199	0.171
	Female	4.234	0.631	City	4.223	0.436	No	4.318	0.177
Material pursuit	Male	4.779	0.539	Rural	4.819	0.099	Yes	4.619	0.004**
	Female	4.724	0.539	City	4.675	0.104	No	4.873	0.004**
Fear of failure	Male	3.178	0.531	Rural	3.127	0.510	Yes	3.169	0.783
	Female	3.116	0.530	City	3.192	0.510	No	3.142	0.784
Personal achievement	Male	4.139	0.001	Rural	4.068	0.255	Yes	3.957	0.198
	Female	3.833	0.001	City	3.961	0.259	No	4.077	0.202
Small group orientation	Male	4.033	0.061	Rural	4.005	0.398	Yes	3.915	0.115
	Female	3.891	0.061	City	3.943	0.405	No	4.031	0.120

**Significant difference ($P < 0.05$), only child or not.

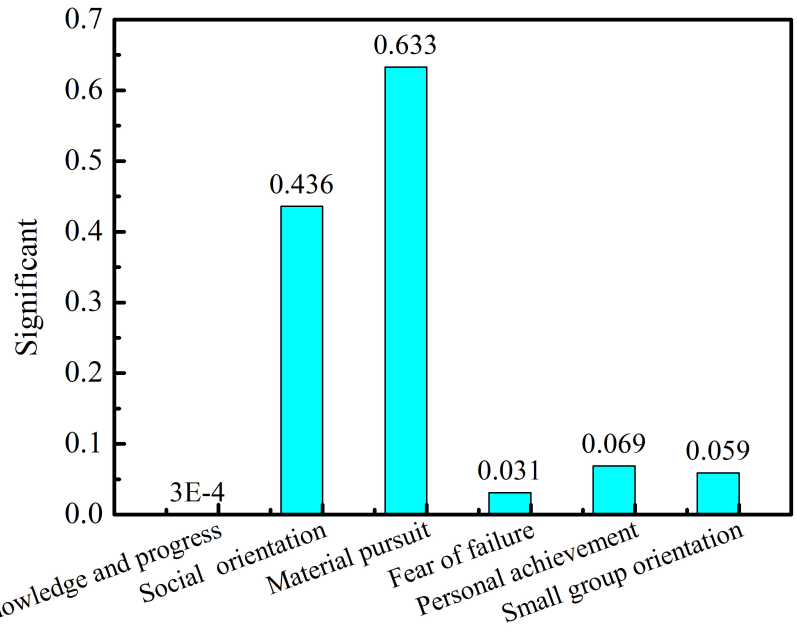


FIGURE 2
Significance of students' learning motivation in college of metallurgical engineering, college of mechanical and electrical engineering, and architecture college of Xi'an.

social orientation, material pursuit, personal achievement, and small group orientation. As can be seen in **Figure 3**, students from the college of metallurgy and mechanical and electrical engineering and those from the college of arts showed significant differences in intellectual advancement ($P = 0 < 0.05$), social orientation ($P = 0 < 0.05$), and small-group orientation ($P = 0.001 < 0.05$) but no obvious differences in fear of failure and personal achievement.

Discussion

Overall evaluation of college students' learning motivation

From the data analysis in **Table 1**, it can be seen that the correlation coefficients of various influencing factors of learning motivation are material pursuit, fear of failure, social orientation, knowledge pursuit and progress, small group orientation, and personal achievement from the top to the bottom.

Compared with the ranking of learning motivation of ordinary students, the ranking of material pursuit is basically consistent with the survey results (Xu, 2015). It is worth noting that the results of fear of failure in freshmen's learning motivation were increased from the sixth place to the second place compared with the previous survey results (Xu, 2015), while the ranking of the other influencing factors of learning motivation did not change that much (Liu et al., 2005; Cheng, 2019).The above results show that the college students generally believe that the main purpose of going to college is to be able to satisfy their material life in the future, and that "to find a good job in the future" and "to have a rich family" are the expectations of the students.

However, fear of failure is rising because at the beginning of the semester, the students have high enthusiasm and strong sense of competition, and strictly abide by the school system, but such a motivation will gradually weaken later, and the fear of failure has no sustainable effect on learning motivation (Du, 2008). Furthermore, instead of being completely immersed in the passive learning of material pursuit and fear of failure, freshmen can show their determination to be a useful person and realize their own value. Compared with the personal achievement, social orientation has a greater impact on students' learning motivation. This means that students are willing to work hard to maintain the honor of the school, college and class, and to become a person beneficial to society. However, we should also be aware that current college freshmen show insufficient motivation to pursue knowledge and progress, which is manifested by the lack of interest in improving their quality, learning content, and motivation to pursue true knowledge, etc., and that they still look forward to having a successful career.

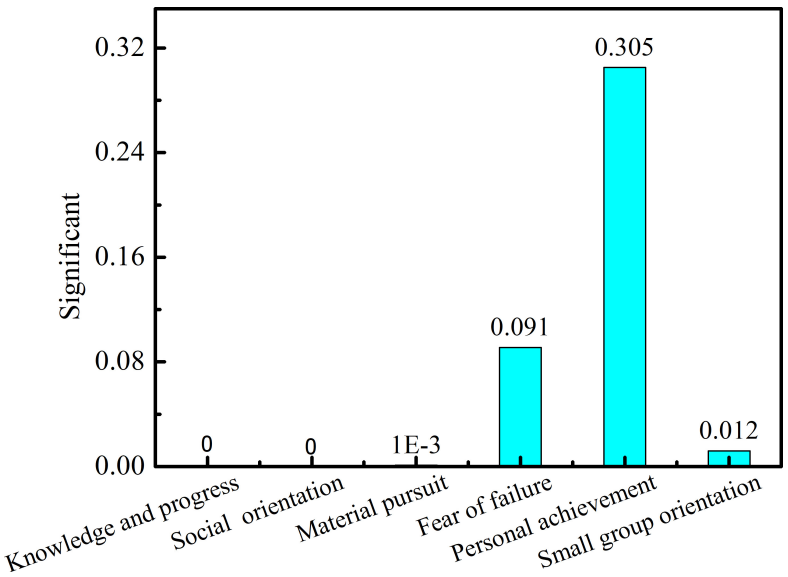


FIGURE 3
Significance of students' learning motivation in college of metallurgical engineering, college of mechanical and electrical engineering, and college of art. **Table 2** significance of learning motivation in gender, region, and only child or not.

Analysis on the difference in freshmen's learning motivation

As can be seen in **Table 2**, the learning motivation of the freshmen showed significant differences in gender and whether they are an only child or not, but the differences were not significant in region. Specifically, the male and female students show significant differences in personal achievements, and their motivations for becoming famous and seeking power, status, and ideal lifelong partners are obviously different. However, the male students have a significantly higher desire for personal achievements than the female students. This result is similar with previous research, which pointed out that female students have learning motivations different from those of male students (Chang et al., 2020).

Although the learning motivation of college freshmen is not obviously different in regions, and the learning motivation of rural students in social orientation, material pursuit, personal achievement, and small group orientation is higher than that of urban students. Maybe it is because students in rural areas are at a resource disadvantage. After entering universities, rural students show a strong desire to learn and strive for honor or material security for themselves and the collective through their own efforts (Oudeyer et al., 2016; Qi and Zheng, 2010). Urban students, on the other hand, prefer to improve their personal quality and achieve career success.

In **Figures 2**, **3**, it can be seen that significant differences between engineering students (metallurgy and mechanical and electrical) and art-related subjects (architecture and art) are reflected in the orientation of seeking knowledge. This may be due to differences in disciplines and students' training modes. The engineering students are good at theoretical subjects but lack thinking skills (Kuo et al., 2021). However, the students majoring in arts need to study independently or cooperatively, and they need to pursue their own potential in learning, thus stimulating creativity. Moreover, the proportion of college students majoring in art in urban areas is larger than that of students taking other majors. Most students are pampered by their parents since childhood, and their material needs can be basically met. Therefore, the art students have a relatively less desire for material pursuit, which is different from students majoring in science and engineering.

Measures to improve learning motivation

The results above show students of different genders, regions, and disciplines being analyzed. According to the group characteristics of the students, ideological education is conducted in a personalized and scientific way to promote the better development of learning attitude (Campos-Mesa et al., 2019). For example, students' learning motivation mainly focuses on material pursuit; as a result, schools, society, and families should guide students to avoid "money worship," and at the same time give appropriate material rewards to improve students' self-confidence, increase sense of security in learning, and maintain students' enthusiasm. Besides, practical activities

such as engineering experiments and social practice can also promote change in students' learning motivation (Kuo et al., 2021; NaderAl-Osaimi and Fawaz, 2022).

Conclusion

Differences in the learning motivation of college freshmen in Northwest China were investigated in this article. The main conclusions are as follows:

(1) The correlation coefficients of various influencing factors of learning motivation are material pursuit, fear of failure, social orientation, knowledge pursuit and progress, small group orientation, and personal achievement from the top to the bottom.
(2) The learning motivation of the freshmen showed significant differences in gender and whether they are an only child or not, but the differences were not significant in region. Boys' desire to achieve results in personal achievement is obviously higher than that of girls', and girls' pursuit of knowledge is stronger than that of boys.
(3) Significant differences between engineering students and those taking up art-related subjects are reflected in the orientation of seeking knowledge. Students majoring in science and engineering are lower than students majoring in art in seeking knowledge, and students majoring in art have lower desire for material things than students majoring in science and engineering.
(4) Rural students have a higher learning motivation in social orientation, material pursuit, personal achievement, and small group orientation than urban students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of Xi'an University of Architecture and Technology. The patients/participants provided their written informed consent to participate in this study.

Author contributions

KQ drafted the manuscript, designed the questionnaires, and proposed the idea. PG translated and revised the manuscript. RX collected the data, preformed the statistical analysis, and designed the study. BL and XC contributed to the revision of the manuscript and funded the investigation. All authors have read and agreed to the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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International students' university choice to study abroad in higher education and influencing factors analysis

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With the development of China's higher education, China has become increasingly popular as an education destination for international students. To explore the rationale and the influencing factors for them to attend Chinese universities, this research adopted a questionnaire survey and interviews with international students from a top university in China. The data were analyzed from four aspects: home countries' push factors, China's pull factors, university attractiveness factors and personal choice factors. The findings show that university attractiveness factors are more significant than the China's pull factors and the home countries push factors; China's pull factors have significant influence on the university attractiveness factors; For students from different regions, the factors of China's pull, home country's push and university attractiveness play significantly different role in affecting their choice of university, with Asian students much more affected than those from other parts of the world. Besides, individual subjective norms and individual value choices also affect students' choices to study abroad.

KEYWORDS

international student, push-pull theory, higher education, university choice, top universities

Introduction

In recent years, an increasing number of international students choose to study in China. In 2017, a total of 489,200 overseas students studied in Chinese institutions of higher education, resulting in a growth rate of more than 10% for two consecutive years. Among them, 241,500 students are pursuing academic degrees, accounting for 49.38% of the total number, 15.04% more than the previous year, which makes China Asia's first destination for studying abroad [Ministry of Education of the People's Republic of China (MOE), 2017]. The increasing number of international students has been one of the drivers behind the international development of China's higher education system, which has been highly valued by the Chinese government. In 2018, the Chinese government launched "Double First-Class Initiative" aiming to build more world-class universities

and disciplines. Chinese universities, such as Tsinghua University and Peking University, have become world-renowned, attracting international students from all over the world. With the globalization of the world economy, countries around the world are striving to internationalize their higher educational systems in order to attract more international students. However, a high enrollment rate does not represent a high level of internationalization of higher education. They way that China and its universities attract more international students and gain a good international reputation in the world has become the key to the success of internationalization of Chinese higher education.

International students' university choice is affected by multiple factors, among which economic factors are considered essential. Developed countries enjoy economic advantages and have a large number of internationally renowned universities, thus they have been one of the primary choices for international students for a long period of time. However, developing countries have an urgent need for the internationalization of higher education and overseas talents. Therefore, favorable policies for international students have been introduced, and some non-traditional destination countries such as China, India, and South Africa are attracting increasing international students (Kondakci et al., 2018). With growing economic strength and favorable scholarship policy, China has attracted plenty of students from both developing countries and developed countries. The proportion of international students is also enlarging in China's top universities. Besides, the reputation and quality of universities are also the core factors affecting the choices of international students. According to the QS global study report released by the UK, the world's most popular destination countries for international students are the United States, Britain and Canada. This is related to the strong competitiveness of the United States' universities that rank high in the World University Rankings. To be specific, the United States has 94 out of the top 200 universities in the world, accounting for 47%, followed by the UK with 20 universities, accounting for 10%. The world's top universities attract more international students by providing adequate learning resources, high-quality courses, and good employment prospects, which increase their competitiveness significantly. Even so, the influence of universities is only an external factor affecting international students' choice of schooling. Choosing a university is also related to an individual's family background, economic situation, personal development goals and other factors. The choice of international students' learning abroad is the result of a combination of various factors. But what are these factors that influence international students' choice of schooling? How can universities and host countries attract more international students? The solution to these problems will help us understand the needs of international students, so as to improve the international environment and enhance the internationalization of the tertiary education system.

Literature review

The university choice and influencing factors of international students have always been a valuable topic of higher education internationalization. The relevant literature is grouped into two categories: first, the studies on international students' university choice and influencing factors, which explore the dynamic mechanism of international students' going abroad; second, the studies on the trend of international student mobility, which explores the scale, characteristics and paths of the students.

University choice and influencing factors for international students

From the perspective of home countries, the number of international students coming to China is significantly affected by: (1) the level of economic development, educational opportunities and quality of education of their home countries; (2) economic cooperation, political relations, mutual recognition of degree systems and geographical distance between students' home countries and China; (3) the opportunity to win scholarships from the Chinese government for international students (Wang and Chen, 2018). When home countries cannot provide high-quality educational resources, satisfactory academic programs, high-level faculty or other learning resources, internal push factors in home countries will be generated to promote the students to study overseas (Lv, 2016).

From the perspective of China, through a sample survey of foreign students in six universities in Beijing, it is found that students' interest in Chinese culture, China's better employment prospect quality, better enrollment opportunities of higher education and higher education quality are prominent reasons to attract overseas students (Liu et al., 2013). In addition, China's increasing economic growth, developing potential, good bilateral trade relations, the improvement of science, technology and education level, and bilateral mutual recognition agreements also attract students (Song and Liu, 2014). Some researchers found that the strongest motivation for international students to study in China is to improve their Chinese language proficiency, experience Chinese culture, enhance their cross-cultural communication ability and pursue employment competitiveness (Yang and Wang, 2017).

From the perspective of universities, Choudaha (2015) believes that if universities want to attract international students, they need to strengthen policy guidance and support (such as improving the visa system, increasing scholarships, etc.), strengthen cooperation and communication with overseas universities, and design "customer-oriented" recruitment strategies so that students can make their own choices. The regional openness, faculty-student ratio, educational expenditure per student and GDP *per capita* have significant positive effects on the regional choice of international students (Qu and Jiang, 2011). Some researchers point out that regional advantages, campus

environment, family recommendations, academic programs, distance from home, and cultural atmosphere are important factors that attract international students (Krampf and Heinlein, 1981). In addition, school reputation, education and teaching quality, academic performance, infrastructure facilities, curriculum, student life and international student organization also affect students' choices (Lin, 1997).

From the perspective of students, Tang (2017) believes that international students are consumers, and students' personal attitudes and personal willingness are the key factors for students to choose to study in China. By the narrative studying on reasons for American student John to come to China, it can be concluded that the internal factors include John 's personal experience, characteristics, hobbies and career pursuits (Yang, 2016).

University choice and mobility trends for international students

With the transformation of the global political and economic pattern, the mobility of international students has also displayed new changes. For example, international students have shown a sustainable growth trend, with the United States and other developed countries still the main destination countries for studying abroad. China has become the world's largest exporter of international students. The destination countries have gradually shown a diversified trend and the distribution of destination countries between regions is uneven (Ma and Cheng, 2018). On the other hand, the recruitment of international students has generally become the internationalization strategy of various countries, and the mobility of international students has gradually changed from "one-way flow" to "two-way flow," especially the trend of regional nearby mobility has increased. Transnational higher education has developed rapidly and has played a crucial role in promoting the mobility of international students (Zhang, 2018).

The regionalization of higher education has promoted the mobility of international students, and the enrollment of nearby students has become a new trend of international student mobility. At present, the regionalization has become a significant feature of the internationalization of higher education. Just like the European higher education area, Association of Southeast Asian Nations and the African Union have gradually built a regionalization strategy for higher education. To be specific, about 82% of EU students choose to study in other countries in EU, and more than 60% of international students of Belgium, Japan, South Korea, Poland, Russia, China and other countries come from neighboring countries (OECD, 2017). The regionalization of higher education provides more flexible policy guarantees for international students such as scholarships, credit conversion, academic qualification certification, etc. The mobility of international students in the region is growing frequent. For instance, Singapore in Southeast Asia, South Africa in Africa, and New Zealand in Oceania are gradually becoming regional centers (Lee, 2015). Therefore, the mobility of international students is showing a multi-destination trend.

The academic reputation of the institution has a continuous impact on the choice of international students. The quality of a university is reflected by its academic reputation, which is a social perception system for the quality of the university formed in the long-term development (Yan, 2012). International students' choices of attendance are influenced by this social perception. Academic reputation has always been an important indicator to evaluate the quality of university education, among which the level of internationalization of a university is an important factor affecting academic reputation. The integration of international students helps to enhance the internationalization level of institutions, and international education is the basic condition for attracting overseas students. One of the purposes of the World University Rankings is to provide a reference for students' university choices, and to build up the international academic reputation. Internationalization level of universities has become a development indicator for global universities to compete for admitting talents. With the regionalization of higher education, universities in some developing countries are gradually establishing centers for international student mobility. For example, China's institutions on the world university rankings are progressively increasing, attracting a growing number of international students.

Theoretical framework

There is an extensive body of research for international students' university choice, which has produced numerous theories to analyze the influencing factors, including Push-Pull Theory, Gravitational Theory, Theory of Reasoned Action, Theory of Personal Planning Behavior and so on. These theories explain the flow of the international students from different angles and learning experiences, which provide theoretical reference for the research.

The Push-Pull Theory was put forward by Altbach (1998) and was used to analyze population flow, economic development, choice intention and other fields. When applied to the analysis of international students, it is believed that the driving factors are often those that promote students to study abroad from their countries of origin (home country), including social and economic limitations, lack of education opportunities, increased competition for employment and other factors. Pull factors often refer to those that attract students to the host country, including the availability of overseas study scholarships, high-quality education, advanced research equipment, appropriate education facilities, a stable political situation and so on.

Gravitational Theory has long been popular for analyzing economic phenomena related to the movement of goods and services, capital, or even people (Ramos, 2016). Supported by this theory, studies have found that the economic development of the home country and China's development potential are

macro factors attracting international students (Wei et al., 2012). Good bilateral trade relations, ease of native language use, increased educational opportunities, university attractiveness and improved quality of education are all important factors. Among them, university attractiveness has become a key factor of affecting the choice of international students. University attractiveness factors include macro and micro dimensions. Among them, macro dimension includes the geographical and regional advantages of the institution, the city's development level and its international reputation, etc.; micro dimension includes school reputation, campus cultural environment, teacher quality, curriculum, etc.

Theory of Reasoned Action (TRA) mainly focuses on personal factors, believing that behavioral intentions can be predicted and explained through individual behavioral attitudes and subjective norms (Ajzen and Fishbein, 1975). Ajzen found that personal behavior relies on outside resources, and he put forward the Theory of Planned Behavior (TPB), that individual behavioral intention is affected by attitude, subjective norm and perceived behavior control (Ajzen, 1991).

Based on the analysis of the above theories, it is found that Push-Pull Theory only focuses on the impact of macro factors international students' choices, Gravitational Theory takes into account the combination of macro factors and campus micro factors. Besides, both Theory of Reasoned Action and Planned Behavior Theory start from the individual behavior choice intention. Four theoretical frameworks explain the different levels international students' university choice. In fact, the choices of international students are influenced by every single factor at the same time, and the process is the result of integration and compromise between different factors. That's the reason why we analyze students' choices at the level of country, institution, and individual. This research adopts a theoretical framework to analyze the factors affecting international students' choice of universities from four aspects: home country's push, China's pull, university attractiveness and individual behavior (see Figure 1).

Research method

Data collection procedures

According to the theoretical framework of "individual—school—country (home country and destination country)," this research uses a mixed method to collect, analyze, and integrate quantitative and qualitative data. Some researchers believe that neither quantitative nor qualitative method is enough to displace research trends and details (Johnson and Onwuegbuzie, 2004). Mixed methods can provide a more comprehensive research perspective through the combination of the above two (Ivankova and Stick, 2007). This study consists of two parts. The first part is a questionnaire survey, and quantitative methods are used to analyze questionnaire data to explore international students' choice of schooling and influencing factors. The research designs a questionnaire about international students' choice of schooling and submits it to the Academic Ethics Club of the university for review. After obtaining the consent of an international student from the United States who was studying in the university, we invited international students through his help to respond to the questionnaires. We made a statement that we would protect the privacy of all participants and the questionnaire data was only for research use. The second part includes interviews and analyze the interview texts to explore the value orientation of international students' choice of schooling. In the questionnaire, we designed a question "Would you like to be interviewed by us? If you are willing, please leave your contact information." Through the contact information, we contacted the interviewees, informed them of the purposes and procedures of the interviews in detail, and signed the information protection agreements. The questionnaires and interviews were conducted in strict accordance with the academic ethics system and requirements.

Instruments and participants

The instruments used in this study includes "International students' choice of university questionnaire." The first part of the questionnaire asks questions about international student background information related to demographic variables to determine whether the students who fill in the answers meet the selection criteria for international students (degree-seeking students). The second part includes questions that we modified from "the International student university choice behavior scale" designed by Tan (2015); we used a 5 point Likert scale, from very disagree to very agree, 1 = very disagree, 5 = very agree. The scale is divided into three dimensions: home country push factors, China pull factors, and university attractiveness factors. The Cronbach's alpha of the home country push factor is 0.712, the Cronbach's alpha of the China pull factor is 0.810, and that of the university attractiveness factor is 0.873, all showing good reliability. The third part asks open-ended questions about the respondents' experience of university choice and invitations that whether they are willing to accept following face-to-face interviews. The paper selected the interviewees according to their questionnaire results, and conducted in-depth interviews afterwards. In the end, 68 questionnaires were collected through WeChat app, excluding 1 invalid questionnaire (which was incomplete), and the sample composition of the questionnaire was shown in the following Table 1.

Based on the questionnaire survey results, we designed an interview outline and contacted the international students willing to be interviewed. To ensure the diversity of interviewees, this research tried to recruit interviewees from different backgrounds according to their respondence to the questionnaires. In the end, 8 international students from 8 different countries were selected

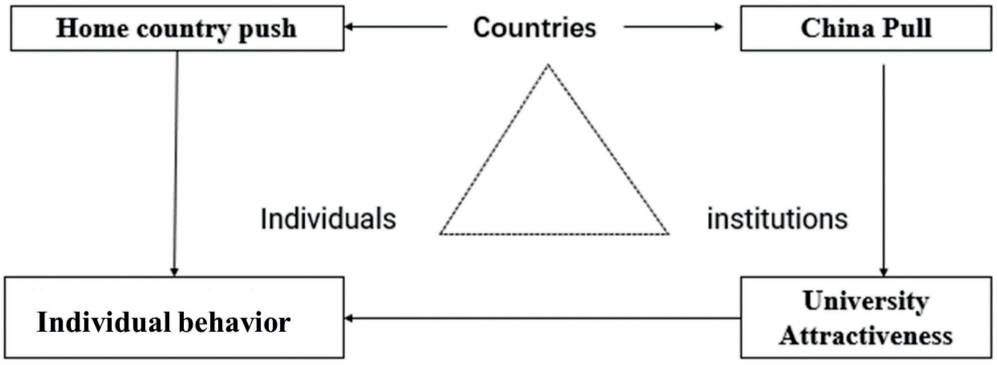


FIGURE 1
Framework for the analysis of international students' university choices and influencing factors.

TABLE 1 Sample composition.

	Variable	Number	Percentage
Gender	Male	46	68.70%
	Female	21	31.30%
Student type	Undergraduate	4	6.00%
	Master	39	58.20%
	Doctoral student	24	35.80%
Field	Engineering	25	37.31%
	Science	8	11.94%
	Humanities and Social Sciences	34	50.70%
Nationality	Asia	35	52.20%
	Europe	9	13.40%
	North America	6	9.00%
	South America	3	4.50%
	Australia	2	3.00%
	Africa	12	17.90%
	Total	67	100%

for the interviews. They are from the United States, Nepal, Indonesia, Pakistan, Myanmar, Nigeria, Georgia and Turkey, and were studying eight different majors in three academic fields. The interviews mainly focused on the student's experiences of selecting the university and their attitudes towards this behavioral choice, so as to comprehensively understand the students' choice. For the students who took part, the research presented a book named *Analects of Confucius* as a gift. The researchers chose a private table in a coffee shop to conduct face-to-face interviews, so that the interviewees felt relaxed and were willing to talk freely about their experiences. Each interview lasted approximately 30–60 min.

Statistical methods

The research used SPSS 17 software to carry out statistical analysis of the questionnaire data. The interviews were recorded and transcribed with the interviewees' consent. The transcription of each interviewer was numbered sequentially with the first letter of their names and first letter of their countries capitalized, such as "TG01."The texts were coded and analyzed through open coding, core coding and selective coding with the software Nvivo 11. The principle that researchers followed is to focus on the materials and data and let the data speaks for themselves.

Results

University attractiveness is a major factor for international students coming to China

Through a descriptive statistical analysis of the influencing factors of international students coming to China, the paper found that the average push factors of the home country were less than the median value 3, indicating that the push factors of the home country were not the main reasons for international students to go abroad or choose China. The influencing factors for international students coming to China are mainly caused by China's pull and university attractiveness factors. As can be seen in Table 2, the university attractiveness factor is significantly greater than both the Chinese pull factor and the home country push factor. Besides, the Chinese pull factor is significantly greater than the home country push factor. This result shows that institutional factors such as school reputation, institutional environment, and teaching quality are closely related to international students' choice of universities. China's stable social environment and the high level of internationalization of universities provide better choice for international students. The findings appear to be consistent with the result of the interviews. The international students interviewed think that social environment and the reputation of the university are the main factors that they consider. One interviewee said that *"My friends told me China is safe, the university environment is very good, and the scholarship is relatively high"* (MG01). Another said that *"This*

TABLE 2 The overall situation of the influencing factors of international students coming to China.

Influencing factors	Number	Minimum	Maximum	Average	Standard deviation	Median
China Pull	67	1.182	4.909	3.289	0.777	3.364
University Attractiveness	67	1.267	4.667	3.446	0.717	3.600
Home country Push	67	1.000	4.8	2.406	0.913	2.400

TABLE 3 The regional difference of influencing factors for international students.

Dependent variable	(I)area	(J)area	Mean difference (I−J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Home country Push	Asia	Europe	1.229*	0.297	0.000	0.635	1.823
		Australia	1.551*	0.578	0.009	0.395	2.707
	Europe	South America	−1.111*	0.530	0.040	−2.170	−0.051
		Africa	−1.344*	0.350	0.000	−2.045	−0.643
	Australia	Africa	−1.667*	0.607	0.008	−2.880	−0.452
China Pull	Asia	Europe	1.193*	0.255	0.000	0.683	1.703
		North America	0.673*	0.301	0.029	0.070	1.276
	Europe	South America	−1.111*	0.454	0.018	−2.020	−0.201
		Africa	−0.808*	0.300	0.009	−1.409	−0.206
University	Asia	Europe	0.916*	0.243	0.000	0.429	1.403
Attractiveness	Europe	North America	−0.715*	0.343	0.042	−1.401	−0.028
		Africa	−1.076*	0.287	0.000	−1.650	−0.501

*The significance level of the mean difference value was 0.05.

university is very influential in my country. It is a matter of great pride to study here" (II03). Therefore, in the choice of universities, international students first consider the institutional factors, then the social environment of the host country, and at last the constraints of the home country.

Origin differences in the factors for international students' choice of university

The analysis of variance was carried out by taking the place of international students as the independent variable and the influencing factors in China as the dependent variable, as shown in Table 3. There were significant differences in the influencing factors of international students coming to China on the countries of origin. After further multiple post-event comparative analysis, it was found that the pull of China is significantly higher for international students from Asia than those from Europe and North America, while China's pull for European students is significantly lower than African and South American students. In terms of university attractiveness, students from Asia were significantly more affected than those from Europe, and European students significantly less than those from North America and Africa. In terms of home country push factors, students from Asia were more affected than those from Europe and Australia, and European students were affected less than South American and African students. In terms of physical distance, Asian countries are relatively close to China, especially within the Confucian cultural circle. There are many similarities and commonalities in cultures, which provide innate macro conditions for Asian international students to come to China. In the interview, a student from Asia said that the distance factor was the main factor he considered, *"China is very near, and the diploma of this university is well recognized by my country. That's the main reason for me to study here"* (SN04). In addition, following the implementation of the "Belt and Road Initiative," China has increasingly frequent economic and trade exchanges with Asian countries, which also leads to cooperation and exchange in the field of higher education. *"China has a good study abroad policy, and our country has a lot of cooperation with China… Chinese universities are becoming more and more international "*(MM05). Therefore, the factors mentioned above, such as the close physical distance, cultural similarity and the increase of international cooperation, contribute more to the Asian students' choosing China than students from other regions.

Correlation analysis of influencing factors of international students

The correlation of three factors for international students coming to China is analyzed, and the results are shown in Table 4. It is found that there is a significant positive correlation between

TABLE 4 Correlation analysis of influencing factors of international students.

	Home country Push	China Pull	University attractiveness
Home country Push	1		
China Pull	0.470**	1	
University Attractiveness	0.326**	0.696**	1

**At the 0.01 level (double-tailed), the correlation was significant.

the home country push factors and China pull factors, China pull factors and university attractiveness factors, as well as home country push factors and university attractiveness factors. On the one hand, the social environment and development conditions of the home country affect individual choices, while the level of trade or cooperation between the home country and China also affect students' chances of attending university in the destination country. Just like what an interviewee said, *"In recent years, our country has a lot of trade contacts with the Chinese government, and the program I join in is one of the cooperation programs. The Chinese government provides us a special scholarship"* (MP02). On the other hand, it can be seen that the pull factors and university attractiveness factors are highly related, with the stable social environment in China as the premise of university attractiveness. *"You feel safe and cozy studying in China,"* said one interviewee, *"The campus living conditions are satisfactory… There are also a lot of international students here, so our communication is relatively smooth "*(JU07) Since China's reform and opening up policy, China's social and economic development has been rapid. This development has also influenced the growth of higher education. With the steady improvement of the global reputation of China's universities, the ability to attract international students is getting stronger.

Individual subjective norms affect international students' choices of universities

As mentioned above, the Theory of Planned Behavior believes that subjective norms refer to the degree of difficulty perceived by individuals to a certain behavior, reflecting the influence of others or groups on the individual's decision-making behavior. When interviewees were asked if they consulted any other people in making their decision, or made the decision on their own, nearly everyone noted that they made the decision to study at China in consultation with others, not on their own. *"My parents support me to study in China"* (SN04), "*My parents did not think it a good idea for me to study in China, but one of my classmates studies here. He shares many stories about China with me, so I really want to study here"* (MN06). Although not all students have the support from their parents in making this decision, they will find the "advantages" of coming to China from their personal relationships. Another two interviewees said their partners were in China and another interviewee brought her husband to China. The rest of the interviewees said they had friends studying in China, and they were willing to recommend friends studying in China, *"I know a lot of Chinese friends here, I also would like to introduce my friends to study here, I think it is very meaningful to study in China "* (JA08). It can be seen that the support from family and friends affect the choice of international students. These important people provide information for international students to have a deeper understanding the university and destination country.

Discussion

With the development of globalization, the competition in the field of higher education is also becoming global. A host of countries are committed to increasing the degree of internationalization in higher education, attracting more talented students. Through an analysis of the selection experiences and influence factors of international students, it can be found that the role of home country push factors is relatively weak, and the pull factors are getting much stronger.

From the aspect of factors of international students' choice, the students tend to pay more attention to the quality and reputation of the institution. University reputation and destination image are the key factors affecting the choice of studying abroad in developed countries, which has been confirmed by several studies (Sarah, 2018; Ma, 2022). This study also found that the ranking of some top Chinese universities and their good prospects will affect students' choices significantly. At the same time, abundant scholarships for international students, the good campus environment and the city where the university is located also influence the students' choice to study in China. The study of Oladipo and Sugandi (2022) also found that improving the internationalization level of universities and providing good learning support for international students (such as scholarships and English-only curriculum plans, etc.) have become the recruitment strategies to attract international students.

From the individual behavioral intention level, students' behavioral intentions are under the influence of internal and external environmental factors. Subjective perceptions affect the students' attitudes towards a university, which in turn influences the individual's choice of school. For example, the academic reputation of Chinese universities in the world and the international students' understanding towards China affect their behavior intention to China. Wiers-Jenssen (2019) found that there are few well-known universities in Norway, but it attracts plenty of international students. The reason is not related to the quality of universities, but the result of students' rational choice. International students will consider to obtain free higher education in a safe country and increase their career opportunities. As for the motivation of international students to study in China, some studies have found that factors such as China's rising economy, development potential, reputation of higher education

quality and bilateral mutual recognition agreement affect international students' choice of education (Lu and Tian, 2018; Wen and Hu, 2019). This study also found that international students' interest in Chinese culture will also affect students' individual choice of schooling. Studies have found that international students tend to choose developed countries with a common language, and a country's culture is very important to attract international students (Hao et al., 2019). In terms of the value choice between students and universities, the internationalization level, reputation and the quality of teaching affect students' evaluation of the value brought by the university, that is, whether the resources or support provided by the university can meet the needs of students. Ma (2022) pointed out that the optimistic judgment on China's future development had become a crucial factor to attract international students to study. This kind of value concept has affected the international students' choice. The value pursuit of international students is affected by external environment factors (such as home country social development level), and internal factors (such as their own interests and hobbies). Therefore, the factors of international students' choice of schooling are the comprehensive results of individual, institution and country factors. Destination countries and universities provide support for students' value pursuit, which includes scholarships provided by schools for international students, learning environment, future employment development, global employment competitiveness, etc. These are all potential value factors for international students to consider. On the other hand, the flow of international students helps colleges and universities improve their internationalization level. As a "bridge" between two different cultures, international students can enhance mutual understanding and trust between students from different countries, thus promoting global understanding and cross-cultural awareness. Therefore attracting more high-quality students becomes a practical approach to the internationalization strategy of the world's top universities (Li et al., 2021). International students are not just valuable financial assets for the destination country, they are also individuals who enrich these countries with their diverse heritage and perspectives (Rachel and Nigar, 2011). The academic achievements and innovations obtained by international students can also increase the academic reputation of the university. Their academic output cannot only serve the development of their own countries, but also contributes to the development of mankind, which is the value brought by individuals to the development of the university.

Conclusion

This paper discusses the important factors affecting international students' choice of education from the four dimensions of China's pull, home country's push, university attractiveness and personal choice, at individual, institution and country levels. The research data consists of 67 international students' answers to the questionnaires and 8 students' interview transcript. It is concluded that the pull factor of China, the push factor of home country, the attractiveness factor of universities and individual subjective norms all affect the university choice of international students. Among them, the attractiveness of Chinese universities is the main factor, which is closely related to the pull factor of China. With the continuous improvement of the internationalization level of Chinese higher education, the academic reputation of Chinese universities has been recognized by international students, so more and more international students choose to study here. At present, studies on the flow of international students mostly focus on the competitiveness between countries, and mostly focus on the factors that Chinese students go to western developed countries to study, but there is insufficient research on how to attract international students to study in Chinese universities. This study attempts to explore the influencing factors of international students' choice in China through mixed research methods, and establishes a four-dimensional three-layer analysis model, which hopefully could contribute to future research of international students' university choice.

Limitations and future work

The limitations of this study are related to the sample and methods used. This study only targets international students who come to study in China, and the sample size is relatively small, which may lead to insufficient representation of the study. In addition, it should be noted that the study was conducted before the outbreak of COVID-19, and the comparison of data before and after the epidemic was lacking. The factors of environmental changes in the international community were not considered enough, either.

This research shows the overall situation of international students' choice to study in Chinese universities, and a small scale of questionnaires were distributed and several international students were interviewed. The research shows that international students' choice of university education is influenced by individual, institution, destination country, and home country, among which the pull factor of China and institution attractiveness factor are playing important roles. Chinese institutions of higher education need to prepare and change to attract students from around the world. China's universities should actively strengthen exchanges and cooperation with global renowned institutions, constantly enhance their academic reputation, and improve the quality of education and teaching, so that they could attract high-quality students from around the world. At the same time, China's universities need to create good campus environments, promote the construction of campus cultural diversity, create good studying and living environment, set up the corresponding management mechanism, strengthen the international assimilation of student management, and increase the communication between international students and Chinese students.

In future studies, research methods should be further improved and larger samples should be selected for research. What's more, the international students who choose universities in China may also affected by some other factors, including

individual learning motivation, environment, social economic status, university city, and so on. The follow-up study will continue to explore more factors to comprehensively understand international students' university choice factors. Moreover, the university choices of international students may also change when the global political and economic environment changes or faced with public health emergencies. For example, the global COVID-19 outbreak has greatly affected the flow of international students. Therefore, these external environmental factors or emergencies should be taken into account in future research.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Author contributions

HK, DJ, and LX signed the study and wrote and modified the manuscript. HK analyzed the data. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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A mediation model of the relationship between university students' news media literacy and xenophobia: The role of intellectual humility, perceived threat, and blind patriotism

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The dissemination of misinformation and disinformation has increased the need for news media literacy. This study administered a self-developed questionnaire to measure the relationship between news media literacy and xenophobia among college students in China (N = 430). The questionnaire measured five variables: news media literacy, xenophobia, blind patriotism, perceived threat, and intellectual humility. Confirmatory factor analysis (CFA) was used to validate this five-variable survey, and the analyses indicated satisfactory construct validity. Results from structural equation modeling indicated that intellectual humility was a significant predictor of news media literacy, and blind patriotism and perceived threat mediated the relationship between news media literacy and xenophobia. This study provides insights for researchers and instructors who are promoting news media literacy education in schools.

KEYWORDS

news media literacy, xenophobia, intellectual humility, perceived threat, blind patriotism

Introduction

News media literacy is an important form of literacy in the post-truth era in which social media are rife with various kinds of misinformation, and some news agencies work with politicians to advance their respective agendas. The post-truth era has not only threatened individuals' ability to explore what is true (Barzilai and Chinn, 2020), but the

accompanying mass dissemination of misinformation has also led to misperceptions and has influenced decision-making based on false beliefs, especially in terms of popularizing and perpetuating biases and ethnic stereotypes (Erba et al., 2019), as well as posing threats to individuals, organizations, and society as a whole (Talwar et al., 2019).

At present, although there is still a lack of clarity regarding the differences between the concepts of misinformation and disinformation, some preliminary consensus has been reached (Søe, 2017; Tucker et al., 2018). According to Born and Edgington (2017), misinformation is inaccurate information that is promulgated unintentionally, but it is intentionally neutral. In contrast, disinformation is spread knowingly to support the interests of individuals or organizations, and is motivated by a desire to destroy public confidence or to deceive or mislead. Therefore, it is reasonable to define the two notions as fully distinct concepts, which cannot simply be referred to as "fake news."

Given the complexity of misleading information, people need to be careful with the information they receive. Affected by misleading information, people could be emotionally clouded and hence engage in behaviors that endanger themselves and others. Xenophobia might be one of the consequences. Previous studies on xenophobia have suggested its tremendous psychological impact on individuals and communities (Suleman et al., 2018). People with xenophobic beliefs have reported significant emotional distress, including vulnerability, depression, and loneliness (Vromans et al., 2011). In countries where xenophobia holds sway, incidents of violence happen repeatedly, and it seems to affect many people (Onah, 2008). On a global scale, the failure to address the issue of xenophobia threatens political transformation and further exacerbates irreconcilable national differences (De Master and Le Roy, 2000). Xenophobia warrants further attention as it threatens worldwide peace and harmony. By concluding the tragic events fueled by xenophobia during the COVID-19 pandemic, Mamun and Griffiths (2020) suggested that avoiding unreliable or untrustworthy sources of information might be beneficial for the public to reduce fear or panic about certain issues. Specifically, how people process and perceive information might influence their attitudes. Thus, news media literacy needs to be considered when discussing xenophobia.

The relationship between obtaining and perceiving information and some irrational behaviors or cognition is complex and could be influenced by multiple factors. The factors identified so far include hate speech exposure (Abdul et al., 2019), inherent stereotyping (Arendt, 2013), and political ideology (Tully et al., 2020). As Faulkner et al. (2004) suggested, there are many other personality factors or societal variables that may contribute to xenophobic attitudes. For example, the realistic group conflict theory and symbolic racism theory suggest that the perceived threat from an outgroup largely contributes to negative attitudes or feelings of prejudice toward those outgroups (Nshom et al., 2022). Symbolic politics theory proposes that the words and symbols political elites employ would increase negative stereotypes of specific groups and evoke emotional reactions (Fussell, 2014). In other words, emotional reactions depend on knowledge of a specific group and, therefore, can be manipulated to some extent by information people receive. Studies have also found that blind patriotism promotes preferences for a more homogeneous culture, and people who are blindly patriotic show more xenophobic reactions to some specific groups (Parker, 2010). These intergroup relations provide a more holistic view when exploring the relationship between news media literacy and xenophobia, including how one's beliefs contribute to one's information access, and what attitudes or behaviors one might have. Therefore, the roles of perceived threat and blind patriotism were also examined in this study.

Considering these issues, the importance of news media literacy is clear. However, published studies have analyzed only a limited number of factors that contribute to people's news media literacy. Only need for cognition and media locus of control were found to be significant predictors (Su et al., 2022). Considering the importance of news media literacy, more potential factors need to be explored.

As a virtue, intellectual humility may promote news media literacy. According to Whitcomb et al. (2017), intellectual humility increases one's propensity to admit one's intellectual limitations to oneself and to others. It also helps one to consider alternative ideas, listen to the views of others, and spend more time trying to understand someone with whom one disagrees. These traits of intellectual humility encourage people to rationally access news content instead of being caught up in an echo chamber. A previous study suggested that people's ratings of intellectual humility were associated with their information processing (Deffler et al., 2016). Therefore, the relationship between intellectual humility and news media literacy was explored in this study.

To clarify the situation and the underlying sociopsychological mechanisms involved in the relationship, this study focuses on the above three factors, namely intellectual humility, blind patriotism, and perceived threat. We gained empirical data from young adults in China to investigate: (1) whether intellectual humility may act as a predictor of news media literacy, (2) the relationship between news media literacy and xenophobia, and (3) whether the relationship between news media literacy and xenophobia is mediated by blind patriotism and perceived threat.

Literature review and hypotheses development

News media literacy

News media literacy refers to the knowledge and abilities needed to identify and engage with news (Maksl et al., 2015). Having news media literacy is important as it is the main competency that people need to rely on to avoid negativity bias (van der Meer and Hameleers, 2022). Recent research has revealed several long-established benefits of news media literacy. Maksl et al. (2015) reported that teenagers with higher levels of news media literacy were more critical of news reports and were likely more knowledgeable about current affairs. This may allow them to gain a good understanding of the media landscape, and help them to interact with the media to achieve pro-social and personal goals.

The significance of studying news media literacy has also been highlighted. As Ashley et al. (2013) suggested, cultivating news media literacy helps people to have a more holistic understanding of how news is produced. This knowledge equips people to better access, evaluate, and analyze news content. However, although a number of media literacy interventions have been developed in the past 30 years, meta-analytic assessment of the effects and factors which increase news literacy application are still unavailable (Jeong et al., 2012). In addition, there are insufficient studies on the contexts in which news literacy is performed (Swart, 2021). Thus, more studies on news media literacy would be beneficial.

Given the importance of news media literacy, researchers have found some educational ways to enhance it, such as integrating news and current affairs into instruction (Moore, 2013). Hobbs (2004) also noticed that some schools emphasize the importance of media issues studies, and students are taught to critically evaluate news content. Opportunities for media production are also offered in some places. However, researchers believe that educators have not grasped the whole picture of news media literacy.

Based on the above results, researchers have highlighted the need to explore potential factors which may have associations with news media literacy in future research, especially forming a model which includes multiple influences that might stimulate people to critically consume news (Tamboer et al., 2022). This could promote more effective initiatives to stimulate the involvement in current affairs. Although young people are called digital citizens and tend to be adept at using media as a way of obtaining information, their ability to examine media content is still limited (Musgrove et al., 2018), and little empirical evidence exists demonstrating the positive role of the new media literacy in assisting young people in discerning facts from falsehoods (Luo et al., 2022).

Considering the above suggestions, the present study focused on surveying young adults in Mainland China to explore the relationship between news media literacy, intellectual humility, and xenophobia. In addition, although news media literacy and related education are welcomed by the Chinese government, no educational policy has been developed in this field, and not many schools in China actually put news media literacy education into practice (Lee and Tiande, 2016). Therefore, this study also aimed to assess Chinese students' news media literacy.

Xenophobia

Xenophobia has become an important public issue in the context of cultural diversity. According to The United and Nations Organization (2001), xenophobia describes "attitudes, prejudices and behavior that reject, exclude and often vilify persons, based on the perception that they are outsiders or foreigners to the community, society or national identity" (p. 2). On the generation of xenophobia, Rydgren (2004) argued that xenophobic beliefs may be formed by stereotyping, as what people apprehend when confronting a new thing is contingent upon what they already know. Xenophobic values are prevalent in all societies, and there is no sign that such value will disappear (Hjerm, 2001). New concerns about xenophobia emerged during the COVID-19 pandemic as the debate and stigma over the origin of COVID-19 fueled xenophobia and even led to a "pandemic of hate" (Ittefaq et al., 2022).

Although some scholars believe that xenophobia should be regarded as an appeal for national and ethnic unity, the negative effects of xenophobia can still lead to considerable disastrous consequences. Studies on HIV-infected people found that xenophobia was one of the barriers for them to access medical care and other health assurance (Alvarez-del Arco et al., 2012). In Europe, increasing immigration has created problems for many Europeans, pushing some toward more conservative or extreme positions. De Master and Le Roy (2000) believed that these situations threaten the balanced political environment of the European Union. Hence, xenophobia constantly threatens the harmony of society and personal wellbeing. Unfortunately, xenophobia can be easily spread through social media.

Social media have been widely named as a major factor in the increase of expression of hate (Bursztyn et al., 2019), and it is clear that the emergence of modern media has influenced where and how xenophobia occurs, and its effect. For example, news websites' comments have already become an important space for spreading hate speech (Erjavec and Kovačič, 2012). Nevertheless, due to the lack of news media literacy, people rely on low-quality information, and they are easily influenced by such media content. Specifically, as many people cannot process and perceive information objectively and rationally, the echo chambers created by news media fuel ideological homophily and give audience good reason for relying on them without much reflection. Political consumers in particular are

increasingly turning to social media for information, but these sources are not beholden to traditional journalistic standards. More importantly, these sources play a deleterious role in shaping hostile attitudes toward specific groups or organizations (Lajevardi et al., 2022).

Although most studies on racism, nationalism, and xenophobia emphasize how biased messages and media influence audience attitudes, especially in inspiring favoritism for their own countries and questioning information provided by out-group media sources (Golan et al., 2021), much remains unclear. Firstly, although news media literacy seems to help people objectively access news content, the relationship between news media literacy and xenophobia has not been explored. Secondly, xenophobia has become an international phenomenon, but the previous measurements were mainly conducted in countries outside of Asia. Therefore, they need to be cross-culturally validated, with empirical data from China providing an Asian perspective on xenophobia. In this study, a specific xenophobia scale developed by van der Veer et al. (2011) was used to examine the relationship between news media literacy and xenophobia in China. Based on the above research gaps, hypothesis one was formulated as follows:

> H1. News media literacy would be negatively associated with xenophobia.

Blind patriotism

According to Parker (2010), blind patriotism is defined as an "uncritical support for national policies and practices" (p. 97). In other words, blind patriotism creates exclusive group boundaries, negative attitudes toward external groups, and denial of the nation's transgressions against others (Schatz, 2020).

People who are biased with blind patriotism show different attitudes toward citizens and foreigners because they tend to fuse their personal identity with their social identity as in-group members. For example, Spry and Hornsey (2007) surveyed 95 Australians and found that people with higher scores on blind patriotism had more negative attitudes toward multiculturalism, immigration, and providing cultural services to immigrants. On the contrary, they had more positive attitudes toward cultural assimilation because they were worried about their national culture being "contaminated" by foreigners.

However, blind patriotism does not emerge from a vacuum; rather, it is related to the information people possess. By comparing two groups of college students who professed blind or constructive patriotism, researchers found that they had different types of information exposure (Parker et al., 2009). This finding was possibly because the bias in information access affects individual cognitive patterns. Moreover, stronger interpersonal bonds with fellow nationals can also predict a higher level of blind patriotism (Finell and Stevenson, 2022). This is because tight intergroup relationships may create an echo chamber, thus blocking group members from accepting diverse information.

Although research has found that prevalent ideologies and norms influence individuals' attitudes toward other cultures, the role of blind patriotism has rarely been analyzed. This is especially so in China, where patriotism is different from that in Western countries (Hamada et al., 2021). Based on the above reasons, the Chinese geo-cultural context represents a large research gap. In addition, as nationalist historical beliefs are part of the structure of Chinese national identity (Gries et al., 2011), blind patriotism may profoundly affect the Chinese perception of the country's problems, and this kind of orientation may help people to form subjective perceptions of the outside world.

Given the fact that blind patriotism is associated with obtaining and processing information, and might trigger irrational beliefs such as bias and stereotypes against out-groups, hypothesis two was posited:

> H2. Blind patriotism would mediate the association between news media literacy and xenophobia.

Perceived threat

According to the integrated threat theory, a threat happens when different groups perceive each other as competing for the allocation of scarce resources that are necessary for their security (Nshom et al., 2022). Hence, as Semyonov et al. (2004) concluded, perceived threat can be seen as a competitive threat to one's actual interests and prerogatives, which in turn might increase hostility, antagonism, and discrimination against other groups.

As unfounded perceived threats may lead to many negative effects, researchers have explored the underlying mechanism. A study in Lebanon showed that there was a significant decrease in the number of vaccinated people due to exposure to false or verified news in the context of the COVID-19 pandemic (Ghaddar et al., 2022). These unconfirmed messages may convey a sense of unease or a potential threat, leading to public distrust in vaccines. That is to say, the information people access is important, as their cognition or behaviors might be highly influenced by that information. Calvillo et al.'s (2020) research involving 346 US citizens found that the perception of threat was related to which channel people obtained information from. For example, the researchers found that participants who got more news from Fox News would perceive less threat as they believed that the media were exaggerating the threat of the pandemic. However, participants who got more news from CNN would perceive more threat as they believed that

COVID-19 was more severe. These findings suggest that there are relationships between perceived threats and the information that people receive. More specifically, what views people form about outgroup members or issues is related to how they understand information and what information they choose to believe.

Thus, focusing only on perceived threat might obscure our understanding of what triggers xenophobia since perceived threat mainly comes from the information people choose to believe. Therefore, the role of perceived threat should be considered in the relationship between news media literacy and xenophobia. Additionally, although previous research has found that blindly patriotic individuals or those who believe in an inflated image of an ingroup would perceive more threat from outgroups, samples are mainly from western countries (Spry and Hornsey, 2007; de Zavala et al., 2009; Willis-Esqueda et al., 2017). In China, researchers believe that Chinese people's nationalist historical beliefs powerfully predict their perceptions of threats from foreign countries, which in turn directly affect their preferences for specific countries (Gries et al., 2011). Moreover, the study of public attitudes toward foreigners or immigrants can also contribute to the study of Chinese public opinion, which appears to play an increasingly important role in Chinese policy decision-making processes (Han, 2017).

Therefore, it is necessary to verify this relationship among non-western populations. Moreover, the conclusion that news media literacy might reduce the perception of fear or threat remains controversial, so the relationship between the two factors needs further investigation (Bergan and Lee, 2018). Therefore, hypotheses three and four were posited:

> H3. Perceived threat would mediate the association between news media literacy and xenophobia.

> H4. Blind patriotism would be positively associated with perceived threat.

Intellectual humility

Intellectual humility is a cognitive virtue that can be defined as an individual's acceptance of their personal limitations in adopting an absolute epistemic position (Leary et al., 2017). More specifically, it shows the degree to which an individual recognizes that a particular personal belief may be wrong (Deffler et al., 2016).

Intellectual humility could promote rational thinking. For example, samples from two American communities showed that intellectual humility predicts less political bias, helping individuals to escape from the echo chamber (Bowes et al., 2022). In the context of COVID-19, people with high intellectual humility are more likely to review online information rationally, rather than easily believing in misinformation (Koetke et al., 2022; Newman et al., 2022). These studies report the importance of intellectual humility in rationality development, which is also one of the significant components of news media literacy.

In addition, intellectual humility is related to the way individuals process information and think about their beliefs. Specifically, people with a high level of intellectual humility can recognize the limitations of evidence for their beliefs and are aware that their ability to acquire and evaluate relevant information is limited (Deffler et al., 2016). More importantly, having intellectual humility does not mean "being self-effacing or always yielding to others"; rather, it is a balance between dogmatically rejecting information that questions one's views and giving in too quickly (Krumrei-Mancuso and Rouse, 2016). This evidence suggests that intellectual humility may be an important aspect when considering the formation of news media literacy.

Although previous findings suggested that intellectual humility is related to how people critically assess knowledge claims, there is not yet much research on the relationship between intellectual humility and individuals' behaviors or cognition. Koetke et al. (2022) suggested that intellectual humility may provide some of the motivation behind engaging in behaviors that fight against misinformation as those who realize their tendency to make mistakes or be wrong may verify the accuracy of information more frequently to ensure that their beliefs will be accurate and objective. Thus, we suspect that intellectual humility is important for news media literacy and might be a predictor of it. Hence, hypothesis five is posited:

> H5. Intellectual humility would be positively associated with news media literacy.

Based on the above research assumptions, we formulated the following structural equation model (**Figure 1**). In this study, we hoped to clarify the relationship between news media literacy and xenophobia, and explore the role of intellectual humility, blind patriotism, and perceived threat in that relationship.

Materials and methods

Background

The present study's geo-cultural context is China, where information is regulated by governmental control (Guo, 2020). Nonetheless, the prevalence of misinformation contributed by nearly two billion internet users inevitably makes China a post-truth society. Misinformation is accelerating and affecting the way individuals interpret daily affairs, which has resulted in serious societal and political consequences (Cheng and Lee, 2019; Guo, 2020). It is worth noting that news

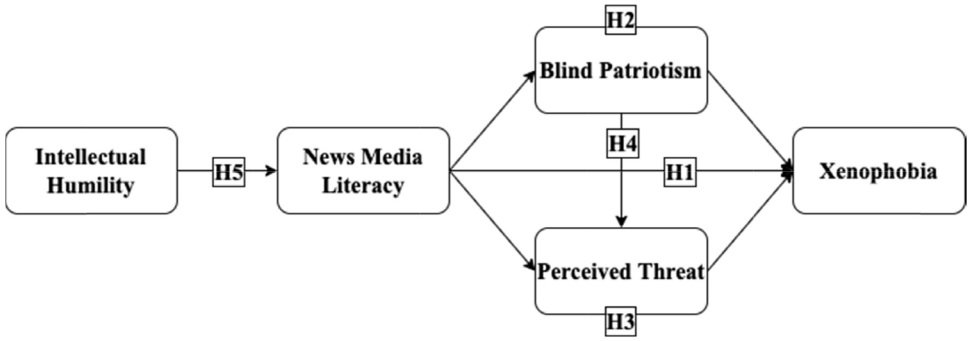


FIGURE 1
The hypothesized model.

media literacy and xenophobia related studies have not been adequately conducted in China. Compared with developed Western countries, China's news media literacy education is not universal, and knowledge of students' levels of news media literacy is insufficient (Zhao, 2022). With the lack of news media knowledge, people may not realize that the press may serve as a "mouthpiece" (Zhang, 2021) for people in power. Therefore, it is necessary to understand the situations of news media literacy and xenophobia in China's sociocultural and media environment.

In this study, we were curious about the relationship between news media literacy and xenophobia as information can affect public perceptions or shape human emotions (West, 2022). Also, we hypothesized that people with lower news media literacy may have higher blind patriotism and perceived threat, which might be the predictors of some extreme behaviors or cognition.

In this study, we recruited participants from Project 985 universities, Project 211 universities, and unranked universities. Most Project 985 universities are in the top 500 QS World University Rankings, while Project 211 universities are in the 500–1400th QS World University Rankings. The rest are listed as unranked universities as they have no world or national rankings. There is a significant gap in academic achievement between the universities of different levels. Therefore, students of these universities are also considered to have significant differences in their academic performances.

Participants

A total of 430 participants (females = 197, males = 233) volunteered to take part in this research (**Table 1**); their average age was 22.28 years (*SD* = 0.13). The sample consisted of 104 top QS 500 university students, 107 middle-class university students, and 219 unranked university students. Of the 430, 191 were bachelor students, 217 were master's students, and 22 were doctoral students. They were invited to complete an online survey at their own pace, and were compensated with a small monetary reward at the end of the study.

TABLE 1 The demographic characteristics of all the participants.

Variable		n (*N* = 430)	Proportion
Gender	Male	233	54.2%
	Female	197	45.8%
Age group (years)	18–20	101	23.5%
	21–23	248	57.7%
	24–26	60	14.1%
	27–29	14	3.3%
	30-Above	7	1.4%
Education	Bachelor's degree	191	44.4%
	Master's degree	217	50.5%
	Doctoral degree	22	5.1%
Academic performance	Top	104	24.2%
	Middle level	107	24.9%
	Low level	219	50.9%

Instrument

Background factors

Age, gender, degree, and academic performance were selected as background factors. Although GPA has been widely used in defining students' academic performance, the grading schemes of universities are different and hard to unify and standardize (Garipagaoglu et al., 2012). In order to avoid fallacy in the interpretation of the students' academic performance, the university ranking was selected to identify their general academic standing in this study.

News media literacy scale

The news media literacy scale developed by Ashley et al. (2013) was selected to measure participants' notion of the gap existing between representation and reality in media reporting.

TABLE 2 Correlation between variables included in the study (N = 430).

	1	2	3	4	5	6	7	8
Age	–							
Gender	− 0.021	–						
University	− 0.066	0.072	–					
Degree	0.034	0.078	− 0.075	–				
News media literacy	0.106	− 0.003	0.044	− 0.067	–			
Xenophobia	− 0.033	− 0.032	0.076	− 0.037	− 0.378**	–		
Blind patriotism	0.007	− 0.048	0.036	− 0.070	− 0.362**	0.503**	–	
Intellectual humility	0.008	0.038	0.042	− 0.111	0.345**	− 0.344**	− 0.271**	–
Perceived threat	0.057	− 0.011	0.075	− 0.067	− 0.367**	0.507**	0.483**	− 0.225**

**$p < 0.001$. The relationships between ordinal variables (degree and university) and other variables were calculated by Spearman's rank correlation, while others were calculated by Pearson correlation.

TABLE 3 The item factor loadings, CR, Cronbach's alpha values, and the instrument variable descriptive statistics (N = 430).

Instrument variable and measurement items	Factor loadings	Mean (*SD*)	α	AVE	CR
News media literacy (NML)	–	4.17 (1.474)	0.937	0.624	0.937
NML 1	0.802	4.37 (1.891)			
NML 2	0.752	4.27 (1.791)			
NML 3	0.814	4.07 (1.760)			
NML 4	0.736	4.16 (1.806)			
NML 5	0.766	4.34 (1.756)			
NML 6	0.823	4.08 (1.837)			
NML 7	0.794	4.21 (1.799)			
NML 8	0.808	4.11 (1.851)			
NML 9	0.808	3.93 (1.783)			
Xenophobia (XEN)	–	4.60 (1.422)	0.877	0.591	0.878
XEN 1	0.786	4.59 (1.813)			
XEN 2	0.695	4.48 (1.697)			
XEN 3	0.799	4.62 (1.704)			
XEN 4	0.743	4.72 (1.723)			
XEN 5	0.815	4.62 (1.744)			
Intellectual humility (IH)	–	4.16 (1.470)	0.884	0.559	0.884
IH 1	0.754	4.21 (1.846)			
IH 2	0.772	4.18 (1.827)			
IH 3	0.719	4.21 (1.841)			
IH 4	0.740	3.91 (1.888)			
IH 5	0.712	4.26 (1.854)			
IH 6	0.788	4.20 (1.837)			
Blind patriotism (BP)	–	4.42 (1.490)	0.847	0.583	0.848
BP 1	0.775	4.67 (1.799)			
BP 2	0.729	4.22 (1.815)			
BP 3	0.810	4.32 (1.826)			
BP 4	0.738	4.47 (1.739)			
Perceived threat (PT)	–	4.31 (1.461)	0.831	0.553	0.832
PT 1	0.758	4.49 (1.731)			
PT 2	0.741	4.13 (1.809)			
PT 3	0.710	4.33 (1.764)			
PT 4	0.764	4.30 (1.864)			

SD, Standard Deviation; AVE, Average Variance Extracted; CR, Composite Reliability.

TABLE 4 Heterotrait-monotrait ratio of correlations result.

	Constructs	1	2	3	4	5
1	News media literacy	–				
2	Xenophobia	0.417	–			
3	Intellectual humility	0.406	0.583	–		
4	Blind patriotism	0.379	0.390	0.313	–	
5	Perceived threat	0.417	0.594	0.575	0.260	–

This is a nine-item scale including items such as "Individuals can find news sources that reflect their own political values," "Two people might see the same news story and get different information from it," and "News makes things more dramatic than they really are." Participants were asked to use a Likert scale to indicate their level of agreement or disagreement with each statement (from 1 = "strongly disagree" to 7 = "strongly agree"). The overall Cronbach's alpha values reported by Jones-Jang et al. (2021) and Stamps (2021) were 0.82 and 0.90, respectively, which indicated that the coefficient of internal consistency for the total scale was high. The reliability of the news media literacy scale in this study was 0.94.

Xenophobia

With reference to and modification of a prior research scale (van der Veer et al., 2011), xenophobia was assessed using five items. The respondents were asked to rate their agreement with five statements using a 7-point Likert scale (from 1 = "strongly disagree" to 7 = "strongly agree") including "Immigrants cause increase in crimes," "Interacting with foreigners makes me uneasy," "I worry that foreigners may spread unusual diseases," "I am afraid that in case of war or political tension, immigrants will be loyal to their country of origin," and "I am afraid that our own culture will be lost with increase in immigration." In this study, the xenophobia scale showed an acceptable reliability of 0.88.

Blind patriotism

Drawing from Schatz et al. (1999), four items were used to assess blind patriotism. Participants were asked to rate their agreement on a 7-point Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree" to determine whether individuals love their country irrationally. Sample items included "I would support my country whether it was right or wrong." The scale has been used with an Australian population (Spry and Hornsey, 2007) and an American population (Parker, 2010) and showed a high coefficient of internal consistency of 0.73 and 0.78, respectively. The scale showed a good reliability of 0.85 in this study.

Perceived threat

Each participant responded to the perceived threat scale to self-report their perception of threat from foreigners. This survey was developed and validated by Semyonov et al. (2004) and consists of four items that measure perceived threat (e.g., "Foreigners who live in China are a strain on the welfare system"). Each item uses a 7-point Likert scale from 1 = "strongly disagree" to 7 = "strongly agree" for participants to select from. The reliability of the perceived threat scale in this study was 0.83.

Intellectual humility

The general intellectual humility scale of Leary et al. (2017) was selected to measure the intrapersonal aspects of intellectual humility. Participants were asked to rate their agreement with six items from 1 = "strongly disagree" to 7 = "strongly agree." The scale has been widely used and presented high Cronbach's α = 0.89 and 0.84 among different groups (Bowes et al., 2022). The Cronbach's α of this scale was 0.88 in this study.

As the original scales shown above were all written in English, we asked English major students to help translate them into simplified Chinese. The scales were reviewed by two professors who majored in Chinese and English language, respectively. We also provided items in both English and Chinese to ensure the accuracy and minimize the errors. Then five university students were recruited to take part in a pilot test. They were required to give comments on the statement of each item, including the differences in expressions between the Chinese and English versions and the clarity of the translations. After that, we revised the statements according to their feedback. Finally, five more university students were recruited to take

TABLE 5 Standardized regression weights according to the path model.

Path	*B*	β	*SE*	CR	*p*
News media literacy → Xenophobia	− 0.138	− 0.147	0.047	− 2.947	< 0.01
News media literacy → Blind patriotism	− 0.377	− 0.411	0.050	− 7.509	< 0.001
News media literacy → Perceived threat	− 0.190	− 0.219	0.047	− 4.076	< 0.001
Blind patriotism → Perceived threat	0.458	0.486	0.058	7.840	< 0.001
Blind patriotism → Xenophobia	0.321	0.314	0.064	4.997	< 0.001
Perceived threat → Xenophobia	0.380	0.350	0.070	5.435	< 0.001
Intellectual humility → News media literacy	0.423	0.387	0.059	7.127	< 0.001

SE, Standard Error; CR, Composite Reliability.

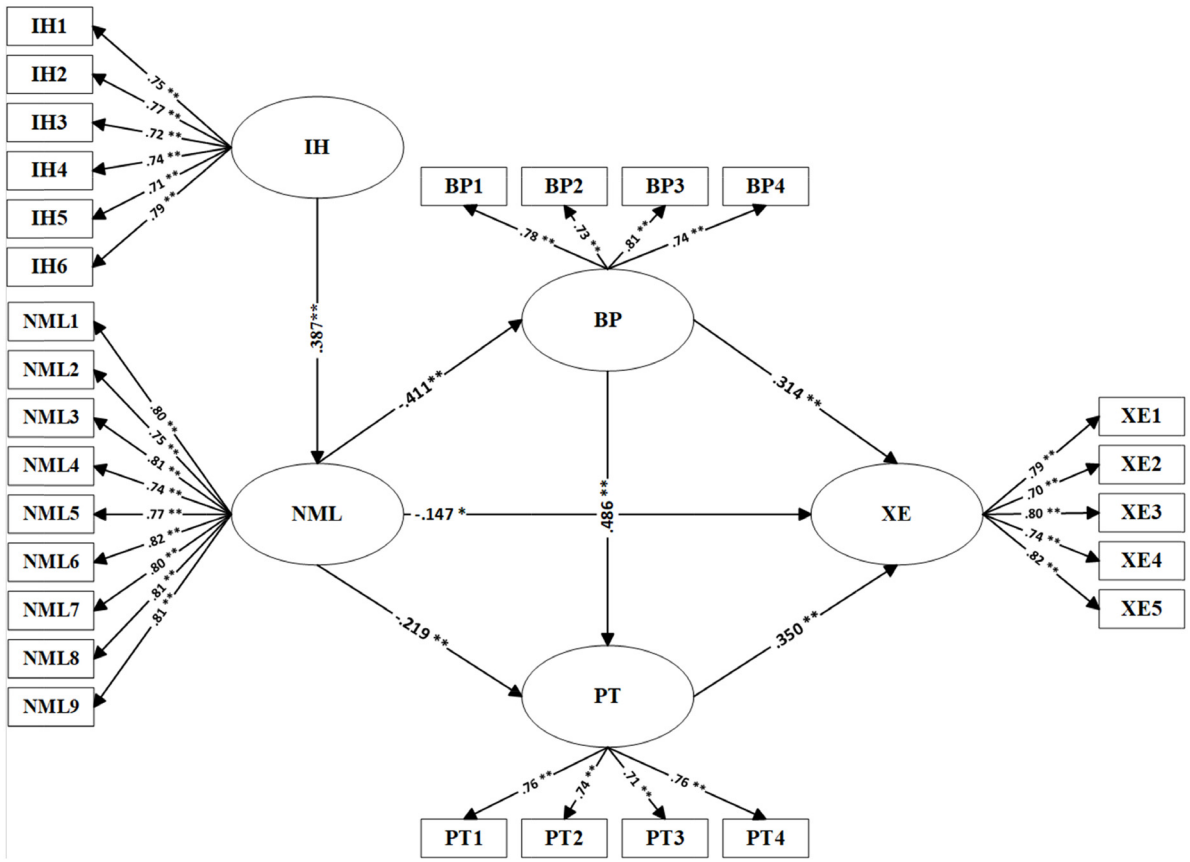


FIGURE 2
Structural path model.

part in the second round of the pilot test; they all gave positive feedback on the Chinese version.

Data collection

An online survey was conducted to help us verify the double mediator hypothesized model we proposed. On the first page of the questionnaire, participants signed a consent form (IRB Reference No. EDU2022-055), and they were fully informed of the purpose, hypotheses, and conditions of this research. In addition, we emphasized that this survey was for academic research only, participation was completely voluntary, and participants might withdraw at any time. We collected data by using the Tencent Survey Platform,[1] a well-known data service platform in China. Participants could open the survey link directly in WeChat, which created a convenient environment for our investigation.

1 https://wj.qq.com

TABLE 6 Model fit indices.

	Model	Acceptable values
χ^2	549.813	
P-value	<0.001	
χ^2/df	1.603	<3 (Kline, 2015)
AGFI	0.901	≥0.80 (Kim et al., 2019)
RMSEA	0.037	≤0.08 (Cangur and Ercan, 2015)
NNFI	0.966	≥0.90 (Bentler and Bonett, 1980)
CFI	0.969	≥0.95 (West et al., 2012)
IFI	0.970	≥0.90 (Bollen, 1989)

AGFI, Adjusted Goodness of Fit Index; RMSEA, Root Mean Square Error of Approximation; NNFI, Non-normed Fit Index; CFI, Comparative Fit Index; IFI, Incremental Fit Indices.

Data analysis

A series of statistical analyses was performed to examine the data. Firstly, Pearson correlation and Spearman's rank correlation analysis were used to analyze the relationships between the factors. With reference to Huang et al. (2017), as the sample size of this study was large, the correlation analyses

TABLE 7 Mediation result.

Parameter	Effect	BootSE	Lower	Upper	*p*
Ind1	−0.104	0.020	−0.144	−0.069	<0.001
Ind2	−0.065	0.017	−0.101	−0.035	<0.001
Ind3	−0.043	0.010	−0.063	−0.027	<0.001
Total	−0.212	0.028	−0.268	−0.160	<0.001

Ind1 = News media literacy → Blind patriotism → Xenophobia. Ind2 = News media literacy → Perceived threat → Xenophobia. Ind3 = News media literacy → Blind patriotism → Perceived threat → Xenophobia.

were employed with a 0.001 level of statistical significance to prevent any Type I errors. Secondly, indicator reliability, construct reliability, convergent validity, and discriminant validity were assessed by indices including factor loadings, Cronbach's alpha coefficients, composite reliability (CR), average variation extracted (AVE), and heterotrait-monotrait ratio of correlations (HTMT). Confirmatory factor analysis (CFA) was performed using SPSS Amos 24.0 with 5,000 bias-corrected bootstrap samples and 95% confidence intervals (CIs). The SEM analysis was also used to examine all the relationships among the factors. In addition, indices including χ^2/df, the adjusted goodness-of-fit statistic (AGFI), root mean square error of approximation (RMSEA), the non-normed fit index (NNFI), the comparative fit index (CFI), and the incremental fit index (IFI) were employed to assess the comprehensive goodness of fit of the research model. Next, User-defined estimands were used to test our hypothesized model.

Before the analyses, univariate and multivariate normality tests were conducted. Firstly, we noted that both skewness (range: from −0.46 to 0.10) and kurtosis (range: from −1.07 to −0.60) were satisfied with the required range. Secondly, to test the multivariate normality, we noted that the standardized multivariate kurtosis was −0.961, which means that the data conformed to multivariate normal distribution (Noar, 2003).

Results

Correlations between variables

Pearson correlation coefficients were calculated to investigate the correlations among continuous variables, such as news media literacy, xenophobia, blind patriotism, intellectual humility, and perceived threat. Spearman's rank correlation coefficient was also used to investigate the correlations between ordinal variables (university and degree) and other variables. As noted in **Table 2**, news media literacy is positively associated with intellectual humility, but it is negatively associated with blind patriotism, perceived threat, and xenophobia. On the other hand, blind patriotism is positively associated with perceived threat, and both factors are positively associated with xenophobia.

The measurement model

The measurement model of this study was examined through convergent validity and reliability (see **Table 3**). The standardized factor loadings of news media literacy, xenophobia, intellectual humility, blind patriotism, and perceived threat were greater than 0.5. The Cronbach's alpha values were 0.94, 0.88, 0.89, 0.85. and 0.83, respectively. According to Taber (2018), a Cronbach's alpha value above 0.7 is considered as indicating an acceptable level of reliability. The constructs also exhibited CR values greater than 0.7, and the AVE values exceeded the recommended threshold value of 0.5. Therefore, all the variables indicated satisfactory convergent validity and reliability.

In addition, regarding the goodness of fit for this model construct, χ^2/df = 1.54, GFI = 0.92, AGFI = 0.91, IFI = 0.97, TLI = 0.97, CFI = 0.97, and RMSEA = 0.035 were acquired. The fit scale showed a sufficient fit for this model as these indices were approaching the criterion of a good fit according to some researchers (Bentler and Bonett, 1980; Bollen, 1989; West et al., 2012; Cangur and Ercan, 2015; Kline, 2015; Kim et al., 2019).

The discriminant validity was examined through HTMT. As shown in **Table 4**, all the values are below the stringent criterion of 0.80, as suggested by Henseler et al. (2015). This means that discriminant validity was also met. Therefore, according to the above results, all measures were found to be adequately valid and reliable, and both the convergent and construct validities were confirmed for all questionnaires in this model.

The structural model

The path analysis results are presented in **Table 5** and **Figure 2**. Specifically, blind patriotism is positively associated with perceived threat ($\beta = 0.486$, $p < 0.001$), and both are positively correlated with xenophobia ($\beta = 0.314$ and 0.350, $p < 0.001$). As for news media literacy, it is negatively correlated with xenophobia ($\beta = -0.147$, $p < 0.01$), blind patriotism ($\beta = -0.411$, $p < 0.001$) and perceived threat ($\beta = -0.219$, $p < 0.001$). Intellectual humility was the positive predictor for explaining news media literacy ($\beta = 0.387$, $p < 0.001$). In summary, the above results indicate that the hypotheses in the model were all verified.

In addition, χ^2/df, AGFI, RMSEA, NNFI, CFI, and IFI were employed to assess the comprehensive goodness of fit of the research model (see **Table 6**). Results of structural equation modeling showed that the proposed model for the whole yielded a good fit.

Test of mediation

To further validate the structural relationships of our model, we assessed the serial mediation with blind patriotism and perceived threat serially mediating the relationship between news media literacy and xenophobia by plugin PROCESS 4.1 in SPSS 24.0 (see **Table 7**). The 95% confidence calculated by the tests showed that a mediating effect occurs when the range of intervals does not cross zero. The results showed that news media literacy had a significant indirect effect on xenophobia via blind patriotism [Effect = −0.10, $p < 0.001$, 95% CI = (−0.14, −0.07)], and news media literacy showed an indirect effect of −0.07 on xenophobia via perceived threat [$p < 0.001$, 95% CI = (−0.10, −0.04)]. Regarding the serial mediation analysis, we found a significant indirect effect serially via blind patriotism and perceived threat [Effect = −0.04, $p < 0.001$, 95% CI = (−0.06, −0.03)], and the path serially via blind patriotism and perceived threat contributed slightly more than the Ind 1 path but had no significant difference from the Ind 2 path. Thus, the mediation effects in the hypothesized model existed. In addition, as the direct effect of news media literacy on xenophobia is significant, the mediated effect and direct effect both exist and point in the same direction. According to Zhao et al. (2010), there is complementary partial serial mediation of blind patriotism and perceived threat on the relationship between news media literacy and xenophobia.

Discussion and conclusion

News plays a role in establishing public agendas, while misinformation presented as news can contribute to severe social consequences and influence people's perceptions of outgroup or specific events (Corser et al., 2022). Although there is increasing evidence for various media effects on public opinion, the relationship between news media and societal attitude is symbiotic. Societal attitudes such as xenophobia imply that such reports attract audiences. This would obviously affect the production of news as it affects the profits of news agencies (Hansen and Goligoski, 2018). Understanding this relationship is important, as reducing xenophobia may require effort regarding both sources. At the consumer end, cultivating news media literacy is important (Tully and Vraga, 2017). It helps individuals to access news content objectively to avoid media manipulation.

Although news media literacy has received much attention in the current complex media environments, and xenophobia has become more intensive with the Covid-19 pandemic, the relationship between the two factors among college students has rarely been explored, especially in the Asian context. As previous research has suggested, although contemporary young adults are always considered to be digital natives or cyber experts, they are vulnerable media users, which places them in a paradoxical situation (Livingstone and Helsper, 2010; De Leyn et al., 2022). Considering that students must be prepared for exposure to a media environment full of uncertainty, it is important to investigate the news media literacy and how it could combat xenophobia. In addition to this, it is also necessary to investigate factors that can serve as a predictor of news media literacy, which informs educators on how to cultivate news media literacy.

In this study, we investigated the relationship between news media literacy and xenophobia based on Chinese university students. Considering that news media literacy would affect how people obtain information, which further influences their perceptions of the outside world, this study also investigated the mediating role of blind patriotism and perceived threat. In addition, since news media literacy is about reviewing and processing information rationally, we also hypothesized that intellectual humility would be positively associated with news media literacy. Findings from 430 college students in China indicated that the relationship between news media literacy and xenophobia was mediated by blind patriotism and perceived threat. Specifically, people with higher news media literacy might perceive less threat and would not be so blindly patriotic. Therefore, they might have less xenophobic beliefs. In addition, blind patriotism was positively associated with perceived threat, and intellectual humility was a positive predictor of news media literacy. The results of this study are consistent not only with studies indicating that news media literacy affects individuals' perceptions (Vraga et al., 2012), but also with studies which found that intellectual humility reliably predicts desire for authenticity (Koetke et al., 2022). Our findings suggested that to develop stronger news media literacy skills to combat xenophobia, educators may need to help cultivate students' intellectual humility. In addition, blind patriotism and perceived threat are also two perspectives to understand xenophobia. The implications of this study are discussed below.

Firstly, this study employed Amos 24.0 to establish a valid and reliable five-variable structural equation model that measures the relationship between news media literacy and xenophobia among college students, and which integrates intellectual humility, blind patriotism, and perceived threat into the model. More interestingly, this study confirmed the mediating role of blind patriotism and perceived threat and the predicting role of intellectual humility. To the best of our knowledge, this is the first model that incorporates these

variables to examine the relationship between news media literacy and xenophobia. Our model implies that the students' news media literacy played a role in their acquisition and review of online information. Intellectual humility is significant (Whitcomb et al., 2017), and the traits it involves may be helpful for promoting news media literacy. Therefore, encouraging students to cultivate intellectual humility should be beneficial. However, students with perceived threat and blind patriotism may be discouraged from rationally perceiving the relationship with outgroups. Specifically, the results showed that people with low levels of news media literacy may perceive more threats and be more likely to be blindly patriotic, and therefore generate xenophobic beliefs. By comparing the effect size of each path, blind patriotism showed a stronger effect than perceived threat in the relationship between news media literacy and xenophobia.

The current results imply that the way students process information influences their views about outgroups, which also corresponds to the cognitive behavioral theory, indicating that one's cognition would shape one's behavior and vice versa (Potter, 2004). From a practical perspective, our survey findings from around 400 respondents can serve as useful input for courses on news media literacy. For example, educators should integrate communication strategies of news coverage and social media postings into the course to help students build a holistic view of the operation system of online information, to mitigate the negative psychological impacts of perceived threat and outgroup and ingroup relationships and to improve individual and societal wellbeing. Moreover, the results also imply the importance of some personal inner traits. For example, the inclusion of intellectual humility, rational perception of outgroup and ingroup relationships in the news media literacy education would help students to build a more scientific epistemology of news media literacy.

Secondly, this study enriches the research on news media literacy and xenophobia by broadening the samples to include data from China. Also, it helps better understand the news media literacy of college students from mainland China. Moreover, the results show that students with a higher level of news media literacy had positive perceptions of outgroup relationships, which is the same as the previous findings in western samples. It implies that news media literacy should also be promoted for Chinese students to reduce the chances of them developing negative outgroup perceptions.

Furthermore, Mason (2021) believed that Confucius started the work of outlining the concept of intellectual humility a long time ago. Therefore, it is necessary to explore it in the Chinese context. Within the Web of Science Core Collection database, we identified 382 studies containing the search term "intellectual humility." However, further separate searches within this result using "Chinese" identified only one study (Wei and Wang, 2021). In this study, we noted that the mean score of students' intellectual humility was also greater than the neutral point, and it was a significant predictor of news media literacy. This study could therefore further enrich the applicability of intellectual humility in the Chinese context and help gain a deeper understanding of this trait and virtue.

In conclusion, the emergence of the Internet and social media has changed the spread of information, and people must learn how to face this complex situation to avoid being emotionally affected by misinformation and disinformation. Students should develop news media literacy, which will form knowledge for their future decision making and allow them to examine information critically and to understand group relationships objectively. We also recommend that educators pay attention to the impact of intellectual humility on news media literacy and emphasize the danger of blind patriotism and perceived threats in the formation of xenophobia. This would help people to navigate an increasingly convoluted information ecosystem, promote harmonious relationships, and prevent violent extremism.

Limitation

Study limitations and areas for continued research are important to note. Firstly, this study did not consider the influence of some underlying reasons, such as news bias and political bias. In addition, as Tully et al. (2020) suggested, understanding attitudes, motivations, and decision-making processes could also help to know more about news media literacy and its effects. More importantly, although some participants may have received news media literacy education before, we did not measure their achievements. Therefore, more empirical studies involving underlying factors and using longitudinal research designs are needed in future research. Thirdly, we acknowledge the limitations of the sample size and the lack of sample diversity. Future research can be expanded to other populations and larger groups in order to test the reasonability of our model. Furthermore, news media literacy includes far more than a set of skills that aim to identify misinformation—skills that will likely be made redundant or insufficient as technologies continue to develop, as the advent and application of new techniques is highly uncertain and unpredictable (Corser et al., 2022). In the increasingly complex information environment, the flaws of traditional media literacy have been shown (McGrew, 2020). Therefore, future research should continuously broaden the theoretical understanding and practical experience of news media literacy to keep people from falling into different traps.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was conducted by The Chinese University of Hong Kong (IRB Reference No. EDU2022-055). Written informed consent for participation was approved by The Chinese University of Hong Kong and signed by each participant in accordance with the national legislation and institutional requirements.

Author contributions

ML and CC contributed to the conception and design of the study. ML performed the statistical analysis and wrote the first draft of the manuscript. CC and J-CL contributed to manuscript revision, read, and approved the submitted version. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Social comparison effects on students' cognitive anxiety, self-confidence, and performance in Chinese composition writing

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Social comparison is a mind-altering determinant that affects students' learning behavior. To understand the effect, three instructional approaches to teaching Chinese writing skills were designed and implemented in this study: (1) The No Comparison Group (NCG): students were asked to complete compositions on their own; (2) The Upward Comparison Group (UCG): superior composition examples were provided and the students were asked to write compositions on the same topics; and (3) The Downward Comparison Group (DCG): inferior examples were provided for students to critique. Taiwanese junior high school ninth graders participated in three groups, and wrote compositions on six themes. The results revealed that the Chinese composition writing (CCW) skills of the students in the UCG and DCG improved significantly more than those of the students in the NCG. Composition-prompted cognitive anxiety in the DCG declined substantially. The results imply that adopting upward and downward comparisons for students to practice Chinese composition is worth adopting in writing lessons.

KEYWORDS

cognitive anxiety in writing, downward comparison, self-confidence in writing, social comparison, upward comparison

Introduction

Within the social-cognitive approach (Bandura, 1986), social comparisons are related to a psychological mechanism that influences people's judgment and behavior (Corcoran et al., 2011; Liu and Lan, 2016). In general, there are two types of social comparisons, upward and downward. Social comparison among peers can reflect individuals' perceptions of others as "better or worse-off" than they are

(Chua and Chang, 2016). When upward comparison (i.e., comparing oneself with those who are better) occurs in writing, individuals may want to improve themselves; this will lead to self-editing to compensate for their weaknesses. If downward comparison (i.e., comparing with those who are worse) occurs and individuals feel dissatisfied with others' writing, they may think of other expressions to improve the writing, then edit their own manuscripts accordingly (Dijkstra et al., 2008; Calkin, 2018). A previous study indicated that, through comparison with peers, an epistemic belief is formed that can enhance one's writing skills and abilities (Wright et al., 2019). However, most teachers adopt upward comparison in composition writing classes, with few using downward comparison to promote students' writing skills. Accordingly, comparison of upward and downward social comparison (DSC) in Chinese composition writing (CCW) is the topic of interest of this study. In this study, students in the experimental group of upward social comparison (USC) learned from superior writing examples, while students in the experimental group of DSC learned by critiquing and correcting inferior writing examples. USC is described as making comparison with those who are better at something than we are, which may cause anxiety. On the other hand, DSC is related to making comparisons with those who are worse at something, and this can enhance our self-confidence (Saiphoo and Want, 2018). In Taiwan, CCW courses for junior high school students are required, in which the students need to complete 2 h of writing tasks each week. The effects of USC and DSC on these students' CCW have not as yet been extensively studied, and so are the focus of this study.

Drawing on a social-cognitive perspective (Bandura, 2001), Dewaele and MacIntyre (2014) defined affect as the emotional interpretation of language learning experience. This interpretation can be further specified based on the achievement emotions theory (Pekrun, 2006); specifically, activating emotions such as hope, confidence and enjoyment are presumed to facilitate the use of flexible learning strategies, and can thus have a positive influence on learning performance. Conversely, deactivating emotions, such as anger, anxiety, and shame, imply detrimental effects on performance (Pekrun et al., 2011). That is, emotions are deeply implicated in the process of language learning by hampering or facilitating language development (MacIntyre and Vincze, 2017). However, many teachers teach writing based on example-based learning (Renkl, 2014; Lin et al., 2022), because example-based learning can facilitate students' writing (Hoogerheide et al., 2019). Using examples for learning requires a few cognitive resources (Payne, 2012), such as time, mental effort, and conscious attention. These cognitive processes can activate or deactivate emotions by social comparison (Guastella and Dadds, 2008). Moreover, Lee and Evans (2019) found that the more USC that people engage in, the higher the levels of anxiety they deactivate, while Chatzisarantis et al. (2016) found that when students engage in DSC, they tend to persist with tasks and report activating levels of self-confidence after receipt of negative feedback from peers. However, in the discussion of activators, self-confidence enhancement, deactivators, and cognitive anxiety in social comparison, few studies have considered the effects on CCW; therefore, the purpose of this study was to explore how students' cognitive anxiety and self-confidence enhancement interacted with their learning progress in CCW by adopting different social comparison approaches.

Integrating information technologies such as blogs can extend learning beyond the classroom, leading to an exchange of a variety of viewpoints that may affect the level of personal engagement with an issue (Levy et al., 2015; Marvell, 2018). Blogs can be used in an educational setting for a variety of purposes; for example, they can be used as a method for teaching written accuracy and personal reflection (Sackstein, 2015; Cumming et al., 2016). In line with this, the present study employed blogs for students to practice social comparison by making remarks about the superior or inferior examples of CCW posted by the teacher. Moreover, based on the achievement emotion theory, participants' self-confidence enhancement and cognitive anxiety were examined in terms of six themes of writing practice. It is hoped that the results of this study can be used by CCW teachers to promote their students' CCW performance.

Literature review

Cognitive anxiety in social comparison

Anxiety can affect cognitive performance through impairing attentional control (Eysenck et al., 2007). That is to say, cognitive anxiety is a transient condition characterized by tension and apprehension, coupled with activation of the autonomic nervous system (Spielberger, 1985). Cognitive anxiety may be associated with using maladaptive coping strategies, such as avoidance and withdrawal, in a stressful situation (Lysaker et al., 2005). If cognitive anxiety increases, this could be problematic, since cognitive function plays a major role in task performance (Lindgren et al., 2020). For example, in a test, increasing cognitive anxiety will decrease test performance (Thomas et al., 2017). Particularly, cognitive anxiety has been associated with lower verbal processing speed, but not with memory and planning functions or general neurocognitive performance that decrease writing performance (Stouten et al., 2017).

Cognitive anxiety consists of apprehension difficulties, concentration difficulties, lack of control over thoughts, and worry about the outcome (Fergus and Wheless, 2018). In social comparison, students may be concerned that their peers will outperform them, thus raising anxiety in their learning, but the results remain inconclusive (van Gennip et al., 2009). Individuals under age 18 tend to compare themselves with their friends (Callan et al., 2015); however, there is limited research

related to cognitive anxiety in Chinese writing for junior high school students. Therefore, students' cognitive anxiety related to their composition writing performance was explored in this study.

Self-confidence enhancement in social comparison

The key aspect of confidence is that when an individual judges a cognitive task, it will provoke immediate reflection on his/her current performance. Within a learning task, confidence enhancement is positively related to cognitive and behavioral strategies (Marsh et al., 2012) and is directly relevant to task performance (Kleitman and Stankov, 2007). In using information technology, Yang (2009) stated that students who used blogs to learn found that their ability to communicate with peers helped them to critically reflect on the subject materials and enhanced their self-confidence. Moreover, students aged 15–17 have been described as being in a unique period of their life during which intensified social comparison related to their self-knowledge and self-evaluation affects their self-confidence (van der Aar et al., 2018). Thus, the extent to which social comparison could enhance junior high school students' self-confidence after several rounds of composition writing was explored in this study.

Research hypothesis

In the context of the social comparison theory (Festinger, 1954), researchers have extensively studied the relation between students' achievement in the context of social comparison. Once established, USC enables learners to compare the level of a partner's knowledge and to seek better learning approaches (Sangin et al., 2011). Moreover, Schwabe et al. (2019) claimed that providing opportunities for upward comparison will enhance students' ability, whereas possibilities for downward comparison will decrease their ability. Previous research has pointed out that USC processes may explain an underlying mechanism of the negative effects of learning achievement (De Vries and Kuhne, 2015). That is, a negative relation between students' DSCs and ability improvement does not only exist in specific domains, but also in different age groups (Marsh et al., 2014). However, the effects of different types of social comparison on the learning progress of CCW has not yet been studied. Thus, to understand how the writing progress can be improved via three types of social comparison was hypothesized as described below.

Neugebauer et al. (2016) argue that less knowledgeable learners who rely on social comparisons will be motivated to increase their engagement to learn knowledge from partners who are more knowledgeable. Moreover, when comparison options are restrained (i.e., only superior or only inferior examples are available to compare with), learners tend to seek comparisons that may effectively motivate them to achieve their learning goals (Ray et al., 2013). Conclusively, the review of others' writing can help students to optimize their learning, and mirrors a form of learning progress (Wiliam, 2007; Clark, 2012). In this respect, writing progress is assumed to be a result of different types of social comparison. Therefore, hypothesis 1 was proposed as follows:

> **H1:** Students' writing performance will improve differently according to the three types of teaching methods.

Social comparison significantly influences self-evaluations and affective reactions (Zell and Strickhouser, 2020). Previous studies have suggested that the presence of confidence echoes the effects of an individual's ability (e.g., Stankov et al., 2012a,b). Herron et al. (2019) used examples with video simulation to deepen students' understanding of the learning content, and found that the use of examples as simulation-based learning can enhance students' self-confidence. Moreover, the mindset of self-confidence has been found to affect language learning through social experience (Lou and Noels, 2020). For example, Theising et al. (2014) investigated how students' self-confidence impacts their attitude toward peer feedback in a language class. In this regard, the question of whether or not the degree of self-confidence would vary as the practice times increased in the three approaches of writing composition was explored. Thus, hypothesis 2 was proposed as follows:

> **H2:** Students' self-confidence enhancement in Chinese composition writing (SCECCW) will improve differently according to the three types of teaching method.

The Anxiety and Uncertainty Management theory (AUM; Gudykunst, 2005) provides a framework to approach this question by describing the cognitive and affective challenges, including anxiety, that students are likely to experience during interactions with peers. Previous analyzes indicated that higher anxiety was related to USCs (Butzer and Kuiper, 2006). According to the social comparison theory, experiencing cognitive anxiety would inhibit students' performance (Morony et al., 2013; Bum and Shin, 2015). As the students were taught with three different learning approaches to write compositions, their cognitive anxiety was expected to vary due to the different degrees of social comparison they engaged in. Therefore, hypothesis 3 was proposed as follows:

> **H3:** Students' cognitive anxiety in Chinese composition writing (CACCW) will improve differently according to the three types of teaching method.

Martens et al. (1990) supported the negative relationship between cognitive anxiety and self-confidence, and characterized self-confidence as the relative lack of cognitive

anxiety. Moreover, Dickhäuser (2005) found that students' self-concept related to anxiety was affected differently by external and internal comparison processes. Additionally, self-confidence is relevant to learning outcomes, and other key factors within the learning setting (Bum and Shin, 2015). As the primary purpose was to examine the effects of social comparison on self-confidence and anxiety (Seaton et al., 2010), different types of social comparison were combined to explore the benefits to the CCW learning outcomes. Taken together, how different types of reflection would interact with cognitive anxiety and self-confidence enhancement in students' writing progress was hypothesized as H4:

> **H4:** The difference in the Chinese writing progress of students learning with the three types of teaching method is impacted by their SCECCW and CACCW.

Research design

Participants and procedure

In this study, we adopted purposive sampling to select students from one urban junior high school located in Taipei city (note that compulsory education is up to ninth grade, year 3 of junior high school in Taiwan). Six ninth-grade classes consisted of 181 students in the target school. Because ability grouping is prohibited in the junior high school system in Taiwan, there was no difference in the writing ability of the students in each class, because they were normally distributed as they entered the school according to school policy. After asking the Chinese language teachers to assist with this research, one teacher was willing to participate; she taught three classes with a total of 90 students (M = 14.47 years old) who were selected for this study. These 90 students were randomly divided into three groups: 31 were placed in the NCG, 32 in the UCG, and 27 in the DCG. All three groups had composition lessons twice a week (45 min per lesson). The students all had previous experience of using blogs. Before the beginning of the research, the teacher taught the UCG and DCG students how to use the blog for reading, and how to give responses or comments using a mobile device.

Totally six lessons were taught with a different topic chosen for each. The composition topics included "Presents," "A song I like," "At the swimming pool," "The person I want to be," "This time, I will be different," and "Those whom I treat as friends." All the topics were written as narrative prose.

The CACCW questionnaire was given to the students before each trial, a total of five times. The SCECCW questionnaire was given to the students after each trial, that is, also five times in total. In the preface of the questionnaire, the participants were notified that they were participating in an evaluation study, that the data they provided was anonymous and that the study might be published. Additionally, we also collected and recorded information on the students' writing performance for the five different compositions.

Experiment setting

Blogs have been recognized as a valuable, flexible and easy-to-use web 2.0 technology tool for teaching and learning (Halic et al., 2010; Ifinedo, 2017). According to Yang (2009), the study found that students' communication ability and reflection of learning has been enhanced by using blogs for learning. Researchers found that students recognize that blogs are a useful tool for their learning (Halic et al., 2010; Chen et al., 2015; Ifinedo and Usoro, 2016). In light of this, the present study focused on implementing social comparison, and used blogs as a writing and interactive tool for students to refer to compositions, and post comments on the writings. Three intact classes of students were designated as the three groups: the first class was the no comparison group (NCG), the second class was the upward comparison group (UCG), and the third class was the downward comparison group (DCG). These three classes were taught Chinese by one teacher. Particularly, the UCG and DCG students had to use the blogs to read some anonymous writings and to give their responses to or comments on the provided samples which had been evaluated by teachers as best or worst writing examples. Briefly, the features of the three groups are elaborated as follows.

The NCG: This was the control group. In this group, the teacher announced the writing topics and explained the meaning to the students. The NCG Students had to make a plan of their writing structure before they started to write.

The UCG: This was one of the two experimental groups. In this group, students first received five superior writing samples which were related to the same writing prompt. The UCG students had to give their feedback on the samples, including the reasons why they were considered superior. They received no input from the teacher at this stage. They had to mark what parts of the writing they preferred, and they had to post their comments and take on the Blog that the teacher regulated. The teacher then responded with additional remarks to point out which of the student's comments were correct, useful or appropriate.

The DCG: This is the other experimental group which was taught to reflect on five samples of inferior compositions which the teacher posted on the blog. The DCG students also received a message telling them which post they had to read and give their responses to or comments on. The DCG students marked those parts they thought might be incorrect as well as mistakes they found in the examples. In other words, the students conducted peer assessment based on the criteria which had been taught by the teacher beforehand, and highlighted the problematic sentences in each sample. They were asked to revise as many as possible in each sample without any feedback from the teacher,

but they had to post their comments to the blog for the teacher to understand how much effort they had put into the task.

The topic of the sample writing was the same for the UCG and DCG: describing people swimming in a pool. These sample writings were written by students in the same grade but who did not take part in this research. After grading by the teachers, the writings were divided into groups and the superior and inferior samples were posted separately on the blog. The superior sample shown in **Figure 1** features the use of some exquisite, ornamental language and some rhetorical skills that the students could learn from. A student in the UCG highlighted (in yellow) what he/she considered to be good sentences in the sample writing that he/she could not think of him/herself. The students could apply such words or sentences in their own writing on the same type of topic.

On the other hand, students in the DCG were given an inferior writing sample which also described people swimming in the pool. The DCG students were asked to improve the sample writing using some rhetorical skills such as similes, metaphors, and metonymy. **Figure 2** shows an example of a DCG student's revision of an inferior composition (the revisions are marked in bold in the original Chinese text and in the English translation). From the revision of **Figure 2**, the present study can see that the student was trying to add some adjectives to the original sentences.

Teachers' assessment of students' performance

The present study used a writing performance assessment rubric which referred to the Competence Indicators of Mandarin Writing (Ministry of Education, 2010) to ensure the effect of the writing performance assessments. It also focused on some parts of language learning such as grammar, writing style, vocabulary usage, language accuracy, coherence, and fluency as previously mentioned.

The assessment rubric

The CCW assessment rubrics are divided into six levels. To gain 6 points, the following criteria should be met (Chang and Sung, 2019): (1) Content: Appropriate information is included with reference to the topic and theme, and is elaborated with details to meet the objective; (2) Organization: The composition is complete, well-structured, and coherent; (3) Vocabulary and Sentence Structure: The use of vocabulary and phrases is precise and accurate with an effective application of a wide range of

The superior sample writing in Chinese	Translated in English
蹬著牆，**身體任憑池水推進**，右手由水底划出，在空中畫下半個圓，手腕向下彎曲傾斜的再落入水中。**右手，左手，右手，左手，兩手交替在空中劃出一道道水的舞姿**。 雙腳打直，拍打池面，一波波浪花打在腳上，驅除我的暑氣。**蛙鏡底下，池底世界是一條條浮動的橫紋**，而眼前正游動的人們，**腳底打出一團團白色泡沫和一個個大小相間的泡泡**，順著水流，**陣陣從我的臉上拂來，又快速的往兩邊散去**。刺鼻的消毒水味也隨之盈滿我的鼻中，一次次探頭出水面換氣，襲來的是冰涼的空氣和吵雜的人群聲，**深吸一大口氣，鼓著大嘴，我又再次回到水下那寧靜的藍色世界**。	Kicking on the wall, **the body is propelled as the water flows**. The right hand paddles the water and draws a half circle in the air. The wrist bends down into the water, **right hand, left hand, right hand, left hand; the two hands alternate and draw lines of water in the air**. Straightening the feet and paddling on the water surface, a wave of spoondrift hit my feet to dispel the heat. **Viewing through the goggles, there are fluctuating lines of waves in the under-water world**. People who are swimming **kick rounds of white foam and bubbles**, and the white foam and bubbles flow with the water, **whisking over my face and then disperse to two sides**. My nose is filled with the smell of the pungent disinfectant, and as I pop out of the water to breathe I feel the cold air and hear the noisy sounds. **Breathing deeply and filling my mouth with air, I return into the silent blue world**.

FIGURE 1
Example of a student's critique in the upward comparison group.

The inferior sample writing in Chinese	Translated in English
我將半個身體浸入**沁涼的**池中。每到游泳池，我通常是最早起身坐在泳池邊的，看著互相比賽的人**全速踢水前進**，看著**天真的**孩子在水中~~遊玩~~**大聲嬉戲**的模樣，看著我用腳濺起**雪白**的水花。當我沖洗完，準備離開時，一股泳池常有的漂白水味後，才~~真正~~**依依不捨的**離開。	**I will** plunge half of my body into the **cool** water. Every time I go to the swimming pool, I'm always the earliest to sit by the pool, observing the people **who are kicking water with full speed** during competitions, observing those **innocent** children playing around in the pool, and observing the **snow colored** splashes from my own feet. After I shower and am about to leave, the smell of the disinfectant drifts into my nose, like a sign of farewell. As I walk by the pool, I come into contact with a touch of disinfectant once again, and finally leave **with a heavy heart**.

FIGURE 2
Example of a student's critique in the downward comparison group.

sentence structures for fluent expression; (4) Chinese characters, Format, and Punctuation: Spelling, format or punctuation is almost flawless. The superior examples of CCW posted by the teacher should have scored 6 points, while the inferior examples only scored 1 or 2 points.

Credibility of assessment

For triangulation purposes, three Chinese language teachers who clearly understood the six composition grading criteria, which were the same as the composition grading criteria of the Comprehensive Assessment Program for Junior High School Students in Taiwan, were invited to grade the writing performance of the study participants. All the students' compositions were rated by the three raters, and the rating results were compared and rationalized until they agreed on a score to ensure the consistency of the rating. The three raters repeated the above process until they achieved a consistent result above 95% based on Kendall's coefficient of agreement analysis (Tong et al., 2020). If the coefficient was above.9, it shows that the appraisers were applying essentially the same standard when assessing the samples, which is considered as excellent.

Measuring instruments

Questionnaire item development

Self-confidence enhancement: Adapted from Grundy (1993), confidence level is related to the performance of a specific skill; moreover, it refers to a subjective cognitive experience which results in judgments of certainty relevant to one's performance (Jackson and Kleitman, 2014). Cognitive anxiety measurement: Adapted from Viney and Westbrook's (1976) Cognitive Anxiety Scale (CAS) is a means of measuring cognitive anxiety. Adapting from above researchers, this study designed the questionnaire by professionally translating the original items into Chinese, then using the forward-backward method to verify its face validity.

In this study, a 7-point Likert scale was used for the measurement, with 1 representing strongly disagree and 7 representing strongly agree. The suitability of the questionnaire items in each construct was tested by first-order confirmatory factor analysis (CFA) after the first trial. In the original questionnaire, there were 12 items in the CACCW construct, and 10 in the SCECCW construct.

According to first-order CFA, the χ^2/df values of each construct were all less than the threshold value of 3. CACCW is 2.71 and SCECCW is 2.19, both of them are less than 3. In addition, the threshold value of the goodness of fit index (GFI) is 0.9 and 0.92 for CACCW and 0.94 for SCECCW are both above 0.9 and the threshold of the adjusted goodness of fit index (AGFI) is 0.9, and CACCW is 0.95 and SCECCW is 0.91, both of them were above the cutoff value of 0.90. The threshold value of the root mean square error of approximation (RMSEA) is 0.08 and CACCW is 0.76 and SCECCW is 0.42, and both of them were less than 0.08. The threshold of standardized root mean square residual (SRMR) is 0.05 and 0.05 for CACCW and 0.32 for SCECCW were less than 0.05. Above indicating that there was a good fit for each construct (Hair et al., 2009). According to the first-order CFA, seven items for the SCECCW and nine for the CACCW remained.

Moreover, the present study tested if the reliability of the two constructs was acceptable in terms of their Cronbach's α value by using the software, SPSS 22. Subsequently, the questionnaire was

applied to another four trials after the participants finished each composition. Self-confidence enhancement: How confident the participants felt compared to the first time they completed a writing task was measured after each writing (e.g., "Compare how confident you feel now to how you felt the last time you completed a writing task in terms of: how confident you are in using a variety of vocabulary for better writing; how confident you are in using language precisely in writing"). The Cronbach's α = 0.87 and CR = 0.90, indicating that the internal consistency and composite reliability of this construct were acceptable. Cognitive anxiety measurement: students' CACCW was measured after each writing, including, "During this writing task, I was anxious because I didn't know how to get started." The Cronbach's α = 0.88 and CR = 0.91, indicating that the internal consistency and composite reliability of this construct were acceptable.

In addition, this study aimed to analyze the power of the factors influencing students' composition writing performance progress. For the considered factors and interaction, the estimation of effects was carried out by ANOVA, analysis of variance, to investigate the significant differences among the three groups, and *post hoc* analysis was also performed to compare the difference among three groups.

Results

The collected data were analyzed using SPSS 22 to test the significance of the four hypotheses.

Serial analysis of writing performance progress, self-confidence enhancement in Chinese composition writing, and cognitive anxiety in Chinese composition writing

To assess the ability to learn from distributional information alone, a serial reaction time task can be categorized into a sequence of input stimuli (Hunt and Aslin, 2010). Serial analysis was adopted in this study to examine the composition writing performance progress through the SCECCW and CACCW of the three groups, NCG, UCG, and DCG, during the 5 weeks' experiment. Regarding the performance in composition writing, **Figure 3** revealed a series chart of the three groups' composition writing performance. Compared to the UCG and NCG, the DCG had higher writing performance, while the NCG had the lowest performance among the three groups. Furthermore, the UCG and DCG students' composition writing performance generally improved across the five trials (with the exception of the DCG from trial 2 to trial 3).

Figure 4 reveals the change over the five trials of the three groups' participants' self-confidence enhancement in composition writing. Compared to the UCG and NCG, the DCG had greater SCECCW, and the NCG had the lowest self-confidence enhancement among the three groups. In addition, the self-confidence of the participants in the UCG and DCG increased across the five trials, while the self-confidence of the NCG students decreased. **Figure 4** shows that the SCECCW of the NCG decreased over the five trials, while the SCECCW of the UCG and DCG generally increased. The self-confidence level of participating students with upwards and downwards treatments all showed improvement over time.

Figure 5 reveals the change over the five trials of the three groups of participants' cognitive anxiety in composition writing. Compared to the UCG and DCG, the NCG had higher cognitive anxiety, whereas the DCG had the lowest cognitive anxiety among the three groups. Moreover, the self-confidence of the participants in the UCG decreased across the five trials, while the self-confidence of the DCG students decreased along with the number of practice times (with the exception of trial 2 to trial 3). For the NCG, participants' cognitive anxiety decreased from trial 1 to trial 3, and increased from trial 3 to trial 5 to be higher than it was in trial 1.

The difference between groups in relation to writing progress, self-confidence enhancement and cognitive anxiety

The present study investigated the differences among the three groups in relation to writing performance progress, SCECCW, and CACCW in this study. **Table 1** shows the results of the repeated measures ANOVA and *post hoc* comparison. Means of writing performance progress, SCECCW, and CACCW are significantly different in the three groups. For the writing performance progress, $F_{(2,87)} = 3.36$ ($p < 0.05$) which indicates that there is a significant difference in the three groups, and the means of the UCG ($M = 3.85$) and the DCG ($M = 5.38$) are higher than the means of the NCG ($M = 0.80$). For SCECCW, $F_{(2,87)} = 6.04$ ($p < 0.01$) which indicates that there is a significant difference in the three groups, and the means of the UCG ($M = 3.98$) and DCG ($M = 4.17$) are higher than that of the NCG ($M = 3.59$). For CACCW, $F_{(2,87)} = 4.62$ ($p < 0.01$) which indicates that there is a significant difference among the three groups, and the mean of the NCG ($M = 3.98$) is higher than both the UCG ($M = 3.66$) and DCG ($M = 3.45$). Regarding the degree of writing performance progress, participants in the UCG and DCG showed greater improvement than those in the NCG. In a similar way, participants in the UCG and DCG also exhibited a higher level of SCECCW than those in the NCG. In addition, the present study found that the students in the UCG and DCG had a significant decrease in their CACCW levels than those in the NCG.

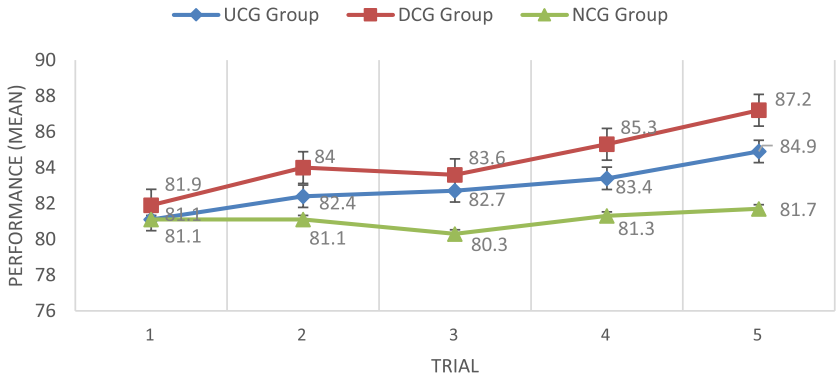


FIGURE 3
Writing performance progress for the three groups.

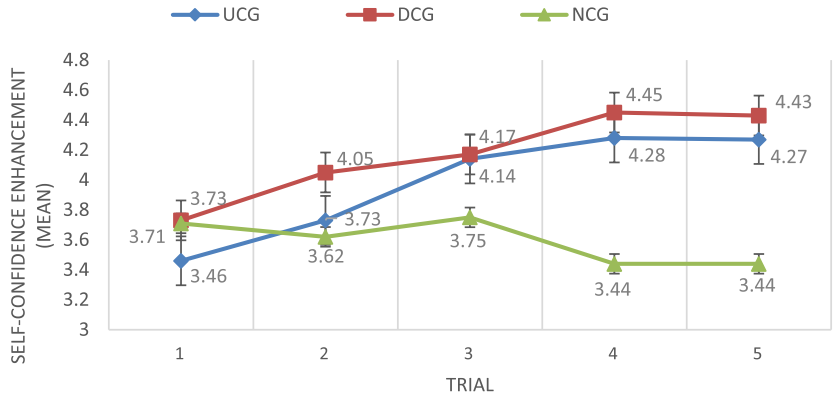


FIGURE 4
SCECCW for the three groups.

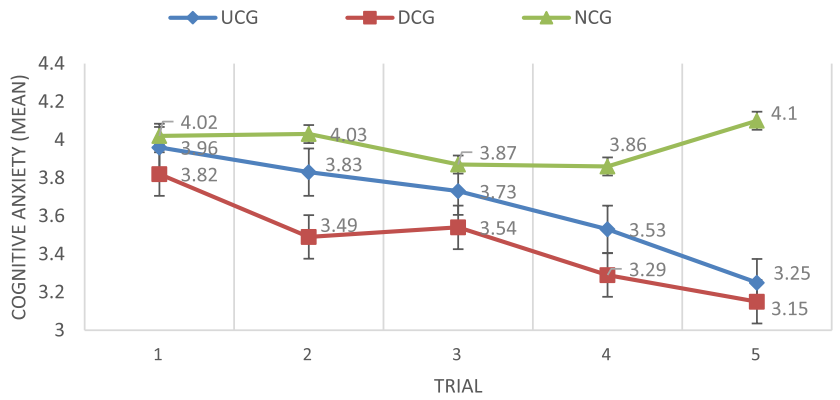


FIGURE 5
CACCW for the three groups.

Discussion

Based on the achievement emotion theory, this study investigated participants' self-confidence and cognitive anxiety change along with the upward and DSCs. The results of this study indicate the effects of three different forms of social comparison. Firstly, the students in the UCG and DCG showed greater improvement in CCW than those in the NCG. Secondly,

TABLE 1 Summary of writing progress, self-confidence enhancement and cognitive anxiety.

Variable	Group	N	Mean	*SD*	*F*	Post hoc comparison
Writing progress	NCG	31	2.80	1.31	3.36*	DCG, UCG > NCG
	UCG	32	3.85	1.53		
	DCG	27	5.38	1.31		
SCECCW	NCG	31	3.59	0.59	6.04**	UCG, DCG > NCG
	UCG	32	3.98	1.46		
	DCG	27	4.17	1.23		
CACCW	NCG	31	3.98	0.86	4.62**	NCG > UCG, DCG
	UCG	32	3.66	1.24		
	DCG	27	3.45	0.93		

**$p < 0.01$, *$p < 0.05$.

the students in the UCG and DCG showed greater improvement in SCECCW than those in the NCG. Thirdly, the students in the UCG and DCG experienced a greater reduction in cognitive anxiety about CCW than those in the NCG. If we only compare between the UCG and DCG, the analysis result shows that there has no significance between the two groups. The verification of the research hypotheses is presented as follows.

> **H1:** Students' writing performance will be improved differently according to the three types of teaching methods.

When comparison options are restricted (i.e., only superior or only inferior examples are available for comparison), learners tend to seek comparisons that may effectively enhance themselves to achieve their learning goals (Ray et al., 2013). However, these studies did not examine writing improvement in relation to the effect of number of practice times in using Blogs. In addition, previous research has found that writing performance will be significantly improved with more practice (Oppenheimer et al., 2017). Supporting this point of view, the current study revealed that when the students examined other works, they could make further revisions of their text development, writing organization, and writing style. The results of the present study indicate that no matter which group the participants were allocated to, their writing performance improved, and furthermore, participants in both the UCG and DCG may have had a better cognitive process when they had more composition writing practice. This result is partially consistent with some previous studies which indicated that USCs can trigger people and improve performance through increased practice (Yang, 2010).

> **H2:** Students' SCECCW will be improved differently according to the three types of teaching method.

According to the social comparison theory, students' anxiety level would be promoted or inhibited as a result of upward comparisons (Johnson and Stapel, 2007). When less knowledgeable learners practice upward comparison, it can increase their anxiety. Besides, seeing one's own potential in the superiority of others may turn into positive affect about oneself (Neugebauer et al., 2016). Moreover, Takahashi et al. (2009) and Swencionis and Fiske (2014) proposed that downward comparisons can produce many kinds of emotional responses and show different activations in the state anxiety circuitry. Findings of this study showed that the NCG participants experienced a higher degree of CACCW as the number of practice times increased. Regarding cognitive anxiety as the deactivated factor of achievement emotion theory, the results also showed that given platitudinous practice time, with social desirability (Gruda and Hasan, 2019), participants' cognitive anxiety as state-anxiety deactivated at a much more substantial rate in both the UCG and DCG than it did for the students in the NCG.

> **H3:** Students' CACCW will improve differently according to the three types of teaching method.

Some people would like to show their superiority to others in downward comparisons (Wills, 1981) to make themselves feel prominent and outstanding (Larrick et al., 2007), and also to enhance their self-confidence (Brown et al., 2007). A previous study used examples with video simulation to deepen students' understanding of the learning content, and found that it can enhance students' self-confidence (Herron et al., 2019). Moreover, Theising et al. (2014) assessed how students' self-confidence influences their attitude toward their reception of peer feedback throughout the experimental language curriculum. The results of this study in support of this point of view is that the DCG participants enhanced their self-confidence more significantly than the NCG participants by comparing their last practice to their first practice of CCW. Regarding self-confidence as the activating factor of achievement emotion, the results of the present study verified that the UCG participants demonstrated a greater activation of SCECCW than the NCG participants as a result of the increased number of practice times.

> **H4:** The difference in the Chinese writing progress of students learning with the three types of teaching method is impacted by their SCECCW and CACCW.

Within educational settings, lower confidence levels have been positively associated with higher levels of English and Mathematics anxiety (Stankov et al., 2012a; Morony et al., 2013). However, the anxiety-related experience might put one's own achievements in doubt (Want and Kleitman, 2006). Additionally, self-confidence is relevant to learning outcomes, and other key factors within the learning settings (Bum and Shin, 2015). Dickhäuser (2005) found that students'

self-concept related to anxiety was affected differently by comparison processes. Students who used blogs for learning subjects by responding to or receiving comments have been found to be able to enhance their self-confidence (Yang, 2009; Bowman and Akcaoglu, 2014). The results of this study indicated that the UCG and DCG outperformed the NCG. The UCG and DCG students achieved better learning outcomes than the students in the NCG. Supporting the above study and responding to the question about whether there is a difference in the learning progress of the three groups, the present study revealed that students using the two types of comparison performed better in terms of their writing progress with less cognitive anxiety, and experienced better self-confidence enhancement than the students in the NCG. Briefly, the results of this study are based on series analysis, which is different from previous studies that focused on one-shot data collection and analysis, for example, Zhang et al.'s (2020) study which testified the motivation and demotivation with anxiety in one experiment. With time series data analysis, the activator of self-confidence will increase, but the deactivator of cognitive anxiety will increase as learning trials increases.

Conclusion

In order to improve their writing performance, there is a need for students to adopt example-based learning to reflect on and enhance their writing abilities (Cheng and Chan, 2019). In this study, we used the social comparison theory to provide insights into these complex findings by examining the self-confidence, cognitive anxiety, and behavioral aspects related to CCW. The main goal of this adaptive educational approach was to create a social comparison environment by using blogs to support peer learning that can evoke learners' dynamic cognitive and affective states. The results of this study indicated that providing superior or inferior examples to learners can foster their understanding of the principles and concepts, generate confidence, and eliminate anxiety in CCW; their learning of the CCW principles and concepts generate confidence, and reduce anxiety in CCW.

Implications

People have a propensity to follow the norm of "seeing our own strengths and seeing others' shortcomings" in peer assessment (van Boven et al., 2003). The results of this study support the premise that the writing performance of students can differ based on the characteristics of superior or inferior samples. The critical role of upward or downward comparison as an essential factor affecting students' cognitive and affective perceptions has been highlighted in this study. Therefore, it is specifically recommended that teachers employ the upward and downward comparison instructional approaches of teaching composition writing.

It is useful for teachers to consider how individual students interact with various aspects of their social context in relation to their cognitive anxiety to apply different teaching approaches in writing compositions. Comparison of their own writing to superior or inferior writing samples may cause some students to feel more or less cognitive anxiety, which may affect their willingness to engage in writing. However, the results of this study indicated that the more practice they had, the less cognitive anxiety the participants experienced, except for those students in the NCG. Thus, we suggest identifying individual students' inclination for social comparison, and applying downward comparison for more effective learning in composition writing.

Limitations and future study

There are two limitations to this study: the sampling and the tool. First, we selected ninth graders in Taiwan as our sample in this study. According to Stankov et al. (2012b), an individual's cognitive processes and affective states will change with age. We therefore suggest that future studies can expand the sample size across students of different grades and also from different schools to compare the differences in their social comparison across ages. Second, in this study, we used a blog as the online forum tool to support learning. Therefore, the influences of contemporary tools that students use for communication in efficient and popular ways (e.g., Facebook, LINE, Skype) should be studied further (Yen et al., 2015). Moreover, the difference between blogging and traditional paper-and-pencil delivery of the writing can also be further studied to compare the different effects of the two moderating approaches.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

J-CH: original draft. K-HT: data analysis and review and editing. M-YH: review and editing. C-YL: data collection. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Improving social presence in online higher education: Using live virtual classroom to confront learning challenges during COVID-19 pandemic

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The COVID-19 pandemic has compelled practically all higher education institutions to adopt online education tools over the previous 2 years. Online education has a huge potential to supplement or take the place of in-person instruction. However, there are certain drawbacks of online learning, such as the absence of classroom environment interaction and the difficulty in keeping track of students' engagement and participation. In this study, a live virtual classroom was developed to aid students in their learning activities. The effectiveness of these live video classes was reported from both students and instructors, as well as the variables promoting their implementation within higher education institutions. One of the more significant findings to emerge from this study is that the instructors found it convenient, as they could readily check course participants understanding by studying their live video lectures. The second major finding was that students felt satisfaction with online learning while asking questions without interfering with the instructor's presentation. Moreover, peers could also provide them with more expertise. However, the teaching process became dynamic, requiring the educator to pay close attention. The course participants also experienced anxiety when they were in front of other people. Additionally, both the instructor and the students need to be highly self-sufficient in technology.

KEYWORDS

digital learning, COVID-19, e-learning, MOOCs, learning analytics, sustainable online learning, virtual classroom

Introduction

The United Nations Educational, Scientific and Cultural Organization, "UNESCO," demonstrated that more than 1.5 billion students around the globe were forced to drop out of their educational institutions due to the emerging COVID-19 pandemic (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2020). The pandemic has forced academic bodies around the world to discover new forms of learning and teaching,

including online and digital education. New pedagogical methods were developed, more technological tools have been integrated in the teaching and learning process, and a focus on inclusion, resilience, and sustainability (Yousef and Khatiry, 2021). In fact, face-to-face instruction has unique properties, and no eLearning technologies can replace the physical presence of the instructor in a real classroom (El Miedany, 2019). However, due to COVID-19 isolation, learners and instructors might not be able to personally interact. Thus, online learning frequently acts as a complement, substitute, or even a replacement for in-person training. When it comes to accomplishing learning objectives, online learning can be just as effective as or even superior to face-to-face instruction (Anthony, 2019). Existing research recognizes the critical role played by instructional design, rather than only the use of new media or technology, which is mostly responsible for the comparable or higher learning results (Aldosari et al., 2022).

The development of the online tools' technology for learning, particularly live virtual classroom, has made it possible to access the ideas and viewpoints among students' network learning, creating chances for novel types of interaction and knowledge creation (Goldie, 2016). One of the most well-known network learning theories created for e-learning contexts is connectivism (Siemens, 2005). It is starting to gain acceptance among higher education instructors. On the other hand, the lack of in-person interactions in online learning environments poses a variety of difficulties for both instructors and students, including a lack of a collaborative learning environment, a loss of visual clues, and loneliness (Urrutia et al., 2015). Instructors and students must also adjust to the new settings, which are very different from traditional classrooms (Anthony, 2019). For instance, when talking to cameras rather than to actual students in classes, instructors and students could feel awkward or out of the ordinary. Similarly, rather than physically contacting the instructors, the students must watch recordings lectures of the instructors on their computer or smartphones. These difficulties and novel encounters will, in part, influence how the instructors deliver their lessons and how actively the students participate in online learning (Castelli and Sarvary, 2021).

Such approaches, however, have failed to address how live virtual classroom strategies are designed and implemented from the perspectives of instructors and students. Thus, there is an urgent need to address some issues of e-learning, including isolation and lack of social communication. In this paper, a group of students completing an online course at Bisha University was assisted by a live virtual classroom using Blackboard eLearning system. The instructor was physically apart from the students. This form was created as a synchronous classes run in real-time, interactive setting where the students and the instructors attending together from different locations utilizing a social networking application that enables both two-way video conferencing and real-time text chat. Therefore, the study's objectives were to investigate how such a live virtual classroom supported by two-way video conferencing could be developed and deployed as well as to investigate the experiences and perspectives of the instructors and students for sustainable online education in higher education institutions in the post-COVID-19. The approach to empirical research adopted for this study seeks answer to the following questions:

1. What is the instructor's reflection of the live virtual classroom's design and implementation?
2. Do the live virtual classroom's environments foster more social contact than other, more traditional distant learning models? Is this rise enough to give course participants a fruitful educational experience?
3. Which factors that influenced faculty members' utilization of the synchronous virtual classroom and acceptance of it?

Qualitative data were collected from both students and instructor by using the questionnaires of the instructor's feedback, and the students' reflections. Moreover, learning analytics was used to analyze data about course participant and their contexts.

Literature review

Digital education is an umbrella term for any type of learning represented using digital technology and includes students who take online courses. This form includes teachers who use digital tools, such as smart boards and portable devices, through synchronous and asynchronous learning tools (e.g., forums, shared discussion tools, email, chat, etc.,) with face-to-face interaction between students and instructors (Thomas, 2011). Thus, online learning is a form that is completely different from the traditional, in-person lesson within a department in an educational institution, depending on the time, the multiplicity of places, and perhaps the circumstances and capabilities (Rapanta et al., 2021). It is done by smart devices such as computers, smartphones, electronic boards and the like *via* the Internet, video conferences, audio–visual multimedia, radio, and television channels, through which a person, individually or a group of individuals, interacts with educational content determined by the professor or supervisors, whether it was a lesson, seminar, or training. However, the reported benefits such as improved learning outcomes do not occur directly within the online learning environment (Müller and Mildenberger, 2021). Instructional design plays a critical role in making an online learning environment more effective (Spatioti et al., 2022). Compared to face-to-face learning, the instructional design of digital learning has various challenges, some of which are to be elaborated in the following sections.

Social isolation

There are numerous obvious advantages to learning in a classroom, including the development of a sense of belonging and high connectedness, the growth of positive relationships between students and the instructor and between students and peers, and the convenience of participating in learning activities (Eze et al., 2018). Due to the geographical separation, however, classroom

climate is often scarce in an online learning setting. A key component of the classroom settings is social presence, which can be challenging to establish in an online learning setting (Wut and Xu, 2021). Social presence is the capacity of students to represent themselves socially and emotionally in an online context as "real" persons (Lowenthal, 2010). In an online setting, there may not be many opportunities for course participants and the instructor to interact. As a result, the atmosphere and social presence in the classroom may deteriorate, and the transactional gap between students and the teacher or among students may increase according to the principles of connectivism learning theory (Utecht and Keller, 2019). Connectivism was created by Siemens, who described it as a cutting-edge learning paradigm significantly influenced by using digital learning tools. Learners can distinguish between synchronous and asynchronous learning interactions by using a network, web, or Internet to (a) obtain updated learning material, (b) find reliable sources for their projects, and (c) knowing where to get information may be just as beneficial as the material itself (Abik et al., 2012). However, researchers attempted to evaluate the impact of utilizing technology, such as real-time video conferencing to establish a virtual classroom where the teacher and students may visually present themselves (Grassini et al., 2020). These experiments confirmed that the live virtual classroom could overcome the lack of social presence and classroom climate based on some requirements (Elmesalawy et al., 2021). The nature of eLearning media tools used can have a significant impact on social presence. Richer social cues can be provided by some medium, like video, than by others, like text (Binder, 2022). However, research also demonstrates that if participants engage in frequent communication and active interaction with one another, even text alone can establish social presence (Namaziandost and Nasri, 2019). It is undeniable that social presence is not solely influenced by the media used but is instead more based upon personal and social factors. However, the absence of nonverbal emotional cues in a communication system that only uses text severely restricts students' capacity to detect the social presence of others (Heidari et al., 2020).

The manner in which communication media are used in eLearning systems can have a significant impact on social presence as well. For instance, asynchronous versus synchronous video usage would result in varying degrees of social presence. Asynchronously watching recorded videos would make students feel impersonal. In contrast, seeing a live video gives the course participants the impression that the teacher is speaking to them right away, which promotes a feeling of interpersonal connection (Lowenthal, 2022). Rich social presence improves students' learning results. However, some studies show a significant relationship between social presence and learning success as well as social presence and learning satisfaction (Molinillo et al., 2018). Moreover, several lines of evidence suggest that improving social presence decreases the dropout rate of students from the online courses and improves student engagement (Sutherland et al., 2018). Social presence does not just mean an instructor's physical presence among the students. According to additional research, students' social presence among their peers is even more crucial for learning satisfaction than their instructor's presence (Järvelä et al., 2016). This is because students are frequently more engaged in interacting with their peers than they are with the instructor (Kemp and Grieve, 2014). Thus, designing the online learning environment should place equal emphasis on establishing the social presence of students.

Technological self-efficacy

Technological self-efficacy is the conviction that one can successfully use technology to fulfill a learning task (Pan, 2020). According to research, students' motivation and contentment with the learning environment where technological tools are used are significantly influenced by their level of technological self-efficacy (Pan and Chen, 2021). Typically, utilizing a novel or unfamiliar technology instrument would enhance the students' cognitive demands, anxiety levels, and likelihood of dropping out of a course. The adoption and use of technology by the instructor are also influenced by their level of technological self-efficacy. One of the main internal obstacles for instructors has been recognized as a lack of technological competency (Herro et al., 2021). When employing new technical tools to teach, instructors frequently experience nervousness (Larson et al., 2020). More recent attention has focused on the provision of training sessions that should not only concentrate on technical skills or elements, but also on how to use technology to effectively enhance teaching and learning activities (Heitink et al., 2016).

There are a number of large cross-sectional studies which suggest students' participation is influenced by their level of technical self-efficacy. According to the case study conducted by Aguilera-Hermida et al. (2021) the students' incapacity to use the technological tool was a major factor in the low engagement rate in an asynchronous video communication setting. In a different study, Lin and Wang (2021) found that students with lower technological self-efficacy had more trouble utilizing the tool and were less willing to participate.

Track of students' activities

Learning is a dynamic and interactive process. Monitoring student behavior and determining whether they are experiencing any challenges during the learning process is essential for good learning to occur (Weist et al., 2018). By keeping an eye on the learning process, the instructor can quickly alter the activities or content and enhance the course structure going forward. However, it can be challenging to keep track of students' participation and engagement in an online learning environment (Ouyang and Chang, 2019). In the classroom context, the instructor may readily observe students and keep tracking on them using their body language, such as their gestures and facial expressions. However, in an online learning setting, it is challenging for the teacher to determine whether students are

following along with the instructional content due to the inability to read students' facial expressions (Wong and Li, 2020). In the synchronous online discussion, it is harder to keep track of students' participation and engagement. In addition to giving instructional material, the teacher must pay close attention to and swiftly respond to any posts or requests made by students. Comparatively, in an asynchronous online discussion, the instructor typically has more time to evaluate students' posts (Galikyan and Admiraal, 2019).

Research method

This investigation takes the form of action research method. Action research can be defined as "an approach in which the action researcher and a client collaborate in the diagnosis of the problem and in the development of a solution based on the diagnosis" (Bell et al., 2022). One of the primary characteristics of action research is to investigate the partnership between the learning objectives and learning outcomes to address organizational issues as described in Figure 1. Based on this method, certain strategies were applied in the design and implementation processes to address the abovementioned challenges. In this section, the action research stages, i.e., analysis, exploration, strategies used, and course implementation process are to be described.

Analysis

The live virtual classroom was designed for undergraduate students, Faculty of Education, University of Bisha, Kingdom of Saudi Arabia. The purpose of offering this course was to: (i) get the students to understand and recognize the importance of the pedagogical, social, and technical components of online learning environments and (ii) consider the design and evaluation of the components.

The virtual classroom was created as a real-time video conferencing environment where the instructor and students may engage concurrently in order to make up for the loss of social presence and classroom atmosphere. The instructor was available online during the meeting, frequently clarifying the course material and responding to students' inquiries. Moreover, the teacher went over the material with the course participants and constantly quizzed them to make sure they understood. Additionally, in order to foster a feeling of community, the instructor could see the students on the screen in addition to the students seeing the live instructor video.

Exploration

In this virtual classroom, the instructor could monitor students' participation and understanding *via* the online status indicator, as their names would appear on the screen once individual students were online. The instructor could also get a sense of students' understanding and engagement by glancing at their posted questions or comments on the discussion thread. Ideally, class discussion mainly consists of student participation; the teacher only facilitates and guides the students to keep the discussion going. Discussions are a great activity that adds vitality, excitement, participation, social interaction, reflection, and introspection to the dynamic of the classroom. The instructor could also use discussions as a formative assessment task—asking questions and brainstorming to check the current level of understanding. The constraint of the technological tool used in this course all members are allowed to see their status and show their activity, and they can exchange private messages with each other. *Via* watching the students' live videos, the instructor could observe what they were doing and if they were following the discussion.

Implementation

Before the first lesson, the instructor held a try-out session with a few willing students. The teacher observed at how to distribute presentation slides and cast a live video. Moreover, the course instructor also looked at how to direct and coordinate students' voices so that there would be minimal background noise and clear communication. The audio and video equipment's functionality was also examined. On an as-needed basis, several extra training sessions were also conducted. For instance, the teacher is periodically required to provide students access to the materials' files. Finally, the course instructor anticipated that the students would be able to view the shared screen, as well as see the highlighted text and remarks, as well as where the instructor had pointed his mouse on the digital whiteboard, as shown in Figure 2.

Experimental procedures

The current experiment procedures were carried out by dividing the students into two groups (experimental–control), where the control group studied the traditional lecture system on Blackboard, while the experimental group studied the modified live classroom system as suggested by this study. Participants in this study were enrolled in the postgraduate faculty of education at Bisha University. Their ages ranged between 23 and 27 years old. The experimental group was 60 students, while the control group was 59 students. The procedures varied between activities managed before the beginning of the study lectures and activities managed during the lectures. This course aims to provide students with some cognitive and emotional aspects of learning related to teaching and its methods, which help them in teaching general education curricula.

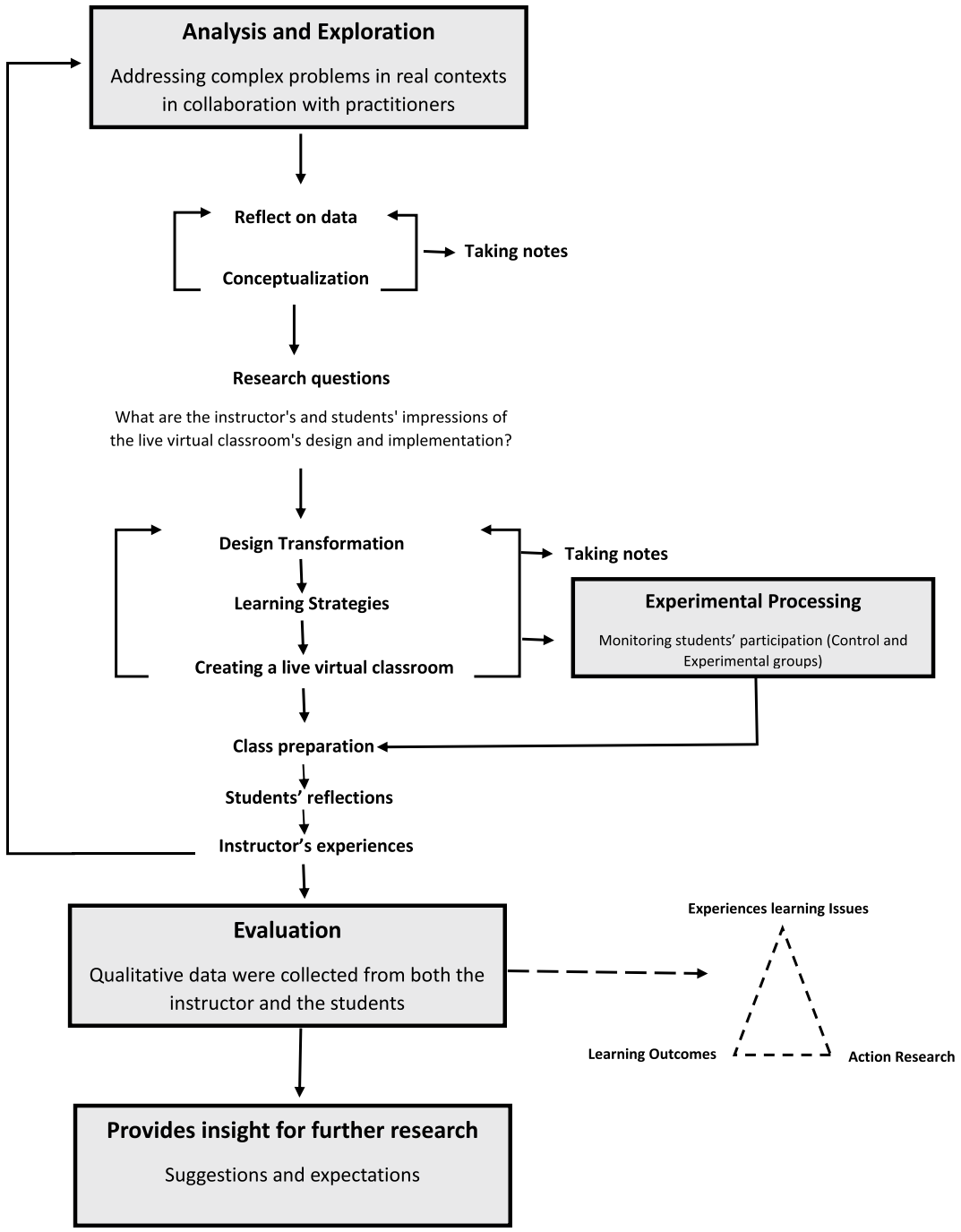


FIGURE 1
Action research method to improve social presence in virtual classroom.

Before the class time

The lectures in both groups were about 120 min, including all activities, projects, and discussions, and the teaching continued for 12 weeks. For the experimental group, the instructor launched a new group video session before beginning a class, and a notification was instantly pushed to the chat window to let the students know. The instructor logged into the group video session and activated the computer camera to cast a live video. After joining the class, the students would watch the streamed video. Their names were added to the participant list automatically, allowing the teacher and other students to see who had attended the virtual session. On the other hand, the control group only had the possibility to follow some recorded lectures and presentations with discussion opportunities through asynchronous interaction tools.

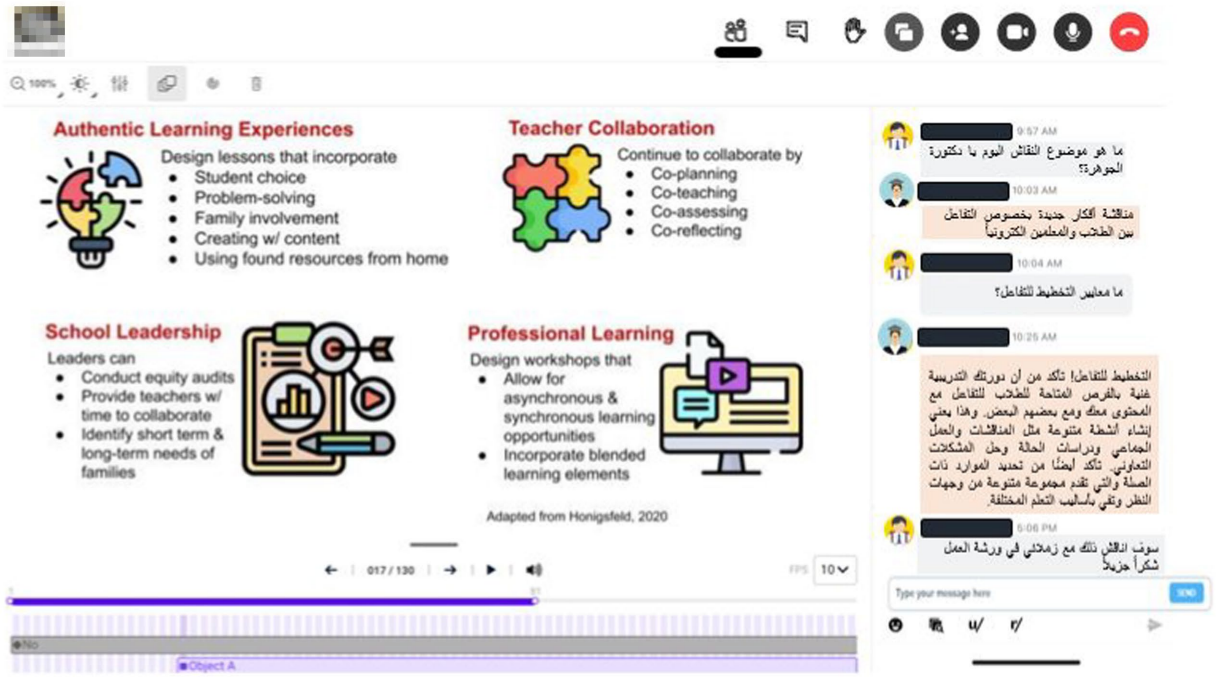


FIGURE 2
Virtual classroom at Bisha University using Blackboard learning management system (LMS).

During the class time

In the experimental group, instructor and other students were able to join the live recordings, and students were asked to cast them to the virtual classroom. On occasion, the instructor would pose a question and the visible course participants would respond. The presentations were conducted in English, while questions were allowed in both Arabic and English. When a student's name was called, they signed themselves up for the waiting list. The individual at the top of the waiting list took control of the microphone once the instructor released it and spoke into it in front of the class. The instructor could take over the microphone at any time if necessary. Only the instructor's voice was broadcast to the students during a presentation. The student on the top of the waiting list started talking when he/she saw the microphone was released and stopped talking when the instructor took over the microphone. Very often the student started with 'can you hear me?' The instructor had to confirm by taking over microphone temporarily and then releasing it quickly for the student to continue.

Results and evaluation

Since this was the first time the course had been offered in such a live virtual classroom setting during COVID-19, a formative course review was carried out to see what issues or challenges the students had encountered and how the course's design and delivery may be further improved in the future. The following research question served as the basis for the course evaluation:

1. What is the instructor's reflection of the live virtual classroom's design and implementation?
2. Do the live virtual classroom's environments foster more social contact than other, more traditional distant learning models? Is this rise enough to give course participants a fruitful educational experience?
3. Which factors that influenced faculty members' utilization of the synchronous virtual classroom and acceptance of it?

Instructor's reflection

Conducting an online course in a live virtual classroom is a new experience for the instructor. As part of the course implementation process, the instructor, who was also a researcher, noted what was prepared before a session, observed, and noted what transpired during a lesson, and considered how the lesson may be improved. Throughout the data analysis process, each researcher personally reviewed the observation and reflection log numerous times. To show the instructor's experiences and opinions of using the live virtual classroom, key issues were selected, debated, and common themes were condensed. The present results are significant in the following major respects.

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TABLE 1 Factors that influenced instructors' utilization of virtual classroom (*N*=12 instructors).

No	Category/factor	*M*	SD
Collaboration			
1	Online dialog with learners in real-time.	4.11	1.12
2	Offering a suite of collaborative tools, e.g., chat rooms and blogs.	4.12	1.16
3	Encourages shy students to interact with teachers better.	3.12	1.30
4	Students experience a stronger sense of community with their classmates.	3.15	1.17
Social presence			
5	Promotes social presence among students.	4.17	1.12
6	Allows for better student-instructor interaction.	4.28	0.98
7	Helping students with social integration despite the quarantine period.	3.86	1.36
8	Students have a direct connection with their peers.	3.50	0.95
Feedback			
9	Enhanced students learning outcomes.	4.26	1.13
10	Students had more time to reflect on what they learned.	4.72	1.18
11	Allows instructors to know which concepts and aspects of course design is beneficial to the students.	3.50	1.12
12	Students upload assignments digitally for peer review.	2.78	1.23
Usability			
13	The flexibility of technology.	3.94	0.91
14	Enriched student products and portfolios using learning analytics.	3.92	1.11
15	Perceived ease of use.	3.12	1.36
16	Enable instructors to share each other's designs.	3.51	0.84

Factors that influenced instructors' utilization of virtual classroom

Sixteen items on the questionnaire measured the extent to which factors that influenced faculty members' utilization of the synchronous virtual classroom and acceptance of it. Five-point Likert scale was used, where (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. The results obtained from the preliminary analysis are summarized in Table 1. Closer inspection of the table shows that online dialog with learners in real-time (M=4.11) and offering a suite of collaborative tools (M=4.12) had the highest mean among the collaboration factors. Promotes social presence among students (M=4.17) and it allows for better student-instructor interaction (M=4.28) were most highly rated among the social factors. Enhanced students learning outcomes (M=4.26) and students having more time to reflect on what they learned (M=4.72) had the highest average among feedback factors. The flexibility of technology (M=3.94) and enriched student products and portfolios (M=3.92) had the highest means when considering usability factors.

Adjustments of the instructor's role

The instructor had to regularly examine the students to see if they were still following the discussion or if they had difficulties in understanding the content. Occasionally, during the instructor's presentation, the students remained silent for a considerable amount of time without speaking. The teacher had to halt, elicit answers from the course participants, and ask questions. During the online classes, the instructor got incredibly concentrated. The instructor had to keep a careful eye on the chat window while presenting the material so that any questions or comments from the students could be noted and quickly handled. Multiple questions may occasionally be posted at once, and some may receive responses from peers. Before moving on with content delivery, the instructor had to swiftly evaluate whether specific questions or comments needed to be addressed.

Students' reflections

Do the live virtual classroom's environments foster more social contact than other, more traditional distant learning models? Is this rise enough to give course participants a fruitful educational experience? In light of the results in Figure 3, it is clear that there is a noticeable superiority for the experimental group that was taught in the interactive video conferencing system compared to the control group that was taught in the traditional way. The majority of the students in the experimental group indicated that the interactive virtual classroom offered a convenient and welcoming setting where they could attend the course using their own computers at their preferred locations, such as the study room. The schedule for online learning was also flexible because the time of the class could be determined as needed. Therefore, most students could participate in each session. The course participants believed that they learned more from their peers. In a real classroom, students often exclusively pick up knowledge from the teacher. However, students received assistance and advice from other participating classmates in this online classroom using interactive learning tools. Additionally, they believed that the resources that their peers shared and the relationships with others were beneficial to them.

Regarding students' engagement, the participants felt free to raise questions without interfering with the instructor's speech. While watching the instructor's lecture, they may quickly post

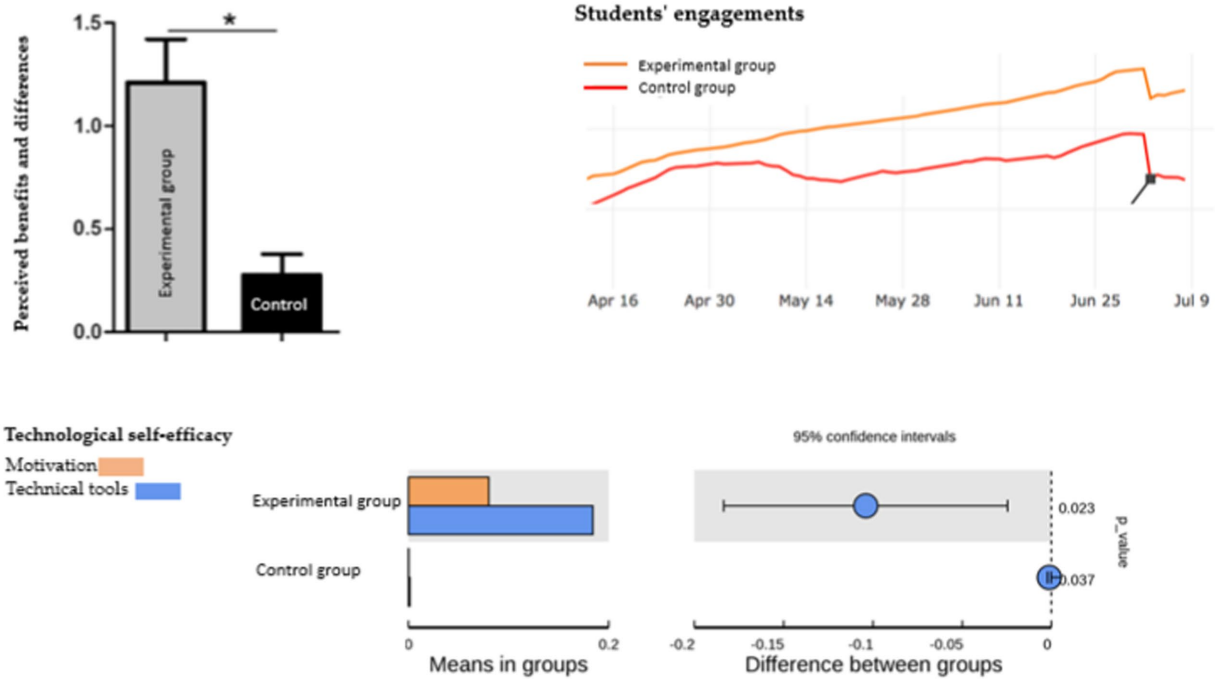


FIGURE 3
Statistical analysis among groups using learning analytics.

questions to the chat window. The teacher or other students may also provide them with timely criticism. In contrast, students frequently hesitate in a face-to-face classroom to interrupt the instructor's lecture and ask questions. Moreover, they thought that taking notes would be simple. Additionally, the chat window automatically captured the conversation and postings for later use.

Discussion

In a real classroom, the students can easily see if the instructor is in the classroom and if the instructor is going to start a lesson. But in an online environment, these visual cues are missing. In this virtual classroom, the instructor informed the students of his presence by broadcasting a live video. Thus, we emphasize the necessity of starting the live lectures a few minutes before their time to adjust the settings and prepare for broadcasting at the correct time. This finding is consistent with that of Newton et al. (2014) who confirmed that video lecture should set up time of about 3 min before class. Sometimes, the instructor also played a test video on the screen before a lesson started for the students to check if their computers were ready for receiving videos with sound and let them know the instructor was ready. Moreover, teachers' awareness of the substantial supports in enhancing students' self-directed learning.

Compared to traditional classroom teaching, the students became active participants rather than passive information receivers. They gave comments to the content, asked questions, and encouraged their peers to share ideas. Also, the students became useful helpers and resource providers (Gharti, 2019). For instance, when the instructor was referring to a figure the presentation, some students quickly found that figure and posted it to the chat window for others to view. When a student met technical problems, other students provided helpful information promptly.

Coordinating voice communication in the virtual classroom was challenging but manageable. The instructor kept the student's videos on the screen silent and cast his voice only to the students. When a student was invited to talk, his/her voice was broadcast to the class, but the instructor could take over the microphone at any time. As the students and the instructor were familiar with the tool and knew how to take and release the microphone, the voice communication process was rather smooth. This is one of the general criteria for designing educational courses recommended by studies (Mishra et al., 2020). Moreover, there are many factors that influence the use of live virtual classroom, including an instructor's level of comfort with the technology, and offering a suite of collaborative tools, e.g., chat rooms and blogs. These results corroborate the findings of a great deal of the previous work in Siemens (2017) who emphasizes the role of social media in promoting distributed learning across networks, and this is what the current study has benefited from as it provided the opportunity for students to discuss through discussion rooms and blogs.

This study proved that offering a live virtual classroom through two-way live video conferencing helped establish a classroom environment and was advantageous to both the instructor and the students. From the students' point of view, watching the instructor's

live video increased his or her presence in the classroom and created the impression that the teacher was always in touch with them. This conclusion supported the findings of Fatani's (2020) study, which showed that synchronous learning generally improved student happiness, and teaching effectiveness was more dependent on teacher, cognitive, and social presence than on technology. Technology is still a crucial tool for instructors' instructional activities, nevertheless. Therefore, it is best to develop a blended course to supplement future course delivery (Van Doorn and Van Doorn, 2014).

From the instructor's perspective, by watching the students' live videos, the instructor felt that he was talking to real people rather than to the computer screen. Also, the instructor could observe whether the students were following him or had difficulties in understanding the content However, this study also revealed that the students who were visually displaying on the screen appeared to be anxious. To a certain extent, this anxiety might hinder their participation and concentration (Hilliard et al., 2020). This finding echoes the importance that an online learning environment must have certain social affordances so that students feel safe and comfortable to participate (Zhang, 2021).

This study uncovered several challenges with online education. The process of teaching and learning, for instance, became more dynamic. Anytime, students are welcome to ask questions or make comments, and they expect the instructor to get back to them right away. It is possible that the learning process will not go exactly as intended. This result confirms that the social dynamic in online learning environments has changed (Dhawan, 2020), and instructors are urged to deliberately create a favorable social dynamic concurrently with the delivery of knowledge (Wendell et al., 2019).

In addition, appropriately moderating voice communication to keep a quiet but interactive learning environment was a challenge. Students often like talking to others in real-time (Broadbent and Lodge, 2021). However, this study discovered that when the sound from various people arrived at the same time, it would be excessively noisy or difficult to distinguish their conversation. Therefore, it is essential to appropriately manage voice communication. This research supports the idea that in a technology-mediated learning environment incorporating audio, instructors should maintain control over the use of the microphone (Prentiss, 2021).

Technological self-efficacy

No glaring disparities were noticed when the online sessions were held at various locations. The Internet was generally rather fast, and there were no additional technical issues when the courses were held at a remote location. The instructor needs to feel comfortable using the technology. The instructor in this research has extensive experience using the technical instrument. However, familiarization sessions were still important and beneficial since they helped the instructor foresee what would happen and determine whether the intended function could be achieved. This finding is consistent with what Rim and Shin (2021) found that tutors valued the training as it part of education components, e.g., learning objectives, course flow, instructional design, feedback techniques, follow-up and evaluation procedures, debriefing structures, and human resources. This finding also confirmed that instructors must have technological knowledge in addition to the pedagogical and content knowledge as described in the TPACK (Technological, Pedagogical Content Knowledge) model (Lachner et al., 2021).

The students also need to be comfortable using the technology. In this study, the control group students were unable to finish the course in large part due to a lack of technological proficiency with the instrument. This result supported the hypothesis that students' level of technical self-efficacy would influence their engagement in technologically mediated learning environments (Aldhahi et al., 2022).

Implications

The study's conclusions have ramifications for creating and putting into practice live virtual classrooms that use technology. The class size ought to be suitable. It might be difficult to keep track of students' participation and engagement in real-time online learning environments. The instructor can use video conferencing to keep track of the students' comprehension. However, a technological instrument, especially a free service, frequently does not support many live videos at once. As a result, each student in this session took turns introducing themselves graphically. If the class is large, it would not be possible to observe every student in a short amount of time.

Before a live online lesson, students need to be well-prepared, and scaffolding questions should be created and available beforehand. Students typically have to respond right away in a synchronous setting, as opposed to taking their time to reflect or research during an asynchronous online session. Without adequate preparation, it would be difficult for them to participate in the conversation and offer helpful suggestions. They could prepare for lessons more purposefully if scaffolding questions were provided beforehand. This would be especially helpful if the learning assignment was challenging, and the course participants felt overwhelmed by it (Zhang et al., 2021).

Limitations and future studies

The generalizability of these results is subject to certain limitations. For instance, the instructor tried to avoid often changing the content on the shared screen due to the network speed restriction. The instructor may show a PPT presentation, and the students will see it together in the class video section. When the content on the shared screen was often moved between sources, it would take some time for the students' screens to update (such as video and PPT). In order to avoid this delay, the instructor had to refrain from switching the screen frequently. Because of the nature of the department, the class size was rather modest. A small class was manageable for observation and communication, but a larger class would present more difficulties. Future studies would involve a larger number of

participants to examine if instructors and participants have different experiences. In addition, the participants in the study were motivated and mature. The findings from this study cannot be generalized into other dissimilar contexts where participants are more junior or less motivated. Future studies would involve less mature students to confirm if the findings from this study are representative.

Conclusion

With the spread of the Corona pandemic all over the world, schools and universities were closed as a precaution. E-learning *via* the Internet has become the ideal solution to confront this closure and to continue education. However, there are also limitations to online learning, such as the lack of connection in the classroom and the challenge in monitoring students' participation and engagement. In this study, a live, virtual classroom was created to support student learning and to investigate teacher and student experiences with and impressions of the live virtual classroom's conceptualization and implementation. The study used the quasi-experimental approach through two groups, one control and the other experimental. The sample amounted to 119 students, divided into the two groups, in addition to 12 teachers who participated in the final questionnaire to determine the factors that lead to an increase in the effectiveness of the use of electronic classes. The results showed a remarkable superiority of the students in the experimental group, and the social presence and psychological support for them were enhanced. Moreover, from the instructors' point of view, the online dialog with learners in real-time and offering a suite of collaborative tools had the highest mean among the collaboration factors. Furthermore, promoting social presence among students and allowing students for better student-instructor interaction were most highly rated among the social factors. Enhanced students learning outcomes and students' reflection on what they learned had the highest average among feedback factors. In addition, the flexibility of technology and enriched student products and portfolios had the highest means when considering usability factors.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

AA: conceptualization. HE and SA: methodology. AA, HE, and SA: validation and writing—original draft preparation. AA and SA: formal analysis, investigation, resources, data curation, visualization, supervision, project administration, funding acquisition, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Sleep duration and depression among adolescents: Mediation effect of collective integration

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Adolescence is a time of dramatic physical and mental change when adolescents are extremely vulnerable to various mental health problems. Depression and poor sleep duration are increasingly common among adolescents. This study is mainly aimed to verify the important mediating role of collective integration on sleep duration and depression and examine the interrelationship between sleep duration and depression in adolescents longitudinally. The data were obtained from the Wave 1 (in 2013–2014) and Wave 2 (in 2014–2015) longitudinal surveys of China Education Panel Survey (CEPS). The analytic sample in the present study included 8,829 seventh-grade students aged about 14years (51.50% boys and 48.50% girls). A structural equation modeling (SEM) was used to investigate parent–child/teacher factors affecting adolescent sleep duration and depression, and Monte Carlo resampling with R was employed to confirm the significance of the mediation effects of collective integration. An autoregressive cross-lagged model was employed to analyze the interrelationship between adolescent sleep duration and depression. The findings were as follows. Firstly, collective integration strongly mediated the relationships among academic self-efficacy, parental involvement, teacher praise/criticism, sleep duration, and depression. Secondly, sleep duration and depression were found to have enduring effects and have effects on each other. Thirdly, parental involvement and teacher praise were positively associated with sleep quality and negatively associated with depression. Teacher criticism was negatively associated with sleep quality and positively associated with depression. Compared with teacher praise, teacher criticism has stronger effects on youth sleep duration and depression. In conclusion, improving sleep problems and depression in adolescents as early as possible can stop the persistent and long-term consequences of these problems. Increasing teacher praise, decreasing teacher criticism, and increasing adolescents' collective integration were effective ways to improve adolescents' sleep duration and mediate depression.

KEYWORDS

adolescent, sleep duration, depression, teacher praise, teacher criticism, collective integration

Introduction

Adolescence, a period of significant physical, cognitive, emotional, and social change, is a vulnerable time in which individuals are at high risk for psychological health problems (Cyl and Rt, 2021). Sleep disorders are a significant risk factor affecting the physical and mental development of adolescents (Lemola et al., 2015; Liu et al., 2020). Many things prevent teenagers from getting enough sleep, such as academics, social interactions, the internet and even depression and anxiety (Dahl and Lewin, 2002). The American Academy of Pediatrics recognizes sleep deficiency in adolescents has become an important public health problem in modern society (Owens et al., 2014). According to the National Sleep Foundation (NSF), adolescents need 8–10 h of sleep to promote optimal health (Hirshkowitz et al., 2015). A survey of the Parisian adolescent student population confirmed that the average sleep duration of adolescents is well below the recommended values (7 h 14 min) (Stheneur et al., 2019). A cross-sectional population-based study found that more than 87% of U.S. high school students obtain less sleep than they actually need (Patrick and Friedman, 2009). Adequate sleep helps adolescents develop good habits, enhances well-being, improves inattention, and reduces antisocial behavior (Lehto and Uusitalo-Malmivaara, 2014; Widome et al., 2019). Short sleep duration has been shown to be associated with academic performance, mood states, suicidal ideation and suicidal behavior in adolescents (Choquet and Kovess, 1993; Dahl et al., 1996; Liu, 2004; Goodwin and Marusic, 2008; Li et al., 2013; Short and Louca, 2015).

Adolescence is a peak period for the development of depressive disorders (Lewinsohn et al., 1998). An estimated 4.1 million adolescents aged 12 to 17 had at least one major depressive episode. This number represented 17.0% of the U.S. population aged 12 to 17 (National Institute of Mental Health, 2022). Longitudinal studies have estimated that adolescent depression is associated with an increased risk of adult suicide and persistent interpersonal difficulties (Fombonne et al., 2001). Previous studies have established significant negative bidirectional relationships between depression and sleep duration among adolescents (Giannotti et al., 2002; Wang et al., 2021). Poor sleep duration predicts depression in students (Fernandez-Mendoza et al., 2016; Kurtovic and Hnojcik, 2021). Appropriately extended daily sleep duration is essential to prevent adolescent depression (Gangwisch et al., 2010). Depression in adolescents can also significantly affect their sleep duration (Stheneur et al., 2019). Some researchers have found that adolescents with depression experienced more wakefulness, lighter sleep, and more subjective sleep disturbances through meta-analysis of a large volume of literature (Lovato and Gradisar, 2014).

Previous studies have only confirmed the negatively bidirectional relationships between sleep duration and depression in adolescents. Some scholars analyzing sleep duration and depression in adolescents using China Family Panel Studies (CFPS) data have only found that short sleep duration is a risk factor for depression (Zhou et al., 2021). Few studies have confirmed whether sleep deprivation and depression co-occur in adolescence and have a malignant interaction. In addition, the important parent–child and teacher factors affecting sleep duration and depression in adolescents remain unclear. Therefore, this study constructs the structural equation model and the cross-lagged model to be further verified using nationally representative data. We propose the following research hypothesis for the article (Figure 1).

H4: there would be a cross effect between sleep duration and depression.

Theoretical background

Bandura's social cognitive theory (SCT) is also known as triadic reciprocal determinism, which is a triadic reciprocal causal model that illustrates the forming of personal factors (cognitive, affective and biological events), behavioral patterns and environmental events bi-directionally (Bandura, 1999). Environment is a potential determinant of behavior. Children and adolescents experience major journeys of socialization and development at family and school (Pina et al., 2021). The family is an environment that has a direct impact on the development of children and adolescents (Hosokawa and Katsura, 2020). With the increase of age, students spend a lot of time in school learning and activities, and the school has become the second environment for adolescents to learn and live. In this environment, adolescents' social relationships mainly involve their parents, teachers, and peers (Tian et al., 2018). Based on the above theory, this study constructs a hypothetical model in which environmental factors (family environment and school environment) are the main variables influencing adolescents' personal perceptions and thus producing changes in certain behavioral factors to further explore key factors that influence sleep duration and depression in adolescents by using a nationally representative data.

Parent–child factors that influence adolescent sleep duration and depression

Academic self-efficacy is an individual's perceived capability to fulfill academic demands, to manage their own learning activities and to fulfill personal, parental, and teachers' academic expectations (Bandura et al., 1999). In terms of parent–child factors involving individuals and parents, previous study indicated that there was a significant correlation between academic self-efficacy and sleep duration in adolescents (Sook et al., 2020). Specifically, academic self-efficacy improved adolescents' sleep quality (Bae et al., 2020). Regarding depression, academic self-efficacy had proven that it was negatively associated with depressive symptoms (Scott et al., 2008). Academic self-efficacy moderated depression and reduced the prevalence of depression

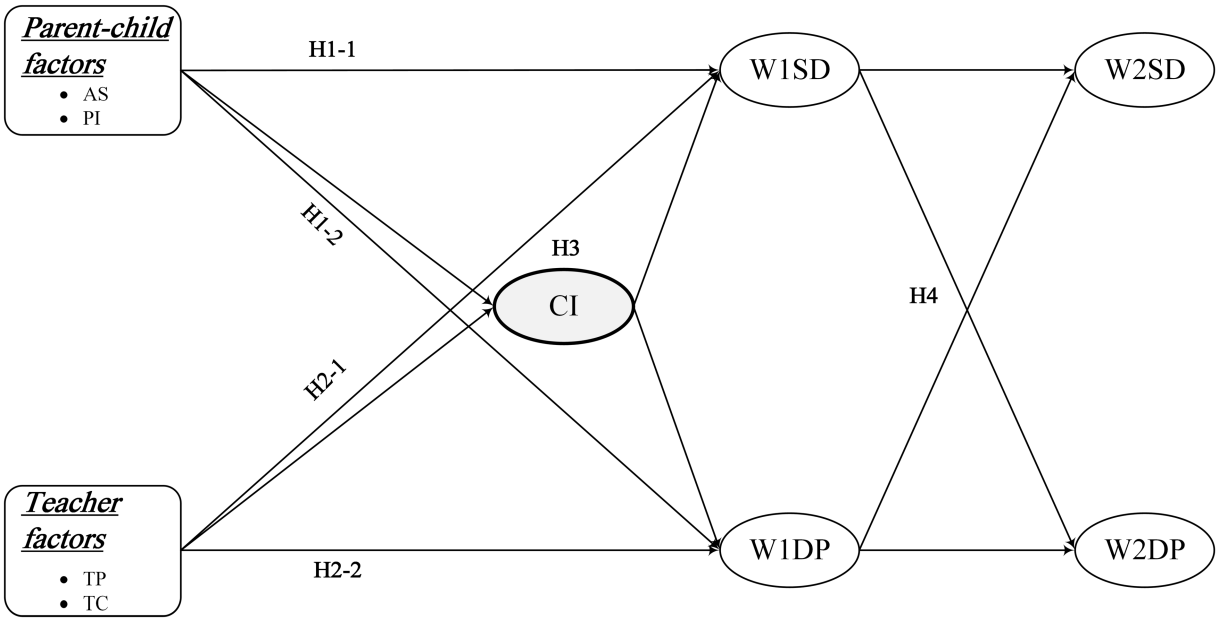


FIGURE 1
Hypothesized model of the research framework. AS, Academic Self-efficacy; PI, Parental Involvement; TP, Teacher Praise; TC, Teacher Criticism; CI, Collective Integration; W1SD, Sleep Duration in 2013–2014; W1DP, Depression in 2013–2014; W2SD, Sleep Duration in 2014–2015; W2DP, Depression in 2014–2015. Hypotheses were that (H1-1) academic self-efficacy and parental involvement would be positively correlated with sleep duration; (H1-2) academic self-efficacy and parental involvement would be negatively correlated with depression; (H2-1) teacher Praise would be positively correlated with sleep duration, whereas teacher criticism would be negatively correlated with sleep duration; (H2-2) Teacher Praise would be negatively correlated with depression, whereas teacher criticism would be positively correlated with depression; (H3) collective integration would mediate the relationships of parent–child factors and teacher factors with sleep duration and depression; and (H4) there would be a cross effect between sleep duration and depression.

in Chinese adolescents (Xiang et al., 2020). Similarly, American scholars emphasize academic self-efficacy directly influenced native depression in adolescents (Scott et al., 2008).

Although adolescents begin to individuate from their families and increase the scope and intensity with peers, they still need the support and approval of their parents (Chen et al., 2006). Parental involvement was found to be associated with sleep functioning in adolescents (Roblyer and Grzywacz, 2015). When the level of parental involvement was lower, adolescents had poorer sleep quality and higher levels of psychological distress (Cousins et al., 2007). A qualitative study in England also highlighted the importance of parental involvement in ensuring adolescents' healthy sleep (Godsell and White, 2019). In addition, parental involvement was closely related to the cognitive, psychological and behavioral development of adolescents (Wu and Li, 2021). Parental involvement has been found to improve adolescents' emotional functioning (Wang and Sheikh-Khalil, 2014). Higher degree of parental involvement and a strong bond between youth and their parents have been found to be associated with a reduced likelihood of youth depression and loneliness (Fröjd et al., 2007). Based on the above, we propose the following research hypotheses (Figure 1).

> ***H1-1***: academic self-efficacy and parental involvement would be positively correlated with sleep duration.

> ***H1-2***: academic self-efficacy and parental involvement would be negatively correlated with depression.

Teacher factors that influence adolescent sleep duration and depression

In terms of teacher factors, teacher praise and criticism are important teacher factors affecting adolescent sleep duration and depression. Positive teacher teaching strategies like teachers praising students contribute to student well-being (Wang and Kuo, 2019). Specifically, teacher praise has a significant positive impact on adolescent mental health (Palsdottir et al., 2012). Teachers use praise can increase adolescent self-esteem, and high self-esteem is a protective factor against depression and contributes to socially desirable behaviors and self-improvement (Baumeister et al., 2003). When teachers use "angry blame" and "ridicule," students have the least emotional pleasure (Wei, 2015). Adolescents are vulnerable to the negative effects of being criticized by their teachers. Teachers use negative remarks frequently create a negative classroom climate and evoke feelings of upset, anxiety, and depression among students (Cadima et al., 2015). Particularly, students who receive teacher criticism are more likely to experience higher levels of depression than their peers (Thompson

et al., 2021). This negative emotional experience caused by teacher criticism affects the sleep quality of teenagers and shortens their sleep time (Delaruelle et al., 2021). According to Bandura's social cognition theory, teacher factors in the school environment are the key influencing factors of students' sleep and emotional experience, so it is necessary to discuss the influence of teacher praise and criticism on students. The hypotheses are established as follows (Figure 1).

> ***H2-1***: Teacher Praise would be positively correlated with sleep duration, whereas teacher criticism would be negatively correlated with sleep duration.

> ***H2-2***: Teacher Praise would be negatively correlated with depression, whereas teacher criticism would be positively correlated with depression.

Collective integration has mediating effects on youngsters' sleep duration and depression

Firstly, the need for human communication increases significantly during adolescence (Gogitsaeva et al., 2019). Adolescents actively seek out peers and groups and approval and inclusion. Teenagers' poor daily interpersonal interactions shape substandard sleep quality and shorter sleep duration (Chiang et al., 2019). Meanwhile, increased feelings of loneliness which means a loss of collective integration predicts greater insomnia and depressive symptoms (Yen et al., 2008; Chu et al., 2019). The study found that negative interpersonal interaction with peers generates higher levels of depression and more harmful emotions (Zimmer-Gembeck et al., 2007). Adolescents' popularity in the collective made an independent contribution to predicting depressive symptoms (Oldenburg and Kerns, 1997).

Secondly, in terms of parent–child factors, lower academic self-efficacy in adolescents is associated with higher social anxiety (Levpuscek and Berce, 2012). Higher social anxiety in adolescents implies lower collective integration. The higher adolescents' academic self-efficacy is, the more integrated they are into the school group and the stronger their sense of belonging is (Arslan and Duru, 2017). Furthermore, a study on the collective integration of Chinese international students showed that the more parents were involved, the less lonely the students felt and the easier it was for them to integrate into the group (Su et al., 2021).

Thirdly, in terms of teacher factors, on the one hand, teacher praise plays a key role in adolescent development by providing emotional support that helps adolescents build and maintain close relationships with family and peers and thus helps them better integrate into the group (Heilat and Seifert, 2019). On the other hand, too much teacher criticism hinders students' sense of security and self-esteem, which further hampers teenagers' collective integration behaviors, such as participating in group activities or communicating with peers and classmates (Cadima et al., 2015). Verbal praise from teachers, rather than reprimands, helps create a predictable, friendly, and safe environment, which helps strengthen students' collective integration (Wilson et al., 2007; Spilt et al., 2016).

Guided by Bandura's social cognitive theory, both parent–child and teacher factors can have an impact on adolescents' sleep duration and depression. Yet few studies have explored the important mediating factors involved. Hence, this study tries to explore the mediating effect of adolescent group inclusion on parent–child factors/teacher factors and sleep duration/depression. The hypotheses are established as follows (Figure 1).

> ***H3***: Collective integration would mediate the relationships of parent-child factors and teacher factors with sleep duration and depression

Materials and methods

Data

Data were obtained from two waves of the China Education Panel Survey (CEPS) which was a nationally representative survey of lower-secondary school students (Grades 7–9) conducted from 2013 to 2015 by the National Survey Research Center at Renmin University of China. In the baseline academic year of 2013–2014, the CEPS recruited a nationally representative sample of junior high school students by multistage probability proportional to the size sampling method. In this project, participants were selected from 112 junior high schools in 28 county-level districts in mainland China. At the first stage, 28 counties/districts were chosen as primary sampling units from 2870 counties/districts with probability proportional to size (PPS). At the second stage, four schools were chosen from each county/district. At the third stage, two classes were randomly selected from the seventh grade, and two classes were randomly selected from the ninth grade in each school. At the fourth stage, all the students from the 438 classes, their parents, and the school personnel from each selected classroom were surveyed as participants. Four rounds of follow-up surveys were conducted from 2014 to 2018, one in each academic year, but currently only two rounds of data (2013–2014 and 2014–2015) are publicly available. Our analysis is therefore based on these two available rounds of data. In order to exclude the possible influence of ninth graders' senior high school entrance examination and promotion to high school on the results during the two waves of follow-up, only 10,279 14-year-old seventh graders were selected for this study. Finally, a total of 8829 students who were successfully followed up for both sleep duration and depression

between the two waves were included in the data analysis (valid sample rate: 85.90%).

Procedure

The study population for the 2013–2014 baseline survey was 10,279 seventh grade students, and all students' questionnaires should be filled out centrally in the school classroom within the specified time, completed and collected in the same classroom. Students who were absent from school for special reasons should take their student questionnaires home to fill them out and collect them in time. In each classroom, the partner should ensure that at least 2 trained surveyors are arranged to complete the on-site survey while cooperating with each other. The majority of 7th grade students in the 2013–2014 baseline survey have normally moved on to 8th in 2014–2015 follow-up survey. For students who have not been placed in a class after moving, they should fill out the questionnaire in the school classroom within the specified time, complete it in the same classroom and collect it all. For students who have been divided into different classes, classroom teachers should be asked to confirm the classes of these students and arrange a suitable time to gather the students together to fill in the questionnaire. For students who were absent from school due to special reasons should take the student questionnaires home to fill out and collect them in time. Before the survey started, the project team actively communicated with the research subjects to clarify the purpose of the study and the research process to them. Finally, participants' written informed consent was obtained by the National Survey Research Center of Renmin University, PR China, and human ethics approval was obtained from Renmin University of China.

The pilot survey of China Education Panel Survey (CEPS) was conducted in 2012 to verify the rationality and feasibility of the study protocol. It was conducted using multi-stage cluster sampling, and the CEPS project team visited the target schools to organize students, parents, and teachers to complete and return the questionnaires on the spot, with a 100% response rate. The pilot survey involved a total of 2306 adolescents, including 1219 boys (52.86%) and 1087 girls.

Measures

Sleep duration

Sleep duration was measured by asking students in wave 1 and wave 2, "How much time on average do you sleep every night."

Depression

The following five items derived from a short version of the Center for Epidemiologic Studies Depression Scale were used to assess students' depression. "Do you have the feelings below in the last 7 days? Feel blue/Depressed/unhappy/Not enjoying life/Sad." Responses ranged from "1 = never" to "5 = always." Depression was measured by asking students in wave 1 and wave 2. The scores for each of the five items were summed to give an overall total score that ranged from 5 to 25. A high score corresponds to a high level of depression. This measurement was used in prior studies with Chinese adolescents and shown to have good reliability (Jiang et al., 2017; Jiang and Dong, 2020). In the present sample, the depression scale had a Cronbach's alpha of 0.85, indicating good reliability.

Academic self-efficacy

Academic self-efficacy scales in this study were adapted from the Aggressiveness Scale (Cai and Wu, 2016). Previous study has also verified its application in the CEPS survey study (Huang, 2018). Students' academic self-efficacy in grade 7 was measured by following four items. And it was investigated in Wave 2, in which students were asked to recall their academic self-efficacy in seventh grade. "How much do you agree with each of the following statements about your experiences in GRADE 7? I would try my best to go to school even if I was not feeling very well or I had other reasons to stay at home/ I would try my best to finish even the homework I dislike/I would try my best to finish my homework, even if it would take me quite a long time/I would persist in my interests and hobbies." Strongly disagree = 1, somewhat disagree = 2, somewhat agree = 3, and strongly agree = 4. The overall total scores ranged from 4 to 16. A higher average score indicated a higher level of academic self-efficacy. In the present sample, the academic self-efficacy scale had a Cronbach's alpha of 0.80, indicating good reliability.

Parental involvement

Parental involvement covers the parenting of children as well as family activities (Yang, 2019). Parental involvement was measured by responses to eight questions in wave 1: "How often do your father/mother discuss the following with you? things happened at school/the relationship between you and your friends/the relationship between you and your teachers/ your worries and troubles." Students' parental involvement scored on a three-point scale (1 = never, 2 = sometimes, 3 = often). A higher average score indicated a higher level of parental involvement. In this study, the parental involvement scale had a Cronbach's alpha of 0.83, indicating good reliability.

Teacher praise

The CEPS uses four self-assessment items to examine students' perceived teacher praise (Jiang et al., 2017). Teacher praise was measured by responses to four prompts in wave 1: "My mathematics teacher always praises me/My Chinese teacher always praises me/My English teacher always praises me/My homeroom teacher always praises me." Each item was scored from strongly disagree = 1, somewhat disagree = 2,

somewhat agree = 3, to strongly agree = 4. A higher value indicating a higher level of teacher praise. The Cronbach's alpha for these items was 0.85, indicating good reliability.

Teacher criticism

Teacher criticism was measured by the following two items in wave 1: "My parents always receive criticism on me from my teacher"; and "My homeroom teacher always criticizes me." Each item was scored from strongly disagree = 1, somewhat disagree = 2, somewhat agree = 3, and strongly agree = 4. A higher value indicating a higher level of teacher criticism. The Cronbach's alpha for these items was 0.60, indicating acceptable reliability.

Mediating variable

In this study, collective integration was hypothesized to play a mediating role between dependent and independent variables. The CEPS explores adolescents' collective integration from the perspective of collective belonging and identity, together with participation in school activities (Huang, 2018). Collective integration was measured by the following three items in wave 1: "Most of my classmates are nice to me"; "I often take part in school/class activities"; and "I feel close to people in this school." Each item was followed by a 4-point scale ranging from "1 = strongly disagree" to "4 = strongly agree." A higher score indicated a higher level of collective integration. The Cronbach's alpha for these items was 0.71, indicating acceptable reliability.

We conducted confirmatory factor analysis (CFA) for the instruments used to measure depression, academic self-efficacy, parental involvement, and teacher praise. The goodness-of-fit index of depression was as follows: (1) chi-square/df = 39.74; (2) RMSEA = 0.065; (3) GFI = 1.00; (4) AGFI = 0.99; (5) TLI = 0.96; and (6) CFI = 0.98. The goodness-of-fit index of academic self-efficacy was as follows: (1) chi-square/df = 59.94; (2) RMSEA = 0.079; (3) GFI = 1.00; (4) AGFI = 0.99; (5) TLI = 0.98; and (6) CFI = 0.99. The goodness-of-fit index of parental involvement was as follows: (1) chi-square/df = 217.68; (2) RMSEA = 0.159; (3) GFI = 0.96; (4) AGFI = 0.93; (5) TLI = 0.86; and (6) CFI = 0.90. The goodness-of-fit index of teacher praise was as follows: (1) chi-square/df = 97.72; (2) RMSEA = 0.102; (3) GFI = 1.00; (4) AGFI = 0.98; (5) TLI = 1.00; and (6) CFI = 0.97. These outcomes indicate that all the instruments have good validity.

Control variables

Several control variables were considered in this study: sex (female = 1, male = 2); live with parents (Yes or No) (live with both parents = 1, only one or neither = 2); and parental highest educational level (primary school or below = 1, junior high school = 2, secondary school/technical school/vocational high school/senior high school = 3, junior college/undergraduate college/graduate and above = 4).

Data analysis

Statistical analyses were performed using SAS version 9.4 (Copyright © SAS Institute Inc., SAS Campus Drive, Cary, North Carolina 27513, United States. All rights reserved), LISREL version 8.80 (Copyright 2006, Scientific Software International Inc., All rights reserved), and R version 4.0.2 (R Foundation, Vienna, Austria). The distributions of the control, independent, mediating, and dependent variables are presented as the frequency distribution and percentages, means and standard deviations by SAS. To examine whether our hypotheses could be empirically supported, structural equation modeling (SEM) was performed with LISREL to analyze our data in two waves. In addition, the estimated indirect effects (IEs) in the output file from LISREL and Monte Carlo resampling with R were used to confirm the significance of the IEs.

Results

Participant characteristics

Descriptive statistics of the sample and mean of variables are presented in Table 1. A total of 8,829 students were selected, including 4,550 boys (51.50%) and 4,279 girls (48.50%). The sex ratio was approximately 1.06:1.

Direct/indirect and mediation effect analysis

Based on the present model, collective integration was added to the structural equation model as a mediating variable in the direct path from parent–child factors (academic self-efficacy/parental involvement) and teacher factors (teacher praise/teacher criticism) to adolescents' sleep duration and depression after controlling for sex, living with parents (Yes or No), and parental highest level of education (Figure 2). According to the smallest and nonsignificant t values, the final model was obtained by deleting LWP → W1SD and AS → W1SD. The final model showed improved overall fit compared to the initial model: Chi-Square/DF = 13.33, RMSEA = 0.040, NFI = 0.93, TLI = 0.93, CFI = 0.94, IFI = 0.94, CN = 647.85, GFI = 0.98, and AGFI = 0.98 (Table 2). The final model is shown in Figure 2.

The pathways from parent–child and teacher factors for sleep duration and depression are presented in Table 3. There was significant direct positive effects of parental involvement and teacher praise on students' sleep duration ($\beta = 0.09$, $p < 0.001$; $\beta = 0.04$, $p < 0.01$). There was a direct negative effects of teacher criticism on students' sleep duration ($\beta = -0.09$, $p < 0.001$). The above results support H1-1 and H2-1. The direct effects of academic self-efficacy, parental involvement and teacher praise on students' depression were negative ($\beta = -0.03$, $p < 0.01$; $\beta = -0.05$,

TABLE 1 Demographic characteristics of participants and descriptive statistics of key variables. (*N* =8829).

Variable	ME	*SD*	*n*#	%
Control variables				
Sex				
Female			4,279	48.50
Male			4,550	51.50
Live with parents (Yes or No)				
Both parents			6,825	77.30
Only one or neither			2,004	22.70
Parental highest education level				
≤Primary school degree			682	7.70
Junior high school degree			3,730	42.20
≤Senior high school degree			2,622	29.70
≥Junior college degree			1,795	20.30
Independent variables				
Academic self-efficacy [1–4]	3.20	0.68		
Parental involvement [1–3]	2.07	0.50		
Teacher praise [1–4]	2.58	0.76		
Teacher criticism [1–4]	1.50	0.65		
Dependent variables				
W1 sleep duration (hours)	8.35	1.09		
W1 depression [1–5]	1.99	0.79		
W2 sleep duration (hours)	8.00	1.07		
W2 depression [1–5]	2.16	0.90		
Mediating variables				
Collective integration [1–4]	3.03	0.73		

ME, Mean; SD, Standard deviation; W1 sleep duration, sleep duration in 2013–2014; W1 depression, depression in 2013–2014; W2 sleep duration, sleep duration in 2014–2015; W2 depression, depression in 2014–2015.
#The total number < *n* = 8829 due to missing.
[]: The range of a single item.

$p < 0.001$; $\beta = -0.03$, $p < 0.05$). The direct effect of teacher criticism on students' depression was significantly positive ($\beta = 0.29$, $p < 0.001$).The above results support H1-2 and H2-2. Collective integration ($\beta = 0.05$, $p < 0.01$) was significantly positively correlated with sleep duration in 2013–2014; in contrast, it ($\beta = -0.28$, $p < 0.001$) was significantly negatively correlated with depression in 2013–2014.

The overall direct effect, indirect effect and total effect of independent variables on adolescent sleep duration and depression were calculated by LISREL and are shown in Table 3. The table indicates that the indirect effect of academic self-efficacy on sleep duration in 2013–2014 was 0.006 [0.11*0.05]; the indirect effect of parental involvement on sleep duration in 2013–2014 was 0.01 [0.21*0.05]; the indirect effect of teacher praise on sleep duration in 2013–2014 was 0.02 [0.33*0.05]; and the indirect effect of teacher criticism on sleep duration in 2013–2014 was −0.003 [(−0.05)*0.05]. The table also indicates that the indirect effect of academic self-efficacy on depression in 2013–2014 was −0.03 [0.11*(−0.28)]; the indirect effect of parental involvement on depression in 2013–2014 was −0.06 [0.21*(−0.28)]; the indirect effect of teacher praise on depression in 2013–2014 was −0.10 [0.33*(−0.28)]; and the indirect effect of teacher criticism on depression emotion in 2013–2014 was 0.01 [(−0.05)*(−0.28)]. In summary, collective integration had significant mediating effects on the relationships between independent and dependent variables (sleep duration/depression). Thus, for the most part, H3 are supported.

To further verify the mediating effects of collective integration, Monte Carlo resampling was used to construct the 95% Confidence Intervals (CIs). Specifically, a program was written in R to construct 95% CIs for the IEs based on 20,000 resamples (Preacher, 2012). According to the results (Table 4), the 95% CI for all indirect effects did not include zero. Therefore, H4 were further supported.

This study evaluated a cross-lagged model in order to reveal a lasting cross-sectional relationship between sleep duration and depression in adolescents. W1SD was positively correlated with W2SD ($\beta = 0.33$, $p < 0.001$), and W1DP was positively correlated with W2DP ($\beta = 0.62$, $p < 0.001$). These results indicated that students' sleep duration and depression have enduring effects. W1SD was negatively correlated with W2DP ($\beta = -0.04$, $p < 0.001$), and W1DP was negatively correlated with W2SD ($\beta = -0.08$, $p < 0.001$), indicating that sleep duration and depression may affect each other persistently; thus, H4 was supported. In this cross-lagged model, first, the synchronous coefficient between sleep duration in 2014–2015 and depression in 2014–2015 was −0.08 ($p < 0.001$). Second, stationarity coefficients were 0.33 ($p < 0.001$) between sleep duration in 2013–2014 and sleep duration in 2014–2015 and 0.62 ($p < 0.001$) between depression in 2013–2014 and depression in 2014–2015. Third, cross-lagged coefficients were − 0.04 ($p < 0.001$) between sleep duration in 2013–2014 and depression in 2014–2015 and − 0.08 ($p < 0.001$) between depression in 2013–2014 and sleep duration in 2014–2015.

Furthermore, in order to explore the causality between sleep duration and depression, we used students without excessive depression/with normal sleep duration in the 2013–2014 baseline survey as study subjects to construct sub-model 1 and sub-model 2, respectively, in Supplementary materials. Firstly,

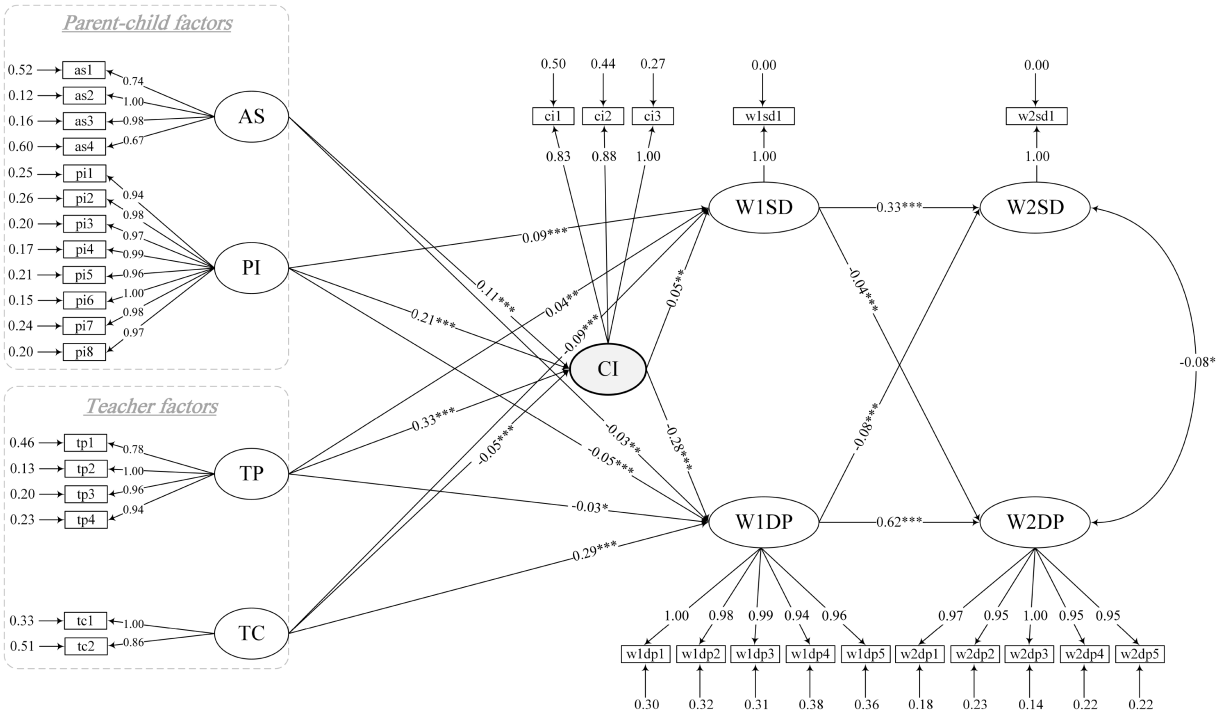


FIGURE 2
Model diagram of the mediating effect of collective integration on sleep duration and depression among adolescents. In this model, sex, live with parents (Yes or No), and parental highest education level are taken as control variables. AS, Academic self-efficacy; PI, Parental involvement; TP, Teacher praise; TC, Teacher criticism; CI, Collective integration; W1SD, Sleep duration in2013-2014; W1DP, Depression in 2013–2014; W2SD, Sleep duration in 2014–2015; W2DP, Depression in 2014–2015. *p<0.05, **p <0.01, ***p <0.001.

TABLE 2 Measures of goodness-of-fit for the competition models.

	Chi-square/DF	RMSEA	NFI	TLI	CFI	IFI	CN	GFI	AGFI
Initial model	7356.30/550	0.041	0.93	0.93	0.94	0.94	645.71	0.98	0.98
Delete	7356.51/551	0.041	0.93	0.93	0.94	0.94	646.79	0.98	0.98
LWP → W1SD									
[#]Delete AS → W1SD	7356.85/552	0.040	0.93	0.93	0.94	0.94	647.85	0.98	0.98

LWP, live with parents (Yes or No); W1SD, sleep duration in 2013–2014; AS, academic self-efficacy.
[#]The goodness-of-fit of the Final model.

the depression scale consisted five questions and responses ranging from "1 = never" to "5 = always." The scores were summed to give an overall total score that ranged from 5 to 25. Strictly speaking, students with a total score of no less than 20 were considered to have excessive depressive emotion. After exclusion, the remaining 8738 individuals were used as study subjects in sub-model 1 (Figure 1 in Supplementary material). The final sub-model 1 using adolescents without depression showed improved overall fit: Chi-Square/DF = 13.03, RMSEA = 0.040, NFI = 0.93, TLI = 0.93, CFI = 0.94, IFI = 0.94, CN = 655.91, GFI = 0.98, and AGFI = 0.98 (Table 1 in Supplementary material). Secondly, according to the National Sleep Foundation (NSF), adolescents need to sleep no less than 8 h per day. And in China, middle school students are required to take a two-hour lunch break every day, so they should sleep at least 6 h per night. Based on this, the study individuals with less than 6 h of sleep per night were excluded, and the remaining 8773 individuals were used as the study subjects in sub-model 2 (Figure 2 in Supplementary material). The final sub-model 2 using adolescents with normal sleep duration showed improved overall fit: Chi-Square/DF = 13.10, RMSEA = 0.040, NFI = 0.93, TLI = 0.93, CFI = 0.94, IFI = 0.94, CN = 655.29, GFI = 0.98, and AGFI = 0.98 (Table 2 in Supplementary material). The results showed that sleep duration and depression in adolescents were causally related to each other. Among adolescents without excessive depressive emotion, sleep duration in the wave 1 can directly and negatively affect depression in the second year ($\beta = -0.03$, $p < 0.001$); meanwhile sleep duration in the wave 1 can directly have a greater positive impact on sleep duration in the second year ($\beta = 0.39$, $p < 0.001$). And there was a correlation

TABLE 3 Descriptive statistics for the direct effect, indirect effect and total effect of the critical Parent–child/teacher factors, and mediating variable on adolescents sleep duration and depression.

	W1SD			W1DP			W2SD			W2DP		
	DE	IE	TE[a]	DE	IE	TE[a]	DE	IE	TE[a]	DE	IE	TE[a]
Parent–child												
AS	––	0.006**	0.006**	−0.030**	−0.030**	−0.060***	––	0.010**	0.010**	––	−0.040***	−0.040***
PI	0.090***	0.010*	0.100***	−0.050***	−0.060***	−0.110***	––	0.040***	0.040***	––	−0.070***	−0.070***
Teacher												
TP	0.040**	0.020**	0.060***	−0.030*	−0.100***	−0.130***	––	0.030***	0.030***	––	−0.080***	−0.080***
TC	−0.090***	−0.003*	−0.093***	0.290***	0.010**	0.300***	––	−0.060***	−0.060***	––	0.190***	0.190***
Mediating variables												
CI	0.050**	––	0.050**	−0.280***	––	−0.280***	––	0.040***	0.040***	––	−0.170***	−0.170***

AS, Academic self-efficacy; PI parental involvement, TP Teacher praise, TC Teacher criticism, CI Collective integration, W1SD Sleep duration in 2013–2014, W1DP Depression in 2013–2014, W2SD Sleep duration in 2014–2015, W2DP Depression in 2014–2015, DE Direct effect, IE Indirect effect, TE Total effect; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
[a]The total effect refers to the value of the output result of the model, and part of it is slightly different from the total value of the direct and indirect effects due to rounding.

TABLE 4 Tests of indirect effects of collective integration in the hypothesized model by Monte Carlo approach of resampling (total sample, n =8829).

Path	Indirect effect[a]	95%CI[a]
AS → CI → W1SD	0.009	[0.0017, 0.0095]
PI → CI → W1SD	0.010	[0.0034, 0.0176]
TP → CI → W1SD	0.020	[0.0054, 0.0275]
TC → CI → W1SD	−0.003	[−0.0053, −0.0004]
AS → CI → W1DP	−0.030	[−0.0389, −0.0233]
PI → CI → W1DP	−0.060	[−0.0692, −0.0493]
TP → CI → W1DP	−0.100	[−0.1072, −0.0786]
TC → CI → W1DP	0.010	[0.0040, 0.0239]

AS, Academic self-efficacy; PI, Parental involvement; TP, Teacher praise; TC, Teacher criticism; CI, Collective integration; W1SD, Sleep duration in 2013–2014; W1DP, Depression in 2013–2014.
[a]The total effect refers to the value of the output result of the model, and part of it is slightly different from the total value of the direct and indirect effects due to rounding.

between sleep duration and depression in the same year, with synchronous coefficients of −0. 09, p <0. 001 (Figure 1 in Supplementary material). In adolescents with normal sleep duration, depression in the wave 1 could directly affect the sleep duration in the wave 2 negatively (β = −0. 08, p <0. 001); depression in the wave 1 largely had a greater positive effect on depression in the wave 2 (β = 0. 61, p <0. 001). And there was a correlation between sleep duration and depression in the same year, with synchronous coefficients of −0.08, p <0.001 (Figure 2 in Supplementary material).

Discussion

In this study, a mediating model was used to test the mediating effects of collective integration and the direct effect of some parent–child and teacher factors on students' sleep duration and depression. Additionally, the results showed that sleep duration and depression may be cross affected by each other and have enduring effects. On this basis, some suggestions are given to protect students from poor sleep duration and depression.

Sleep duration and depression may affect each other and have enduring effects

Previous cross-sectional studies have confirmed a negative association between sleep duration and depression in adolescents (Yang and Cha, 2018; Stheneur et al., 2019). However, the continuous interaction between sleep duration and depression has rarely been explored. Our cross-lagged model in this study further showed that sleep duration and depression among adolescents may interact with each other and have enduring effects. First, adolescents' sleep duration and depressive had a positive auto-regressive effect, respectively. Second, adolescents' sleep duration in the previous year was a causal predictor of depression in the next year. Similarly, adolescents' depression in the previous year was a causal predictor of sleep duration in the next year. Third, there was a negative correlation between sleep duration and depression in the same year. Besides, innovative findings of this study were the lasting effects and interactions produced by depression in adolescents are stronger than those produced by sleep duration. Therefore, only early prevention and treatment of depression and improvement in sleep quality can effectively stop further deterioration of the situation. In the context of the post-epidemic era with rapid development of digital technology, the emotional management of adolescents should be paid more attention to (Ribeiro-Navarrete et al., 2021; Saura et al., 2022). As Stheneur et al. (2019) suggested, qualitative and quantitative assessments of sleep should be included in adolescents' physical examination, and a psychological assessment scale for depression should be administered for early detection, prevention and treatment.

Collective integration plays a crucial mediating role in adolescents' sleep duration and depression

A study found that adolescents with external manifestations such as mood disorders or social isolation were often had symptoms of insomnia or short sleep duration and depression (Fernandez-Mendoza et al., 2016). Social isolation may be a unique risk factor for depression in early adolescence (Richardson et al., 2019). Isolated adolescents do not get along well with their peers at school, which is what we call poor collective integration. Higher isolation was associated with higher frequency of difficulties sleeping, greater sleep disturbance and more instances of feeling tired in the morning (Eccles et al., 2020). This study has found that collective integration plays an important mediating role in the relationship between parent–child/teacher factors and sleep duration/depression among adolescents. The more well integrated adolescents are, the longer they sleep. Further, the less able they are to integrate into a group and get along well with classmates, the stronger the depression. Additionally, the effect of collective integration on teenagers' depression is greater than that of teenagers' sleep duration. Thus, enhanced collective integration may be an effective modifiable protective factor in the prevention of adolescent depression. Enhanced collective integration is also a highly effective approach in ensuring that adolescents receive adequate sleep. The results of this study also showed that academic self-efficacy, parental involvement, and teacher praise/criticism all had direct effects on adolescents' collective integration. In particular, parental involvement and teacher praise had the strongest effects on collective integration. Therefore, we suggest that parents should actively communicate with their children, express their concerns and interests in their school life, be understanding and provide advice when adolescents encounter difficulties and challenges. Parents should be role models and encourage youth to leave the house and integrate courageously into peer groups and society. Additionally, we recommend that teachers adopt an encouraging approach to adolescents and reduce the criticism that undermines their self-confidence, especially in front of the whole class. Teachers should be kind and use words of praise to encourage high self-esteem, rather than harsh public accusations and comparisons that discourage self-esteem.

Compared with teacher praise, teacher criticism has stronger negative effects on youth sleep duration and depression

Teachers guide students and are the most frequent, direct, and authoritative role models for them. Teacher praise and reprimands can be tools to potentially influence student behavior and classroom behavior (Sabey et al., 2019) Teacher praise and criticism are very important and plastic classroom management strategies that play an important role in behavioral intervention and emotion regulation (Spilt et al., 2016; Wills et al., 2021; Zoromski et al., 2021). Compliments can significantly improve interpersonal interactions for adolescents, even for those who lack social skills, and praise can be a good motivator for them to integrate and interact with others (Berner et al., 2001). Most adolescents report that their school life is happiest and most relaxed when they are on good terms with their friends and when they receive praise from their teachers (Wills et al., 2021). We found that both teacher praise and criticism produced direct effects on adolescents' sleep duration and depression. However, teacher criticism produced a stronger negative effect than teacher praise. Smith et al. (2009) also found that self-reported depression symptoms in late adolescence are associated with teacher criticism. Numerous studies have examined the association between parental praise and youth depression (Butterfield et al., 2021; Gadassi-Polack et al., 2021). However, few studies have been conducted to verify the effect of teacher praise on adolescent depression. This study fills that gap. Teachers who guide adolescent development should engage in positive, equal communication with students. The simplest and easiest approach is to increase teacher praise and decrease teacher criticism. It is especially important to note that teacher criticism can more stronger negatively contribute to adolescent mental health, such as sleep problems and depression. Furthermore, teachers' critical approach to education is more likely to provoke rebellion in adolescent students, which is counterproductive.

Major manifestations of academic self-efficacy and teacher praise/criticism in the eyes of adolescents

According to λ values ($\lambda > 0.85$) in the structural equation model, we found that students' academic self-efficacy was expressed in response to two main prompts: (1) I would try my best to finish my homework, even if it would take me quite a long time ($\lambda = 0.98$); (2) I would try my best to finish even the homework I dislike ($\lambda = 1.00$). The results of this study found that increasing adolescents' academic self-efficacy must first increase adolescents' self-motivation and incentive to complete difficult or disagreeable homework. Moreover, regarding teacher praise, the main influence of teacher praise on students comes from Chinese teacher praise ($\lambda = 1.00$), English teacher praise ($\lambda = 0.96$), and homeroom teacher praise ($\lambda = 0.94$). Teachers' criticism has a negative impact on students mainly because teachers share this criticism with parents ($\lambda = 1.00$), followed by the direct impact of the criticism on the students ($\lambda = 0.86$). These findings can be applied to improve the collective integration, sleep quality or duration, and depression of adolescents. On the one hand, positive praise from Chinese teachers, English teachers, and homeroom teachers is more effective. On the other hand, when students make mistakes, teachers' criticism of students should be accomplished face to face with students instead of informing students' parents

in order to protecting the students' mental health, except in the event of serious problems.

Theoretical implications

In Bandura's social cognitive theory (Bandura, 1986), there are interactions between personal factors (e.g., cognitions, feelings, skills), behavioral factors (e.g., strategy use, help-seeking actions), and environmental factors (e.g., classrooms, homes, work environments), through the concept of triadic reciprocal causality, all of which affect the individual's functioning (Usher and Schunk, 2018). Based on the above theoretical foundation, a clear causal relationship between environmental factors and personal/behavioral factors was found through our research model, while there were interaction effects between personal and behavioral factors. Adolescents' environmental factors, especially family environment (parental involvement) and school environment (teacher praise/criticism), will influence adolescents' collective integration. Poor collective integration will eventually be reflected in adolescents' behavioral problems and emotional problems.

Practical implications

In this paper, we applied the cross-lagged model to a large follow-up survey of Chinese adolescents to demonstrate that sleep duration and depression co-occur in adolescence, producing vicious interactions. Besides, this study found that the lasting effects and interactions produced by depression in adolescents are stronger than those produced by sleep duration. Therefore, in order to protect the mental health of adolescents, mediating depression in adolescents takes precedence over extending their sleep duration. This is of particular relevance to parents and schools concerned with adolescents. This study also emphasizes the importance of collective integration of middle school students during adolescence. Also, parents or teachers can have plus or minus effects on students' group inclusion. For example, parental advice and support as well as teacher praise becomes crucial to collective integration of adolescents.

Strengths and limitations

The main strength of this study is that it is a large nationally representative survey of adolescents, which allowed us to explore the factors that influence adolescents' sleep duration and depression. However, this study has several limitations. First, although two waves of CEPS data in this longitudinal study were applied to confirm the enduring interaction between adolescent sleep duration and depression, the time interval between the first and second waves was rather short (1 year). Additional waves could be pursued in the future to elucidate clear long-term effects between adolescent sleep duration and depression. Second, we adopted adolescent self-reported data to measure the variables, which may influence the validity of our findings due to social desirability bias. Future consideration is given to utilizing information from multiple sources, such as parents and teachers.

Conclusion

In conclusion, this study reports the mediating role of collective integration in the relationships between academic self-efficacy/parental involvement, teacher praise/teacher criticism, and adolescents' sleep duration and depression by constructing a structural equation model. This study empirically verified that adolescent sleep duration and depression could affect each other and have enduring effects through a two-wave cross-lagged model. In addition, teacher criticism had a greater negative impact on adolescents' sleep duration and depression than the positive impact of teacher praise. These results suggest that adolescents' sleep duration in the previous year was a causal predictor of depression in the next year. Similarly, adolescents' depression in the previous year was a causal predictor of sleep duration in the next year. The lasting effects and interactions produced by depression in adolescents are stronger than those produced by sleep duration. Collective integration was an important mediator of sleep duration and depression, and improving it may be an effective way to increasing sleep duration and reduce the level of depression. Additionally, to prevent sleep deprivation and depression and to improve the collective integration of adolescents, teacher praise needs to be increased and teacher criticism must to be reduced. The predictive power of the model should be further tested using more waves of data. And future research is given to utilizing information from multiple sources in order to avoid social desirability bias, such as parents and teachers.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary materials, further inquiries can be directed to the corresponding authors.

Ethics statement

Procedures were approved by the Institutional Review Board in the Renmin University of China. All procedures were performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

MG and XL were major contributors in study design, data analysis and interpretation, and drafted the manuscript. C-YL, TC, and Y-CC have made major modifications and improvements to the manuscript. SZ and Y-CC supervised the study and critically reviewed the manuscript several times. HM was contributed in literature review. TC provides funding acquisition. All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1015089/full#supplementary-material

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The gap and two-level differentiation in kindergarten education funding groups in China

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This paper examines the disparity in kindergarten education funding between different groups from 2012 to 2018 through the Gini coefficient and decomposition techniques. The results show that: the Gini coefficient of inter-provincial kindergarten education funding increased from 0.2320 in 2012 to 0.2329 in 2018 during the observation period; the Gini coefficients between urban and rural areas and between regions are smaller than those between provinces, but it is noteworthy that the Gini coefficient between urban and rural areas is growing faster; the gap at this stage mainly comes from the internal gap between the two items of state financial education funding and career income. The internal disparity between urban and rural areas and between regions also contributes significantly to the overall disparity; there is no obvious polarisation in kindergarten education funding. Combined with the analysis results, the following recommendations are made: increase the investment in education funds, gradually reduce the proportion of school fee income in career income, financial resources should be tilted toward kindergartens in regions with relatively slow economic development, and financial resources should be appropriately distributed between public and private kindergartens.

KEYWORDS

kindergarten, education funding, Gini coefficient, polarization, gap

Introduction

China regards the development of education as a basic national policy, vigorously implements the strategy of rejuvenating the country through science and education and strengthening the country through talents, and strives to build a powerful country of human capital. From a social perspective, education can not only distribute economic welfare to the whole society but also narrow the socioeconomic gap and maintain social cohesion (Stucke, 2013). In the 14th Five Year Plan and the proposal for the long-term goal of 2035, the Communist Party of China points out that in the future, it is necessary to build a high-quality education system, promote educational equity, and the balanced development of compulsory education. Scholars mainly study educational equity by studying the allocation of human resources, material resources, and financial resources. Both human resources and material resources are based on financial resources (Ye and Zhou, 2017). Without the guarantee of education funds, there will be no high-quality human resources and material resources. As the material basis of school development, the balanced development of education funds can promote educational equity (Chang, 2015). Kindergarten education[1] is the basis of China's compulsory education and is highly profitable. Kindergarten education funds can enhance the accumulation of human capital and increase the contribution of human capital income (Cai et al., 2022). However, the Ministry of Education of China points out that kindergarten education is the weakest link in the process of the modernization of national education, and the problem of an unbalanced resource supply is quite obvious (Liu and Wu, 2021). If the gaps in education funding between different groups are too large, it will not be conducive to the balanced development of kindergarten education, and it will affect the quality of talent training among groups and harm China's construction of a powerful human capital country. Therefore, it is of practical significance to analyze the education funding gap in China's kindergartens.

Through literature review, it is found that since 2010, the fair distribution of kindergarten education funds has been widely concerned by scholars. Although government investment is the main source of kindergarten education funds (Jane and Anne, 2018), it is relatively limited and cannot support the vigorous development of kindergarten education (Wang, 2013). Moreover, it is allocated disproportionately between groups. This disproportion does not only exist among groups (inter-provincial, urban and rural, and regional) but also within groups (Song, 2011; Li et al., 2015; Wu, 2015; Zhao and Zhao, 2018; Lai and Chen, 2021). Scholars have found that the level of economic development is the main reason for the disproportion between regions. Areas with strong financial resources have relatively adequate investments (Liu and Wu, 2021). In addition, the different emphases of government investment in education are also a reason for the gap. The government investment in education is tilted toward urban public kindergartens, while private kindergartens have relatively insufficient investments (Liu, 2019).

From the perspective of research methods, scholars used various methods such as the Theil coefficient, Gini coefficient, and efficiency coefficient to study the gap in education funds between different groups in China's compulsory education before 2016, and found through econometric models that the size of students, industrial structure, local financial capacity, economic development level, and other factors have a significant impact on the gap in education funds (Yao and Xu, 2016; Wang and Yan, 2017; Zhao and Liu, 2017; Zheng and Yue, 2017; Zhou et al., 2019; Geng, 2020). In addition, scholars also studied the improvement of educational quality (Yang and Li, 2015; Liu et al., 2021) and teacher training (Zhang and Guan, 2019; Liu and Zheng, 2021) in kindergartens; Some scholars also discussed the kindergarten rating system (Wu, 2021), access to education (Huang and Chen, 2014), equalization of education services (Zhuang and Zhu, 2018) and other issues from the perspective of equity. Scholars pointed out that the biggest influencing factor in these problems is how to rationally allocate education funds among regions.

To sum up, most of the current studies focus on the gaps in education funds from government investment, lacking comprehensive discussion of other sources, and the data are mostly from the years before 2016. It is also found that although the Gini coefficient has already been used in previous studies, it is insufficient to describe the gap in education funds only by using the Gini coefficient. Due to the complexity of the sources of education funds, it is also necessary to find the internal factors that affect the gap in education funds. Only by finding the internal factors, can we fundamentally overcome the weaknesses, effectively lessen the adverse effects caused by the widening gap, and optimize the distribution system of kindergarten education funds.

Because of this, this paper uses the Gini coefficient and decomposition technology to study the investment in China's kindergarten education from 2012 to 2018, focusing on the following issues: (1) what is the current situation and trend of the gap in China's kindergarten education investment? (2) what are the key factors that affect the gaps between investments in provincial, regional, urban and rural kindergartens? (3) is there a polarization in kindergarten education funding? and (4) how to

1 In 2016, the Ministry of Education of the People's Republic of China published the Work Rules for Kindergartens, which stipulates that the school-age children in kindergartens are generally 3–6years old, and the school system is 3years. Kindergarten education is an important part of basic education and the basic stage of school education system. The main task of kindergarten education is to implement the national education policy, follow the principle of combining care with education, follow the characteristics and laws of children's physical and mental development, implement all-round education in moral, intellectual, physical and esthetic aspects, and promote the harmonious development of children's physical and mental health.

optimize the current distribution system of kindergarten education funds?

The main contributions of this paper are as follows: First, it expands the research scope of the gap in education funding. Most of the existing literature focuses on government investment in education funds. This paper analyzes the gap between groups with different sources of education funds. Second, it expands the research methods of the gap in educational funds investment. Most of the existing studies apply the Thiel coefficient, efficacy coefficient, and econometric model. Although the Gini coefficient is also used, the gap is measured only by calculating the Gini coefficient. This paper comprehensively uses a variety of Gini coefficient decomposition techniques, calculates the polarization index to study the gap in kindergarten education funding investment, which can clarify the impact of different internal factors on the overall gap, and reveals the internal factors affecting the gap in education funding. It is expected to provide a methodological reference for the research on the gap in educational investment in other stages. Third, it provides some inspiration for improving the distribution system of educational funds in the stage of kindergarten and promoting the fairness of the allocation of financial resources in kindergarten education. This paper determines the extent to which different internal factors exert their impact on the gap in education funding, and puts forward some pertinent suggestions based on the research results, which can help the government create more effective policies.

Sources of education funding data and research methods

Selection of data

The basic data of this paper are from the *China Educational Finance Statistical Yearbook and the Educational Statistics Yearbook of China*. Since the content of the data of "general public budget education funds" has been changed from 2012, this paper selects the annual data of kindergarten education funds in 31 provinces, autonomous regions, and municipalities from 2012 to 2018 in *the China Educational Finance Statistical Yearbook*. According to sources, the total amount of education funds in different provinces and autonomous regions can be divided into national financial education funds, input from the founders of private schools, donations, and other education funds. The national financial education funds are composed of three parts: education funds arranged in the general public finance budget, education funds arranged in the government fund budget, and appropriations from state-owned and state-owned holding enterprises founding schools. Within the province, there are urban kindergartens and rural kindergartens. The number of students in different types of kindergartens comes from the *Educational Statistics Yearbook of China*. The education expenditure per student is the sum of the education expenditure of different types of kindergartens divided by the number of students in kindergartens.

Methods of measuring gaps

In this paper, the Gini coefficient is used to measure the gap between different groups in kindergarten education funding, mainly because the Gini coefficient is widely used to measure the degree of inequality between groups. Moreover, with the advancement of the decomposition technology of the Gini coefficient, this paper can also use it to analyze the main factors affecting the gap in education funding between groups. The specific calculation method is as follows:

Calculation methods for different types of Gini coefficients

The formula for calculating the Gini coefficient for education funding between different groups is as follows:

$$G_{edu} = \frac{1}{2n^2\mu}\sum_{i=1}^{N}\sum_{j=1}^{N}\left|a\omega_{edu,i} - a\omega_{edu,j}\right| \quad (1)$$

In the formula, represents sents the Gini coefficient of the average education funding between groups, n represents the number of students in each group, N represents the number of groups, μ represents the overall capital education funding and $a\omega_{edu,i}$ and $a\omega_{edu,j}$ represent the average education funding of the ith and jth groups, respectively. This formula is used in the calculation of the Gini coefficient between provinces, within regions, between regions, and between urban and rural areas.

The contribution of internal gaps from different sources to the gap between groups and the incremental decomposition of gaps between groups

To better analyze the impact of different sources of education funding on the income gap between groups, the Gini coefficient of inter-group education funding can be decomposed according to the structure of income sources using the following formula:

$$G_{edu} = \sum_{m=1}^{X}\theta_m G_m' = \sum_{m=1}^{X}\theta_m R_m G_m \quad (2)$$

G_{edu} represents the Gini coefficient for inter-group education funding, G_m' represents the concentration index of education funding for the mth source, i.e., the pseudo-Gini coefficient; θ_m indicates the proportion of education funding from the mth source in total education funding, and X indicates

the number of specific sources of income from a certain education funding. This formula is used to decompose the total income source of education funds and the source of financial education funding income.

R_m refers to the Gini Correlation Coefficient proposed by Lerman and Yitzhaki (1985). Taking interprovincial as an example, this paper studies 31 provincial units, so q = (1, 2,…,31), then the education funding of the mth source of the qth provincial unit is y_{qm}.

$$R_m = \frac{\sum_{q=1}^{31}\left(q - \frac{31+1}{2}\right)y_{qm}}{\sum_{q'=1}^{31}\left(q' - \frac{31+1}{2}\right)y_{q'm}} = \frac{\mathrm{cov}(\mathrm{y_m},\ \mathrm{q})}{\mathrm{cov}(\mathrm{y_m},\ \mathrm{q}')} \tag{3}$$

Then, the contribution of the internal gap in education funding from the mth source to the gap in education funding between groups can be expressed as $\frac{\theta_m G_m'}{G_{edu}}$.

Decomposition of the increment of the Gini coefficient between groups by the average education expenditure of students, the ranking of groups, and the student share

This analysis method was proposed by Chotikapanish and Griffiths, and improved by Hong, and this paper uses the improved method to decompose the increment of the Gini coefficient of inter-group education funding in 2012–2018 according to the education funding, group ranking, and student share of each group (Chotikapanish and Griffiths, 2001; Hong and Li, 2006). The formula is as follows:

$$\Delta G = \Delta W + \Delta Q + \Delta P \tag{4}$$

In this formula, ΔW represents the change in the Gini coefficient caused by the change in education funding of each group under the fixed base period level of the group ranking and the student share; ΔQ indicates the change in the Gini coefficient due to changes in the ranking of groups due to the increase in education funding for each group; ΔP represents the change in the Gini coefficient caused by the change in student share caused by the change in education funding and inter-group ranking of each group fixed at the base period level.

Decomposition of inter-group Gini coefficients by different regions

Regarding the Gini coefficient group decomposition method, Scholars such as Mookherjee and Shorrocks (1982), Shorrocks (1984), and Yao (1997) have conducted in-depth explorations, and this paper will carry out multigroup decomposition under eight comprehensive economic zones.[2] The decomposition formula is as follows:

$$G_{edu} = G_g + \sum_{j=1}^{M}\theta_j P_j G_\mathrm{j} + G(f) \tag{5}$$

In this formula, G_g represents the Gini coefficient between regions, θ_j is the proportion of education funding in the group j to the total education expenditure, P_j is the proportion of the number of students in the group j to the total student data, G_j represents the Gini coefficient within the j group, and G(f) is the cross term. The meaning of the cross item refers to the degree of overlap in the distribution of education funding income between each group, and if there is no overlap at all, the cross item is 0.

A method of measuring the polarization of education funding

Aiming at the two-level differentiation of education revenue, this paper uses the following formula to measure (Hong and Li, 2007):

$$W = \frac{2a(G_B - G_W)}{b} \tag{6}$$

In the formula, a and b are, respectively, the arithmetic average and median of education funding in 31 provinces, autonomous regions, and municipalities directly under the Central Government; G_W is the weighted average of the Gini coefficient within the province, reflecting the contribution of the gap in the province to the overall gap; and G_B is the Gini coefficient calculated by the average expenditure of each province and it reflects the contribution of the inter-provincial gap to the overall gap.

2 With reference to the Strategy and Policy for Coordinated Regional Development issued by the Development Research Center of the State Council, this study divides 31 provinces, municipalities and autonomous regions into eight comprehensive economic zones in four major sectors, namely, the Northeast Comprehensive Economic Zone (Liaoning, Jilin, Heilongjiang), the Northern Coastal Comprehensive Economic Zone (Beijing, Tianjin, Hebei, Shandong), the Eastern Coastal Comprehensive Economic Zone (Guangdong, Fujian, Hainan) Southern Coastal Comprehensive Economic Zone (Shanghai, Jiangsu, Zhejiang), Middle Yellow River Comprehensive Economic Zone (Shaanxi, Gansu, Ningxia, Shanxi, Henan), Middle Yangtze River Comprehensive Economic Zone (Sichuan, Chongqing, Hubei, Hunan, Anhui, Jiangxi), Great Southwest Comprehensive Economic Zone (Guangxi, Guizhou, Yunnan, Xizang) The Greater Northwest Comprehensive Economic Zone (Xinjiang, Qinghai, Inner Mongolia) (hereinafter referred to as the Northeast, the northern coast, the eastern coast, the southern coast, the middle reaches of the Yellow River, the middle reaches of the Yangtze River, the southwest, and the northwest respectively).

The overall situation of kindergarten education funds in China

Table 1 reflects the average education funding for kindergarten students in China. It can be seen that since the implementation of the Kindergarten Education Action Plan in 2011, with the strong support of the central and local governments at all levels, the average education funding of kindergarten students in China has increased significantly during the study period. The average education expenditure of students increased from 4080.37 yuan in 2012 to 7886.77 yuan in 2018. It can be seen from the growth rate of the total investment that the total investment in 2012 increased by 37.18% compared with 2011, which is related to the target of 4% of the gross domestic product in 2012 in the "Twelfth Five-Year Plan" formulated by China in 2011. The growth rate from 2013 to 2019 remained around 11.61%.

Table 2 reflects the proportion of income from different sources of kindergartens in their education funding. On average, about 47.81% of the education funding of kindergartens in China comes from the state's financial appropriations; 48.46% comes from undertaking revenue, and 95% of undertaking revenue is tuition fees, and this proportion exhibits an upward trend year by year. In other words, a large part of China's kindergarten education revenue relies on tuition fees, which also explains why kindergarten tuition fees have generally been so high in recent years that in some areas they are even higher than university tuition fees.

Gini coefficient and decomposition of intergroup kindergarten education funding

Gini coefficient and change trend of kindergarten education funding between groups

To reflect the gap between different groups of kindergarten education funds, this paper calculates the Gini coefficient of kindergarten education funds between different groups from 2012 to 2018 according to formula (1), and the results are shown in Table 3. The Gini coefficient for interprovincial kindergarten education funding fluctuated little during the study period, but there was a slow upward trend from 2016 to 2018—it rose from 0.2298 in 2016 to 0.2329 in 2018. The Gini coefficient for urban and rural kindergarten education funding increased by 98.39% during the study period. Only 0.0994 in 2012, it increased year by year, reaching a peak of 0.2032 in 2017, and then dropped to 0.1972 in 2018. The Gini coefficient for interregional funding for kindergarten education declined in fluctuations, with a maximum of 0.2486 in 2014 and a minimum of 0.1596 in 2016.

From the Gini coefficient of education funding between different groups, the gap between provinces is the most significant. Therefore, the next part of this paper will explore the influencing factors that cause the gap in inter-provincial education funding income, starting from the different sources of education funding.

Gini coefficients of different sources of kindergarten education funding and their contribution to the overall gap

Gini coefficient for different sources of kindergarten education funding

According to formula (1), the internal Gini coefficient of different sources of inter-provincial kindergarten education funding can be calculated, and the results are shown in Table 4. Overall, among the sources of income of kindergartens, the largest inter-provincial gap lies in donation income. The average Gini coefficient was 0.5752; the maximum value was 0.6345 in 2015, and then it declined year by year. The main reason for the excessive value of the project is that the *per capita* value of the project in Beijing, Guangdong, and Chongqing is much higher than that of other provinces. The project with the smallest inter-provincial gap is career income—the maximum value does not exceed 0.2500, which is the smallest gap among the five projects. The gap between other education funding projects is also relatively large, except for in 2012; the rest of the years saw a Gini coefficient higher than 0.5000. The gap between the national financial education funding and the investment of the founders in private schools is relatively small, but overall, it shows an upward trend in fluctuations.

The contribution to the overall gap made by kindergarten education funding of different sources

To study the extent to which different sources of education funding affect the overall gap, this paper calculates the contribution of the internal gap of different sources of education funding to the overall gap according to formula (2), and the results are shown in Table 5.

On the whole, the contribution rate of the internal gap in the national financial education funding project to the overall

TABLE 1 Average education expenditure and its growth of kindergarten students.

	2012	2013	2014	2015	2016	2017	2018
Education per student expenditure	4080.37	4513.98	5057.77	5690.13	6351.66	7078.16	7886.77
Growth rate	37.18%	10.63%	12.05%	12.50%	11.63%	11.44%	11.42%

China Educational Finance Statistical Yearbook and Educational Statistics Yearbook of China, the same below.

TABLE 2 Proportion of different sources of kindergarten education funding.

	State financial expenditure on education	Undertaking revenue	The investment made in private schools by their founders	Other education funding	Donation income
2012	49.71%	45.54%	2.68%	1.78%	0.28%
2013	49.05%	46.66%	2.28%	1.84%	0.17%
2014	45.59%	50.65%	2.03%	1.62%	0.12%
2015	46.68%	49.86%	1.95%	1.39%	0.12%
2016	47.30%	49.38%	1.81%	1.39%	0.11%
2017	48.02%	48.74%	1.76%	1.38%	0.09%
2018	48.30%	48.41%	1.83%	1.38%	0.07%

TABLE 3 Gini coefficient for intergroup funding for kindergarten education.

	2012	2013	2014	2015	2016	2017	2018
Inter-provincial	0.2320	0.2438	0.2486	0.2293	0.2298	0.2312	0.2329
Between urban and rural areas	0.0994	0.1025	0.1717	0.2018	0.2023	0.2032	0.1972
Inter-regional	0.1672	0.1818	0.1827	0.1629	0.1596	0.1637	0.1619

TABLE 4 Gini coefficients for different sources of interprovincial education funding.

	2012	2013	2014	2015	2016	2017	2018
State financial expenditure on education	0.3332	0.3493	0.374	0.3497	0.3645	0.3768	0.3731
The investment made in private schools by their founders	0.3426	0.3266	0.3647	0.3611	0.3518	0.3802	0.3663
Donation income	0.5663	0.5623	0.5801	0.6345	0.6149	0.5447	0.5236
Undertaking revenue	0.2492	0.2458	0.2266	0.2161	0.2184	0.2304	0.2283
Other education funding	0.4749	0.5584	0.5703	0.5107	0.5146	0.5148	0.5247

TABLE 5 Extent to which internal gap in education funding of different sources contributes to the overall gap.

	2012	2013	2014	2015	2016	2017	2018
State financial expenditure on education	58.68	58.75	59.52	61.66	64.89	67.42	65.46
Investments made in private schools by their founders	0.62	0.9	1.65	1.37	1.15	1.46	1.72
Donation income	0.52	0.29	0.16	0.16	0.2	0.15	0.1
Undertaking revenue	37.7	37.11	35.46	34.04	31.03	28.21	30.02
Other education funding	2.47	2.95	3.21	2.77	2.73	2.76	2.7

gap has increased year by year, from 58.68% in 2012 to 65.46% in 2018. The contribution rate of undertaking revenue showed a slow downward trend, with the contribution rate in 2012 being 37.70% and falling to 30.02% in 2018; None of the remaining three projects contributed more than 5 percent. Therefore, at the present stage, the gap in kindergarten education funds mainly comes from the internal gap between national financial education funds and undertaking revenue, especially the former, which not only have the highest contribution rate but also rise year by year. Therefore, this paper will further decompose the national financial education funding project.

Gini coefficients of financial education funding for kindergartens from different sources and their contributions to the overall gap

Gini coefficient of different sources of financial education funding for kindergartens

In this paper, the internal gaps in the financial education funding projects of different sources are calculated according to formula (1), and the results are shown in Table 6. The Gini coefficient of inter-provincial national financial education

TABLE 6 Gini coefficients for different sources of interprovincial financial education funding.

	2012	2013	2014	2015	2016	2017	2018
Education funds budgeted by the general public budget	0.3179	0.3244	0.3714	0.3511	0.3660	0.3787	0.3748
Education funds budgeted by Government funds	0.5442	0.5729	0.6015	0.6334	0.5724	0.6138	0.6579
Appropriation by State-owned and its holding enterprises when running schools	0.6237	0.6346	0.6725	0.6482	0.6765	0.6790	0.7079

TABLE 7 Extent to which internal gaps in financial education funding contribute to the overall gaps.

	2012	2013	2014	2015	2016	2017	2018
The general public budget allocates funds for education	81.07	77.35	90.41	99.09	99.33	99.32	98.80
Government fund budget arrangements for education	6.63	9.44	8.39	0.25	0.22	0.38	1.12
State-owned and its holding enterprises in the running of enterprises to allocate funds	1.33	1.22	1.20	0.66	0.45	0.29	0.09

funding projects from all sources showed a certain degree of growth between 2012 and 2018. Among them, the Gini coefficient of education funding arranged in the general public finance budget is the smallest, with an average value of 0.3549; the Gini coefficient of education funding items arranged by the government fund budget has seen the largest increase, from 0.5442 in 2012 to 0.6579 in 2018; the Gini coefficient of enterprise appropriations in state-owned and state-controlled enterprises running schools is the largest, and it has reached 0.7079 by 2018.

The contribution to the overall gap made by different sources of financial education funding for kindergartens

Using formula (2), it is possible to calculate the extent to which the internal gap between different sources of financial education funding contributes to the overall gap in financial education funding, and the results are shown in Table 7. The contribution rate of the internal gap in education funding in the general public budget to the overall gap has increased year by year, from 81.07% in 2012 to 98.8% in 2018. The contribution rate of the remaining three projects has shown a downward trend year by year, and in recent years, it has not exceeded 1%. From the perspective of rural and urban areas, the contribution rate of education funding projects in the general public budget has also increased to 99.06 and 98.54%, respectively, in 2018. It can be seen that at the present stage, the gap in financial education funding for kindergartens is almost entirely due to the internal gap in education funding arranged in the general public budget.

Incremental decomposition of gaps

Decomposition of the overall gap in education funding

According to formula (4), this paper breaks down the total income of education funding and the increase of its largest source of financial education funding from 2012 to 2018 (see Table 8). From 2012 to 2018, the Gini coefficient of kindergarten education funding increased from 0.2320 to 0.2329, and the increment was decomposed according to the change in *per capita* input of education funding in each province (ΔW), the change in the inter-provincial ranking (ΔQ), and the change in student share (ΔP), and the results were: ΔG/G was 0.38%, ΔW/G was −3.56%, ΔQ/G was 4.42%, and ΔP/G was −0.43%. That is to say, the Gini coefficient increased by 0.0009 because the change in the average student input of education funds in each province caused it to decrease by 3.56%, the change in student share caused it to decrease by 0.43%, but the change in inter-provincial ranking caused it to increase by 4.42%. Similarly, what caused the Gini coefficient of national financial education funding for an average kindergartener to increase by 10.72% in 2018 compared with the number in 2012 was the positive impact of changes in inter-provincial ranking, student share, and national financial education funding per student, which has reduced it by 1.07%. Therefore, we should increase financial support for backward provinces and increase the amount of investment in education per student in backward provinces, to reduce the gap between provinces.

Gini coefficient and decomposition of kindergarten education funds in different regions

Gini coefficient of interregional education funding and its contribution to overall disparities

Table 9 shows the Gini coefficients for kindergarten education funding in different regions and the contribution of intra-regional disparities to the overall disparities, calculated based on formulas (1), (5). It can be seen from the table that from 2012 to 2018, the Gini coefficient between different regions decreased in fluctuations, with a maximum of 0.1827 in 2014 and a minimum of 0.1596 in 2016; according to the data in the table, the Gini coefficient in the northern coast was the largest, with an annual average of 0.2900 during the study period, and the Gini coefficient in the southern coast, northeast

TABLE 8 Gap incremental decomposition results.

	ΔG/G	ΔW/G	ΔQ/G	ΔP/G
Education funding	0.38%	−3.56%	4.42%	−0.43%
Financial education funding	10.72%	−1.07%	9.30%	2.47%

TABLE 9 Gini coefficients for intra-regional education funding and their contribution to overall disparities.

	2012	2013	2014	2015	2016	2017	2018
Northeast	0.0486	0.0461	0.0292	0.0326	0.045	0.0542	0.0558
	0.06%	0.05%	0.03%	0.03%	0.04%	0.04%	0.04%
Eastern coastal	0.1466	0.1503	0.1575	0.1581	0.1793	0.1815	0.1801
	1.60%	1.53%	1.51%	1.55%	1.68%	1.65%	1.62%
Southern coastal	0.026	0.0263	0.0269	0.0327	0.0224	0.0338	0.0293
	0.22%	0.22%	0.24%	0.31%	0.22%	0.32%	0.28%
Northern coastal	0.271	0.3097	0.3052	0.2739	0.2794	0.294	0.297
	2.64%	2.96%	2.60%	2.45%	2.36%	2.38%	2.60%
The middle reaches of	0.2207	0.1837	0.1889	0.1914	0.2001	0.1664	0.167
the Yellow River	1.92%	1.55%	1.61%	1.75%	1.76%	1.39%	1.36%
The middle reaches of	0.0563	0.0509	0.0629	0.0825	0.0595	0.0561	0.0605
the Yangtze River	0.47%	0.42%	0.49%	0.72%	0.53%	0.47%	0.50%
Southwest	0.081	0.0995	0.0914	0.0833	0.0933	0.1036	0.1053
	0.89%	0.96%	0.91%	0.98%	1.11%	1.24%	1.25%
Northwest Territories	0.0836	0.1134	0.1542	0.1243	0.14	0.1598	0.1174
	0.07%	0.10%	0.14%	0.14%	0.22%	0.36%	0.24%
Inter-regional	0.1672	0.1818	0.1827	0.1629	0.1596	0.1637	0.1619
	72.07%	74.57%	73.49%	71.04%	69.45%	70.80%	69.51%
The remaining items	0.0465	0.043	0.0472	0.0482	0.052	0.0493	0.0526
	20.06%	17.65%	18.99%	21.03%	22.64%	21.34%	22.59%

China and the middle reaches of the Yangtze River was small, with annual averages of 0.0282, 0.0445, and 0.0612, respectively. From the perspective of the trend of change, only the Gini coefficient in the middle reaches of the Yellow River showed a fluctuating decline, but the decline was only 1.09%; The Gini coefficient in other regions showed a fluctuating upward trend, such as the average difference between the students in the southwest region which rose from 4898.95 yuan in 2012 to 7678.84 yuan in 2018. From the perspective of contribution rate, the contribution rate between regions is the largest, with an annual average of 71.56%, and the minimum annual average contribution rate within the group is 0.04% in the northeast region, and the maximum value is only 2.57% (northern coastal area).

The gap in education funding between urban and rural areas and its contribution to the overall gap

Table 10 shows the Gini coefficient of education funding for an average rural or urban kindergarten student calculated based on formulas (1) and (5) and the contribution of their respective internal gap to the overall gap. In the area divided into villages and towns, the Gini coefficient of rural internal education funding is decreasing, with an annual average of only 0.0347; its contribution rate to the overall gap is on average 14.72%, showing a gradually decreasing trend. Specifically, the average education funding of students in Inner Mongolia (the education funding per student rose from 9619.25 yuan in 2012 to 45249.42 yuan in 2018) and Jilin (from 8019.77 in 2012 to 32083.48 yuan in 2018) and other provinces are growing, while the average education funding of Shanghai students, which widened in 2012, remained at 140,000 yuan during the study period. The gap within cities and towns shows the opposite trend as the internal gap in the average education funding of urban students gradually increased from 0.1043 in 2012 to 0.1377 in 2018, and the contribution rate also shows a year-on-year growth trend. Specifically, the regions and provinces that originally had small interprovincial gaps in the average education funding for urban students in 2012 have gradually widened their gap in recent years. For example, the education funding per student in Beijing rose from 15680.98 yuan in 2012 to 33807.59 yuan in 2018 and that of Shanghai rose from 11,911.22 yuan in 2012 to 28,069.41 yuan in 2018, whereas the average education expenditure of students in Heilongjiang, Anhui, Hunan, Guangxi, Gansu, Ningxia, and other places has hardly increased, and some regions even exhibited a negative

TABLE 10 Decomposition of the overall gap in different areas of villages and towns.

	2012	2013	2014	2015	2016	2017	2018
Rural *per capita* Gini	0.0376	0.0374	0.0374	0.0354	0.0338	0.0313	0.0297
coefficient	16.23%	15.34%	15.03%	15.45%	14.72%	13.52%	12.76%
Urban *per capita* Gini	0.1043	0.1105		0.1251	0.1269	0.1318	0.1377
coefficient	44.96%	45.33%	51.42%	54.57%	55.23%	56.99%	59.14%
The average Gini	0.0994	0.1025	0.1717	0.2018	0.2023	0.2032	0.1972
coefficient between	42.84%	42.05%	69.06%	88.03%	88.04%	87.90%	84.66%
urban and rural areas							
The remaining items	−0.0093	−0.0066	−0.0883	−0.1331	−0.1332	−0.135	−0.1317
	−4.03%	−2.71%	−35.51%	−58.04%	−57.98%	−58.41%	−56.57%

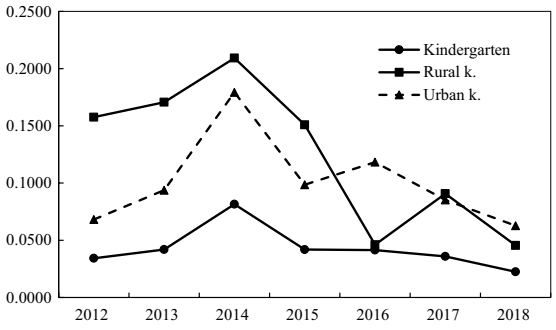


FIGURE 1
Polarization trend of total income for education.

growth trend. In 2012, the average gap between rural and urban students in education was 8320.42 yuan, and by 2018, the gap increased to 18037.90 yuan, which led to the largest contribution rate of the average Gini coefficient between rural and urban students to the overall gap, with an annual average of 71.80%. In addition, it can be seen that the negative contribution of the remaining items increased significantly after 2014, which shows that a series of policies implemented by the state to reduce the regional and urban–rural gaps in education investment had played a positive role.

Polarization

Figure 1 is a polarization trend chart of the total income of kindergarten education funds calculated according to formula (6). From the figure, it can be seen that the polarization index of kindergarten education funds in 2012–2018 was not very large, the overall value was not large either and showed a downward trend; the minimum value was 0.0225 in 2018, and the maximum value was only 0.0815 (2014), which shows that there was no obvious polarization problem in kindergarten education funding. Rural kindergartens and urban kindergartens also exhibited the same trend; although the development trend of rural kindergartens and urban kindergartens was more consistent, the internal reasons for the development trend of the two were different. The average annual decline rate of the gap between the high-income education funding group and the low-income education funding group in rural kindergartens was greater than that of the inter-group gap of 1.03%, and the average annual decline in G_B was faster than G_w leading to the overall downward trend. The average annual growth rate of urban kindergarten G_B was 5.06%, while the average annual growth rate of G_w was 5.99%, making the G_B growth not as fast as G_w; but the difference between G_w and G_B was decreasing, which seemed to have led to an overall decline in polarization.

Conclusion and policy recommendations

Conclusion

During the observation period, the gap between kindergarten education funds between different groups (inter-provincial, urban–rural, and inter-regional) was widening, the largest gap was between provinces, and the fastest growth rate was between urban and rural areas, an increase of 98.39% in 2018 compared with 2012.

The gap between provinces in kindergarten education funds mainly comes from the internal gap between the two projects of national financial education funding and undertaking revenue, especially the national financial education funding project, which not only has the highest contribution rate, but also increases year by year, and the contribution rate has increased from 58.68% in 2012 to 65.46% in 2018. Almost all of the internal gaps in the state's financial education funding projects stem from the internal gaps in the general public budget for education funding. The contribution rate of the internal gap in education funding in the general public budget to the internal gap in the national financial education funding project has increased year by year, from 81.07% in 2012 to 98.8% in 2018.

According to the results of decomposing the increment of interprovincial education funding and interprovincial financial education funding in 2012–2018, it is found that the change in

the education funding per student will lead to a decrease in the Gini coefficient, the change in interprovincial ranking will lead to an increase in the Gini coefficient, and the effect of the change in student share is uncertain. Therefore, we should increase financial support for backward provinces and increase the *per capita* investment in education funds in backward provinces, to reduce the gap between provinces.

From the perspective of different regions, the internal gap in kindergarten education funding in the northern coastal area is the largest, with the Gini coefficient averaging 0.2900, but the average annual contribution rate of the internal gap to the overall gap is only 2.57%, and the interregional gap has the largest contribution rate to the overall gap, with an annual contribution rate of 71.56%.

From the perspective of urban and rural areas, the gap in kindergarten education funding within rural areas is decreasing; The gap within the town is gradually increasing, and the contribution rate of the gap within the town to the overall gap is also increasing year by year. The gap between urban and rural areas contributed the most to the overall gap, with an annual average of 71.80%.

Different from the research of Cai et al., based on the calculated polarization index, this paper finds that there is no obvious polarization problem in China's kindergarten education funds as a whole.

Policy recommendations

Increase the investment in education funds, and at the same time coordinate and adjust the inter-provincial gap in general financial education funds, and the specific use of funds should be allocated and used under the education funding plan for students, to avoid the unfair distribution of education funds and resources caused by the excessive income gap between the average education funds of each province.

Pay attention to the inter-provincial gap in the source of education funding income, and gradually reduce the proportion of tuition income in the total source of education funding in the undertaking revenue. Now there is a widespread phenomenon of excessive kindergarten tuition fees in various regions. According to the National Bureau of Statistics, the disposable income *per capita* in China was CNY35,000 in 2021. But in 2006, some kindergartens in first-tier cities such as Beijing and Shanghai charged more than CNY100,000 a year, and kindergartens charging over CNY5000 a month had also become common. According to the survey, more than 40% of rural parents think that kindergarten fees are too high. That the pressure of the admission threshold shifted to the parents of young children may implement the national three-child policy "difficult to implement," and it may be difficult to attain the goal of "increasing the gross enrollment rate of preschool education to more than 90% in the 14th Five-Year Plan and the "Long-Range Objectives Through the Year 2035″ without solving the problem of high tuition fees.

Pay attention to the internal and inter-regional gaps in different groups. The level of regional economic development directly determines the total amount of educational resources and also directly affects the number of income sources of each part. Financial resources should be tilted to kindergartens in areas where economic development is relatively slow, such as the Northwest and the Northeast, especially to rural kindergartens with large internal gaps at the present stage. This will also help to alleviate the "U-" shaped feature of the inter-provincial gap in teachers' salary cost per student (Tian and Du, 2021). Pay attention to the internal gap in urban kindergartens as well. The share of urban middle school students is decreasing, but the average education expenditure per student is gradually showing an uneven trend. Accelerating the development of inclusive private kindergartens requires appropriate allocation of financial funds in public and private kindergartens, which can help them withstand the test of force majeure on preschool education (Liu et al., 2021), reduce the emergence of whopping-price kindergartens, and alleviate the intra- and inter-group growth of high-income groups and low-income groups in urban kindergartens.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found at: China Educational Funding Statistical Yearbook China Education Statistical Yearbook.

Author contributions

JC: conceptualization, methodology, software, investigation, formal analysis, and writing—original draft. XW: formal analysis, writing, data curation, and writing—original draft. XL: visualization and investigation. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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How should teachers tackle students' boredom in the emergency online language class?

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KEYWORDS

boredom, COVID-19 pandemic, online setting, language learning, ecological perspective, nested ecosystems model

Introduction

Owing to the outbreak of COVID-19 pandemic in 2020, the global education environment has experienced an abrupt and unprecedented conversion from the traditional face-to-face offline class to an underprepared computer-assisted online one (UNESCO, 2020; Limniou et al., 2021; Pokhrel and Chhetri, 2021; Pressley and Ha, 2021; Chen et al., 2022). Not only education authorities and schools of all levels, but also teachers, students as well as parents need to immediately face such a rapid shift (Kim and Asbury, 2020; Tadesse and Muluye, 2020; Gao et al., 2021; Vijayan, 2021; Ashton, 2022). Emergency remote teaching has thus become a necessity in such a pandemic age. Consequently, the modes of teaching and learning have been greatly changed, with teachers teaching on this side and students learning on the other side in those most risky places in the world (Luo et al., 2020; UNESCO, 2020; Chiu Thomas et al., 2021; Tsang Jenny et al., 2021; Kupers et al., 2022). Boredom, a term describing students' learning behaviors, captured the attention of certain Second Language Acquisition researchers under such circumstances (see Derakhshan et al., 2021, 2022; Yazdanmehr et al., 2021; Kruk et al., 2022; Li, 2022), though grassroots teachers might ignore this negative emotion from their students' struggles (Derakhshan et al., 2021). As quite a few research studies in the past decade (see Pekrun et al., 2010; Chapman, 2013; Kruk and Zawodniak, 2018, 2020; Pawlak et al., 2020, 2022; Li, 2021) have shown that boredom can hinder learning performance and even result in poorer achievement outcomes, it deserves further investigations and deeper insights into the causal mechanisms of boredom emergence, especially in the terrain of emergency remote language classes in the current situation, which is most probably going to stay for long (Yazdanmehr et al., 2021; Derakhshan et al., 2022).

With concerns for students' boredom in our own emergency remote teaching and academic interest *per se*, we read the newly-published article by Kruk et al. (2022), which intended to probe into the ecosystemic factors underneath the emergence of boredom in an online English language classroom. To be more specific, the article took an ecological perspective to explore the causes of boredom experienced online by four 14-year-old EFL learners affected by different ecosystemic elements *via* the nested

ecosystems model during the pandemic. In our view, the article reached a conclusion filled with both interpretative and illuminating evidence which is directive in coping with student boredom online for both practitioners and researchers in different ecosystemic layers. Therefore, we would like to share our opinions with our readers, hoping to provide heuristic comments for further investigation and more rational online practice. To achieve clarity, the article Kruk et al. (2022) will be referred to as "the article" hereby.

Prior to our detailed analysis of the article, we believe it is necessary to make clear the existing causes of boredom used in the article, together with how it can be embedded in the nested ecosystems model. Admittedly, the emergence of boredom can be ascribed to multifarious factors based on different models and theories (see Hill and Perkins, 1985; Larson and Richards, 1991; Pekrun, 2006; Eastwood et al., 2007, 2012; Pekrun et al., 2010; Davies and Fortney, 2012; Tulis and Fulmer, 2013). To sum up as a whole, the absence of challenging stimuli, teachers' excessive control and monotonous talk, students' limited choice, students' poor self-regulate attention and self-awareness, students' low perception of task control and value, students' own emotion identification as well as the over- or under-consumed mental energy, are the main sources of boredom emergence according to the abovementioned works. As for the online language learning context, Derakhshan et al. (2021) uncovered teachers' long, tedious monologs, students' insufficient participation, carelessly-chosen tasks and technical problems as the main sources of boredom, while Yazdanmehr et al. (2021) revealed user-unfriendly requirements of online education, such as physical distance or sedentary position, are antecedents of boredom likewise. Moreover, Dewaele et al. (2022) found that the lack of live personal interactions and the monotonous teacher delivery could induce students' disengagement and cause boredom.

Based on the identified causes of boredom in language learning, the article proposed a perspective of ecology to examine the emergence of boredom in an emergency remote English class influenced by different ecosystemic factors. The nested ecosystems model of ecological models serves to explore human behaviors from the immediate to the interdependent and overarching social cultural context (Bronfenbrenner, 1979, 1993), so individual students involved in the online setting of an EFL course can be embedded in different ecosystemic layers to gain a distinctive insight into their perceptions and interpretation of boredom. The article linked microsystem, the inner-most layer of the nested ecosystems model to the online classroom setting, where teachers, students, tasks and activities interacted; mesosystem to students' past online language learning experiences with the current online setting; exosystem to the school policies on online English study; and macrosystem, the outmost of the model, to cultural beliefs and public views of students' emergence of boredom online.

The study

Guided by the sole research question "What are the ecosystemic factors underlying the emergence of boredom in an online English language classroom?" (Kruk et al., 2022), the article adopted a case study with four participants to analyze and compare.

The four participants (one male and three females) were from a private English institute in Iran and were selected *via* a deviant case sampling strategy. A questionnaire was used to decide the subsequent four interviewees, and then two interviews were carried out with a 2-week interval in between to get the qualitative data. After that, the interviews were transcribed and translated into English, followed by reading, coding, categorizing and theorizing under the different ecosystemic layers. It is worth mentioning that there is a complete questionnaire and interview questions attached to the article as appendixes, as well as how the interview questions were designed in line with the ecosystemic framework. Both of the two research tools may facilitate and give reference for future related researches.

In line with the acquired sources of student boredom in either online or offline learning contexts and the four layers of nested ecosystems model, the article illuminated the interaction between ecosystemic factors and participants' boredom in the online English class from the qualitative data through the interviews. At the microsystem level, the teacher's lengthy monologs and repetitive activities under or above students' competence failed to arouse participants' attention for long and resulted in their feeling valueless or exhausted in doing the tasks. To ensure online classroom discipline, the teacher had to exert greater control by muting their microphones, leaving the participants' boredom getting intensified before being given opportunities to talk. At the mesosystem level, home distraction appeared to be the culprit where noise disturbance easily took away the participants' attention or interrupted their tasks underway, and thus a lost track of the class triggered further boredom. Meanwhile, the participants' previous dissatisfied online learning experiences overshadowed their current online learning engagement, especially when the teacher followed the same instruction route as usual. At the exosystem level, the participants' physical fatigue from the long class period, intensive workload with short session intervals but unchallenging online assessment, as well as frequent changes of online platforms by the institute, intertwined to their boredom arousal. As Van Lier (2004) claimed, ecology is the study of one organism holds with the others and with the environment. Although the three ecosystemic levels entail their specific boredom factors corresponding to those theories and models of boredom, several factors embedded in one layer can influence the other layer factors in the emergence of boredom, aligned or misaligned (Kruk et al., 2022), for example, the

conflict between home distraction in the mesosystem and the participants' adaption to the online setting after overcoming boredom for a period in the microsystem. As we see it, several factors in the emergence of boredom overlap and interact within the ecosystem.

Significantly, by taking the ecological perspective, the article echoed the call for situating the emergence of student boredom within the ecology of online classroom learning (Yazdanmehr et al., 2021), and thus put forward a thought-provoking framework for investigating further reasons and indicating solutions for students' diminished interest and participation under the interplay of each ecosystemic layer.

What' s more, the research into boredom in an online language class setting adds to the scarcity of studies on sources of boredom in emergency remote teaching during the seemingly endless COVID-19 pandemic. In this sense, we deem that the article is of strong timeliness and of reference value for analogous studies in other specific online contexts of language learning universally and help to raise the quality of online education by understanding more about this negative emotion.

Discussion

Undoubtedly, the article provides an exemplary case study with abundant evidences for understanding student boredom in the online setting from an ecological perspective, shedding light on how this negative emotion is linked to the environment beyond the classroom. It is of great value in making up for research insufficiency while inspiring researches to dig into the combination of emotions and contextual factors. Nevertheless, in this part, we want to make our comments on the research design, theme creating and other points of the article in the hope of facilitating further research.

Firstly, a questionnaire was used to select the participants who were of the highest or the lowest scores. To make the selection more persuasive, an experienced teacher of this class was involved in the process, but it remains unknown how she finally helped determine the four cases. As Elman and Kapiszewski (2014) indicate that researchers are supposed to share the evidentiary basis and explain how the conclusions are reached. Then, in the study, two semi-structured interviews were the only sources to collect interpretive data from the participants, which seemed to be too one-sided. To ensure the depth and width of qualitative data as far as possible, several sources of data, need to be combined to reach triangulation (Creswell, 2014; Rossman and Rallis, 2016). Hence, it is obvious that more data collection sources can be introduced to consolidate the reliability and validity (Creswell, 2007) of the influential factors of students' boredom in the article. For instance, online class observation would be appreciated in unveiling the real conditions of student learning and teacher teaching. Qualitative studies using field or classroom observations (Tao and Gao, 2017; Ruan and Zheng, 2019; Mansouri et al., 2021; Zhang et al., 2022) have well illustrated that it is an effective way to understand the participants' real practice and complement the data that may have been missed in the interviews. Besides, data from teachers, parents as well as school administrators can be added to supplement to students' unilateral comments or complaints. At last, as addressed by the researchers themselves, further ecological studies could be conducted in other contexts to gain the vacant information hereby concerning the macrosystem factors impacting students' boredom experience. All in all, there is still space for researchers to enhance in terms of data collection in future related studies.

Secondly, to identify themes and sub-themes from the qualitative data through interviews with four participants, the article conducted the practice based on Bronfenbrenner's (1979) nested ecosystems model. Key concepts were picked out to form sub-themes or codes and then themes came into being. As is known to us, the analytic goals of theming are to winnow down the number of themes to explore and to develop an overarching theme from the data corpus (Saldaña, 2016) and the winnowing down of themes are supposed to be "essential" rather than "incidental" (van Manen, 1990). However, some themes in the microsystem appeared to be somewhat repetitive. In the article, the teachers' lengthy, repetitive talk reflected the boring and teacher-centered "teaching style," whereas the "lack of peer participation and engagement" stemmed from the teacher's lengthy talk actually mirrored the fact that the class was never student-centered, which may be classified into "teacher's teaching style," too. In addition, the theme "class control" manifested the teacher had to control students' by muting their microphones due to possible class chaos, whereas "students' violation of class discipline" also dealt with students' annoying behaviors online. Similarly, repetitive themes can also be found in the exosystem. The two themes "online platform problems" and "low learners' literacy of using the online platform" are both about boredom from online platform problems, including frequent changes of platforms and students' low literacy in operating different platforms, so they may as well be classified together likewise. In effect, Jeon et al. (2022) have pointed out that all codes that share a similar core meaning are likely to be grouped into a common theme through several rounds of discussions.

Thirdly, sources of students' boredom in the online setting revealed by the article are distinct from that of the traditional face-to-face class, which may be suggestive for teachers and administrators to make adjustments in different ecosystemic layers. However, the article appeared to be a bit absolute by addressing that it will be easier to vary the teaching style in offline instruction (see Kruk et al., 2022, p. 12). According to one of the participants' remark (see Kruk et al., 2022, p. 7), the teacher's online teaching style is almost a duplication of what she did offline, indicating there being no change in two different teaching settings. Interestingly,

though, it brings about other potential fields worth investigating between teacher-student classroom practice, their emotions and teaching-learning outcomes either online or offline. On one hand, as teachers are supposed to respond and make changes to maintain student learning and to innovate or make changes (Hitlin and Elder, 2007; Ehren et al., 2021), teacher efficacy, teacher agency or digital affordances, etc. in front of such emergency remote teaching under COVID-19 should all be taken into consideration. Actually, teacher efficacy of virtual instruction and engagement were found to be negatively affected during the pandemic in 2020 (Pressley and Ha, 2021), causing teacher stress or even burnout. On the other hand, students' self-efficacy, academic emotions, EFL proficiency (Wang et al., 2021) or learning motivation and learning strategies (Chiu Thomas et al., 2021; Randi and Corno, 2022) are also intertwined with teachers' teaching practice, generating reciprocal impact on teaching quality. As far as we are concerned, the variables mentioned above concerning teachers and students as a whole should be good entries to investigate students' boredom in remote teaching and learning in the future.

Conclusion

In summary, the article is a well-explored and far-reaching piece. It reveals that the online classroom is never an isolated virtual world and the emergence of student boredom is triggered by different factors in the ecosystem as a whole, which either encompass or interact with each other. We are convinced that, after reading the article, researchers, practitioners, school authorities and even parents can get a better understanding into what underlies students' boredom in remote language classes so as to tackle the problem appropriately in future studies, teaching practices, course designs and family environment building. Therefore, we feel it meaningful to recommend the article to more readers, particularly those who are in the pursuit of improving teaching quality and students' sustainable learning engagement in the online setting or in other contexts.

Author contributions

QH and XZ selected the commented article together. QH drafted the opinion. XZ provided insights and valuable suggestions during her writing and helped revise the text. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The effect of social networks on academic self-handicapping with the mediating role of self-regulatory learning strategies and academic achievement among EFL students

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Introduction: In the academic context, social networking sites (SNSs) have reshaped the way university students connect and communicate with each other and the way they learn, thus influencing their identities and dimensions. This research investigates the effect of social networks on academic self-handicapping with the mediating role of self-regulatory and academic achievement.

Method: The current study is considered to be quantitative research in terms of its nature, applied research in terms of its purpose, and correlational descriptive one in terms of its method. The statistical population of the present study includes all language students of Tabriz University, whose number was 540 people. Sampling was done by the random sampling method. Using Morgan's table, the sample size was estimated to be 225 people in 2022. Due to the possibility of falling, 10% was added to this number, and 250 questionnaires were distributed among 250 participants; 17 questionnaires were incomplete, and a total of 233 valid questionnaires were examined. Four questionnaires were administered to collect data. SPSS 26 and AMOS 24 software were used to analyze the collected data from questionnaires. Descriptive, inferential, and Structural Covariance Matrix (SEM) statistics were conducted to explore the effect of social networks on these variables.

Results: Findings showed that social networks significantly impact self-handicapping in language students of Tabriz University. 2- Social networks have a significant impact on self- self-handicapping with a mediating role of self-regulation learning strategies in language students of Tabriz University. 3- Social networks significantly affect self-handicapping, mediating role in language students' academic progress at Tabriz University.

Discussion: Further investigation and experimentation into social networks are strongly recommended. In addition, studies show that self-handicapping is successful in helping individuals divert the assessments of others from attributing weak abilities to failure. Because self-handicapping behavior undermines achievement and can lead to long-term withdrawal from activities (such as school

and college), parents and teachers must discourage self-handicapping and avoid behavior that may encourage it.

KEYWORDS

academic achievement, academic self-handicapping, self-regulatory learning social networks, social networks (online), education

Introduction

The use of new communication technologies, especially social networks in recent decades, has brought us into a new era and society; the society that Daniel Bell called the post-industrial society, Tada Omsu, the network society, and Castell, the information society (Cueva and Inga, 2022). With the increasing development of electronic communication technologies such as satellite and Internet networks and their impact on many social, cultural, political, and economic aspects, society has undergone fundamental changes. Some scholars, including Joseph Ney, have called virtual social networks a new dimension of power in the 21st century (Ghasemzadeh, 2011; Fuhse, 2021). The main issue here is that despite all the advantages and disadvantages of using social networks, it should be acknowledged that many spatial aspects of virtual social networks and bases that work in the form of social media are still unknown, so the review of all aspects of these networks, especially checking their capabilities in the field of education, should be prioritized.

The overgrowth and widespread of SNSs have created concerns among communication experts, university authorities, and researchers about the usefulness and potential effect that university students face while engaging and using online networking sites (Yapıcı and Hevedanlı, 2014). SNSs have changed university students' learning process (Geçer and Topal, 2015). Nowadays, university students worldwide tend to have more than one account on SNSs, which hinders their academic performance and impacts their lives and sociability. This vital issue has been widely addressed in many studies, and it has become prominent due to the many newly developed social sites such as Facebook, TikTok, WhatsApp, etc. (Aljaraideh and Al Bataineh, 2019; Tavakli and Mansour Lecourge, 2019; Albashtawi and Al Bataineh, 2020).

Self-handicapping behavior or choosing a set of behaviors allows a person to attribute failure to external factors and success to internal ones (Callan et al., 2014). Academicc self-handicapping is a defensive strategy in which a person creates barriers before an academic performance to manipulate their documents and act in a way that indicates their inadequacy (Uysal and Knee, 2012; Schwinger et al., 2022). Vrij et al. (2021) concluded that self-handicapping significantly correlates with high school students' academic self-efficacy. With decreasing academic self-efficacy, self-handicapping increases and leads to negative psychological consequences. Kumari (2015), in her research, showed that academic self-handicapping reduces adolescents' success and academic performance and leads to academic failure and eventual school dropout.

Currently, the evidence shows that to improve the progress and success of students in learning, it is possible to achieve the desired academic achievement by using cognitive interventions. Therefore, some interventions are needed to help students reduce negative perfectionism, self-handicapping, and academic failures, and appropriate identification and interventions are essential in this regard. Indeed, early intervention in self-handicapping should be an important focus for school mental health professionals. One of the most critical psychological interventions is the use of cognitive-behavioral coaching techniques, during which, in a collaborative process, the underlying thoughts or cognitive and fundamental schemas in the behavior and feeling are the focus of the intervention. The use of short-term, effective interventions, affordable and tailored, is necessary to get rid of negative perfectionism and academic self-handicapping.

Self-regulation is an active and constructive process according to which the learner considers a series of goals for their learning and then tries to control and adjust these goals and guide their cognition, motivation, and behavior (Bakker and de Vries, 2021). Although there are different definitions of self-regulation in other theories, in general, self-regulation is defined as the ability to control and regulate individuals' learning using cognitive and metacognitive strategies (Trotter et al., 2021). Teng and Zhang's research results show that decreased intrinsic motivation to learn and lack of self-regulation lead to increased procrastination (Teng and Zhang, 2022). Regarding the components of motivational strategies, the results also showed that self-efficacy, intrinsic value, test anxiety, and cognitive strategies are negative predictors of academic self-handicapping (Inzlicht et al., 2021).

Hypotheses:

(1) Do social networks significantly affect self-handicapping in language students of Tabriz University?
(2) Do social networks significantly affect self-handicapping with the mediating role of self-regulated learning strategies in language students of Tabriz University?
(3) Do social networks significantly affect self-handicapping with the mediating role of academic achievement in language students of Tabriz University?

This study investigates the effect of social networks on academic self-handicapping with the mediating role of self-regulatory learning strategies and academic achievement among EFL students of Tabriz University.

Review of literature

Social networks

The term web-based social network was first introduced in 1960 at the University of Illinois in the United States. In 1997, the first social networking site, Six Degrees, allowed users to create profiles to produce a list of friends. The spread of the concept of business on social media in (2002) led to the emergence of social networks such as Esther Friend, Orkut, LinkedIn, and the mushroom growth of these sites in the virtual space. In (2006) public access to Facebook was released because before that; the site was only used as a pilot at Harvard University. Twitter also entered the social media arena in the same year (Sponcil and Gitimu, 2013). The concept of social networks in Iran became widespread among Iranian users around (2004) with the presence of the foreign network "Orkut," and in a short time, it grew so fast that after Brazil and the United States, Iran became the third country in Orkut (Qarabaghi et al., 2017).

Social networks allow users to create informational content for publication on websites, blogs, and social networks. The user of social networks can be the creator of information, interpreter, or reviewer of information in the social community (Mahony et al., 2022). Social networks can also play a beneficial role in business growth through product research and development, sales, marketing, and customer service (Al-vari and Magaki, 2017; Chang et al., 2017). Using social networks provides various benefits to the user, such as facilitating cooperation between friends, expanding human communication, and increasing the productivity of companies to develop relationships with customers (Bakhshi et al., 2013; Forutani and Bahrani, 2018).

Unlike other new information technology phenomena, virtual social networks do not have a comprehensive definition. However, most scholars and researchers refer to virtual social networks as virtual places to communicate and share content that has affected all aspects of people's lives. Virtual social networks strengthen and expand social connections in the Internet space. Users put information such as photos, personal information, interests, and workplace on their personal page, strengthening and expanding cyberspace communication (Alimoradi, 2010; Bour et al., 2020).

Virtual social networks are the types of social media that most closely resemble human society, and regardless of time, place, political and cultural constraints, they allow communication with many people (Yang et al., 2021). Therefore, the harms of using social networks, which have not been around for a long time, have become a topic of interest for many researchers. With the growth of virtual social networks, there is a serious concern about the excessive use and dependence of people, especially adolescents and young people, on these networks (del Coz et al., 2021). Research shows that approximately 301 million people worldwide suffer from extreme dependence on social networks; this dependence significantly disrupts a person's daily activities (Ozimek and Förster, 2021). According to new theories, reliance on social networks refers to the excessive use of these networks, which causes restlessness in the absence of access and fear of the lack of these networks (Schuster et al., 2021). Internet addiction is associated with symptoms such as anxiety and obsessive thoughts, dependents have problems in their daily activities and cannot control their lack of access to the use of media and social networks (Kuss and Griffiths, 2015; Shestak et al., 2021).

Although the word network and community both refer to the pervasiveness and high penetration of these technologies in the world; the use of this technology in the student class (university) and then students(high school) is more than in other classes of society (Sponcil and Gitimu, 2013). According to research, almost all students have a user name in at least one social network, and the age range of users is between 13 and 23 years (Yang and Tung, 2007). Therefore, addiction to social networks is one of the problems that has plagued different communities (Chavoshzadeh, 2009). Numerous and various types of research have been done in this field, and some of its harmful effects have been revealed; the results of Chavoshzadeh's study showed that too much time using the Internet and social networks causes academic problems and low grades for students.

Self-handicapping

Self-handicapping is one of the basic constructs of educational psychology and a term that has been considered in psychology sources since 1960 (Kolditz and Arkin, 1982; Schwinger et al., 2022). Self-handicapping is a defensive strategy in which the person creates barriers before the performance to manipulate their masters after the performance. Self-handicapping can be both behavioral and assertive (claimed; Funkhouser and Hallam, 2022; Melhem, 2022). Behavioral self-handicapping is defined as intentional, observable, and often external actions that directly affect performance. Though assertive (claimed) self-handicapping is internal and accidental and does not necessarily reduce the chances of optimal performance, it is more limited to excuses (Fadhli et al., 2021).

Jones and Berglas (1978) are pioneers in this field. They have defined it as behavior or choice of a set of actions that provides an excellent opportunity for people to internalize failure and internal success. This structure has many consequences and has adverse effects on the educational system of any country (Jones and Berglas, 1978). Hence, many studies have identified the factors and processes that lead to self-handicapping and its consequences (Núñez et al., 2021). Since self-handicapping is an avoidant behavior that leads to reduced performance and academic degradation, affects a person's personality and future adjustment,

and hinders a person's growth in adulthood, this category needs further investigation and attention.

In recent years, academic self-handicapping has been proposed as a defect in self-regulation in the inability to control one's thoughts, emotions, feelings, and optimal performance by one's criteria (Khaneghahi et al., 2022; Török et al., 2022). Therefore, self-regulation is one of the essential variables in explaining the cause of self-handicapping. So that many studies consider self-handicapping as a defect in learner self-regulation (Shin and Park, 2021). Theobald believes that learners who use self-regulatory learning strategies are less likely to commit self-handicapping (Theobald, 2021).

Self-regulation

Self-regulation is an active and constructive process according to which the learner considers a series of goals for his learning and then tries to control and regulate these goals and guide his cognition, motivation, and behavior (Bakker and de Vries, 2021; Cengiz-Istanbullu and Sakiz, 2022). Although there are different definitions of self-regulation in other theories, self-regulation is generally defined as competence in controlling and regulating individuals' learning using cognitive and metacognitive strategies (Khan et al., 2021). According to Pintrich and DeGroot, self-regulation includes two main categories of motivational beliefs and self-regulatory learning strategies (Braund and Timmons, 2021). Rox and Don's research results show that decreased intrinsic motivation for learning and lack of self-regulation leads to increased self-handicapping (Rakes and Dunn, 2010).

Noting that motivation for academic achievement is particularly important, researchers have studied factors affecting it, including self-regulation. Self-regulation is an active and organized process in which learners choose goals for their learning, then try to regulate, control, and monitor their cognition, motivation, and behavior (Azevedo et al., 2022). One of the concepts raised in contemporary education is self-regulated learning.

It has practical consequences for learning, education, and success. Adaptation and success in school require that students expand and strengthen their cognition, emotions, or behaviors by developing self-regulation or similar processes to achieve their goals. Self-regulated learning is an active and self-sustaining process in which students control and regulate their cognition, motivation, results, behavior, and environment to advance their goals. Self-regulation is closely related to motivation. Self-regulation is a process through which students activate and maintain cognition, behaviors, and emotions that are systematically aimed at acquiring goals. Students who are motivated to achieve a goal engage in activities that they believe are useful. Self-regulation enhances learning, and the perception of greater competence maintains motivation and self-regulation to achieve new goals. In the social-cognitive theory, the type of learning that is called self-regulated learning considers learning from both the educational and educational aspects. In this method, learners will have personal control over the education process and therefore learn more quickly and accurately. Educational issues such as higher self-reliance, self-efficacy, and more responsibility will also be created in the learners. In learning, the learner's self-regulation makes learning more efficient. It makes the person more self-reliant due to his careful supervision during the learning process and creates the necessary motivation for learning. The process of self-regulation in learning seeks to activate the learner and accept responsibility for his daily educational issues. By clarifying the personality characteristics of self-regulating people and other research that have been carried out regarding the formation of these characteristics, it is possible to help the motivation of students' academic progress effectively and pay attention to its educational effects.

Academic achievement

Students' academic achievement is one of the critical indicators and owners of the efficiency of the educational system. Therefore the analysis of related factors is one of the most basic research topics in the education system (Chizoba, 2017 research; Wu et al., 2021).

The study and review of the research show that academic achievement is not the result of the influence of one factor, but several factors influence this variable. One of these factors is the motivation for academic achievement. The reason for academic achievement is one of the primary constructs presented to explain motivation in education (Emami Rizi, 2015; Madigan and Kim, 2021). Ins' Slavin view (1983), the motivation for academic progress is the most critical motivation that educational psychologists deal with. The research of Madigan and Curran show that people are very different in terms of this motivation. Some are highly motivated and strive hard to achieve success in competition with others. Their work and others do not have much motivation to progress and succeed and are not ready to take risks to achieve success for fear of failure (Malmir et al., 2015 research; Madigan and Curran, 2021; Schwinger et al., 2022).

Therefore, according to the contents presented above, based on theoretical foundations and empirical background, it can be said that there is a relationship between the research variables in the current research.

One of the influential factors in the tendency of people to study and learn is the motivation for progress. This theory emphasizes the goal's role in students' success and failure. This factor plays a fundamental and vital role in learning and is the engine of a person's movement for behaviors that lead to better and more effective learning (Wang et al., 2021; Papageorgiou, 2022). Motivation for progress means the desire or desire to achieve success and participate in activities in which success depends on personal effort and ability. Progress motivation is a driver that accelerates the learning of homework so that a person can become competent and achieve success.

In other words, the main issue raised in this research is whether self-regulation learning strategies and academic achievement can be effective as a mediating variable on the effect of social networks on academic self-handicapping.

Theoretical backgrounds

Social networks

(A) Internet

Today, in the competitive and rapidly changing business environment, access to correct, timely, and relevant information plays a vital role; so many activities of organizations such as decision-making, forecasting, and business analysis depend on this information. Information technology is a tool that can meet the information needs of organizations and help them achieve their goals (Cueva and Inga, 2022).

The Internet is a global system of interconnected computer networks that use standard Internet protocols to serve billions of users worldwide. The Internet is a network of millions of local or national secret, public, academic, commercial, and government networks connected by electronic, wireless, and optical technologies.

(B) The concept of virtual space

Virtual space presents a unique environment of its own: an environment in which individuals and organizations are continuously producing, packaging, re-packaging, recording, discarding, modifying, transferring, disseminating, accessing, and using information (Wheatstone, 1838). Virtual space can describe all types of information resources created through computer networks. In fact, virtual space is a different type of virtual and digital reality provided by interconnected computer networks, which with a little tolerance can be considered synonymous with the global Internet network.

(C) The concept of social networks

In the new world system, we live in the age of media, an era where mass media are an integral part of life. Meanwhile, new media and virtual social networks were able to influence and transform people with the change in culture and the emergence of modern culture.

One of these communities is virtual social networks. Virtual social networks are also a new concept that is used today as simply as the concept of natural communities. The idea of virtual communities was first proposed in 2014 by Ringold as a social group in the Internet environment through which people discuss with each other. Virtual communities are spaces where members about a topic, come together through sending messages, in which attempts are made to model physical places as well as face-to-face communication, and in which people, not information, have access to other people for discussion and exchange of ideas.

Types of social networks

Twitter

Twitter is a social network and microblogging service that allows users to send 140-character text messages called tweets.

Twitter was created in March 2006 by Dorsey and launched in July 2006. Microblogging had over 100 million users in 2012, sending 340 million daily tweets and over 1.6 billion searches.

Facebook

Zuckerberg and some of his friends designed the Facebook website from his room at Harvard University and launched it in 2004 as a social website for Harvard students. This website was very popular among Harvard students as a network through which students could communicate with each other. For a while, this site was only used by students of Harvard University, but in March of the same year, this social network reached Columbia, Stanford, and other universities.

YouTube

YouTube is the most popular social network for watching and sharing videos. This network was launched in 2005 by three PayPal executives, and the following year it was bought by Google for $1.6 billion.

Instagram

Instagram is a visual social network owned by Facebook. This site was launched in Auto Cad 2010 and has more than 500 million active users. Most users use this network to send information such as travel, fashion, art consumption and similar topics.

WhatsApp

WhatsApp is messaging software for smartphones, computers, and tablets. This application sends images, sound, video, and documents to other users who show the software on the system.

Materials and methods

Statistical population

The statistical population of the present study includes all language students of Tabriz University in the undergraduate

course, whose number is 540 people. Sampling is done by the random sampling method. Using the Morgan table, the sample size was estimated to be 225 people. Due to the possibility of falling, 10% was added to this number, and 250 questionnaires were distributed; 17 were incomplete, and 233 valid questionnaires were examined.

Design of study

The present study is quantitative research in terms of nature, applied research in terms of purpose, and correlational descriptive one in terms of its method.

Instruments

Social networks

Social Networking Questionnaire: To collect data related to the use of social networks, Sadeghi (2017) social network questionnaire was used using a 5-point Likert scale. This questionnaire is one-component and has 20 items. The validity of this questionnaire has been confirmed in Sadeghi Amin's research, and its reliability has been calculated to be 0.89.

Self-handicapping scale

Jones and Rodwalt's (1982) self-handicapping test was used in this study. The scale is scored on a 6-point Likert scale (from strongly disagree = 1 to strongly agree = 6). The scale also includes three factors: negative mood, self-regulatory learning strategies, lack of effort, and apology. In Iran, it was reduced from 25 to 23 items, and factor analysis confirmed its validity. The scale's validity was 86% with the retest method, and the internal consistency was 77%. The combination of negative mood with the inverse score of effort (lack of effort) indicates behavioral self-handicapping, and the combination of negative attitude with apology indicates alleged self-handicapping. The correlation of this scale with related structures such as apology and low effort was reported in a sample of 245 people to be 27%. Also, its internal consistency has been reported in different studies from 38 to 70%.

Self-regulatory learning strategies

Self-regulatory learning strategies questionnaire: Pantridge and DeGroot's (1990) self-regulatory learning strategies questionnaire was used to collect data on self-regulatory learning. The questionnaire has a range of 5 and is coded from 1 to 5. The questionnaire includes three components of cognitive strategies, metacognitive control, and resource management with 22 items. The factor of cognitive strategies is measured by the sum of the scores of items 1 to 13, the factor of metacognition is measured by the sum of the scores of items 14 to 18, and the factor of resource management is measured by the sum of the scores of items 19 to 22.

Pantridge and DeGroot's (1990) research confirmed the validity of this questionnaire, and its reliability was calculated by Cronbach's alpha method of 0.81.

Academic achievement

In this study, the purpose of academic achievement is 48 questions of Pham and Taylor's (1994) standard questionnaire. The range of 5 questionnaires is from very low with code 1 to very high with code 5. Self-efficacy (items 29, 30, 31, 32, 33, 34, 35, 36), emotional effects (items 12, 13, 14, 15, 16, 17, 18, 19), planning (items 1, 2, 3, 4, 8, 9, 10, 11, 40, 43, 44, 45, 46, 48), lack of outcome control (items 5, 6, 37, 38) and motivation (items 20, 21, 22, 23, 24, 25, 26, 27, 28, 39, 41, 42, 47). In Dartaj's (2004) research, the content validity of this questionnaire was confirmed by professors. The validity of this scale was also confirmed by factor analysis. The reliability of the questionnaire was evaluated by Cronbach's alpha method, the results of which were self-efficacy equal to 0.92, emotional effects equal to 0.73, planning equally to 0.93, lack of outcome control equal to 0.64, motivation equal to 0.73, and in total the questionnaire was equal to 0.74.

Reliability and validity of the questionnaire

Factor analysis: To use structural equations, factor analysis is required, the results of which are presented in the following table:

According to Table 1, the KMO values for social networks, self-handicapping, self-regulatory learning strategies, and academic achievement questionnaires are 0.772, 0.877, 0.940, and 0.808, respectively, which indicates that the data volume is suitable for factor analysis. Also, according to the amount of surface covered by Chi-square statistics (significance level), the Bartlett index for all variables and their dimensions is equal to (0.001), which is less than the 0.01 level and shows that the data have a reasonable correlation.

Reliability

To evaluate the reliability of the research questionnaires, Cronbach's alpha coefficient was used, and the results showed that Cronbach's alpha for social networks is 0.834, self-handicapping is 0.972, self-regulatory learning strategies is 0.700, and academic achievement is 873.

TABLE 1 KMO and bartlett test to evaluate the adequacy of sampling and data correlation.

Variables	KMO	Bartlett's Test of Sphericity	*p*-value
Social networks	0.772	852.151	*0.001*
Self-Handicapping	0.877	3870.468	*0.001*
Self-regulatory learning strategies	0.940	3441.595	*0.001*
Academic achievement	0.808	43031.235	*0.001*

TABLE 2 Central indicators and dispersion of research variables.

	N	Mean	Std. deviation	Minimum	Maximum	Skewness	Kurtosis
Social networks	233	56.378	10.331	29	92	−0.281	0.443
Self-handicapping	233	64.957	23.604	30	121	0.263	−1.076
Self-regulatory Learning strategies	233	64.606	10.172	45	85	0.268	−1.115
Academic achievement	233	150.189	23.394	100	185	−0.196	−1.207

TABLE 3 Evaluation of normality of variables by Kolmogorov–Smirnov test.

	Test statistic (K-S)	*P*-Value	Result
Social networks	0.149	*0.200**	The distribution of the variable is normal
Self-handicapping	0.123	*0.200**	The distribution of the variable is normal
Self-regulatory learning strategies	0.131	*0.200**	The distribution of the variable is normal
Academic achievement	0.173	*0.119*	The distribution of the variable is normal

*Significance at the level of 0.05 ($p < 0.05$).

To analyze the data in two sections of descriptive statistics and inferential statistics, SPSS 25 and Amos 24 software were used.

The results of descriptive statistics in Table 2 show that the average social network variables is 56.378, self-handicapping is 64.957, self-regulatory learning strategies is 10.172, and academic achievement is 23.394. Also, the values of skewness and elongation are in the range (2-and 2), which indicates that the data distribution is almost normal.

Defaults of using structural equation methods

Default 1: Kolmogorov–Smirnov test

To check the normality of the research variables, the Kolmogorov–Smirnov test is used; the results are as follows:

Table 3 shows that the *p*-value is greater than 0.05, and the assumption of normal data is accepted.

Default 2: Pearson correlation test

To investigate the correlation of research variables, the Pearson test was used as follows:

The results of the Pearson test in Table 4 showed that the correlation coefficient of the research variables shows that all coefficients are higher than 0.4 and significant at 0.05.

The path analysis method with Amos 24 software investigates the relationship between research variables. The research model is as follows:

The model was fitted in Amos 24 software. The results were obtained as follows.

Paying attention to the software output, the calculated value of 2χ is equal to 2.532, which is less than 3 concerning its degree of freedom, i.e., 1. The low value of this index indicates a slight difference between the conceptual model and the observed research data. The RMSEA value is equal to 0.072. GFI, NFI, IFI, RFI, and CFI indices are equal to 0.949, 0.951, 0.953, 0.900, and 0.952, respectively, which indicate a high fit.

In the following, the research hypotheses are examined.

> *Hypothesis 1*: Do social networks significantly affect self-handicapping in language students of Tabriz University?

The results of this hypothesis are presented in Table 5.

The results of path analysis in Figure 1 and Table 5 show: The standard coefficient between social networks and self-handicapping is 0.450, and according to the absolute value of t-test statistics which is equal to 7.258 and greater than 1.96, it can be concluded with 99% probability that social networks have a positive and significant effect on self-handicapping (value of $p = 0.001$; $\beta = 0.450$). In other words, for one unit of social networks, self-handicapping increases by 0.450 units, and the coefficient of determination, which is equal to the power of the path coefficient, is 0.202, which shows that 20.2% of the self-handicapping changes are due to social networks.

> *Hypothesis 2*: Do social networks significantly affect self-handicapping with the mediating role of self-regulatory learning strategies in language students of Tabriz University?

The results of this hypothesis are presented in Table 6.

The results of examining the mediating role of self-regulatory learning strategies using the Sobel test in Figure 2 and Table 6 show that the standard coefficient between social networks and self-handicapping with the mediating role of self-regulatory learning strategies is 0.152. The Sobel test, equal to 2.049 and greater than 1.96, can be concluded with a 95% probability that social networks have a positive and significant effect on self-handicapping with the mediating role of self-regulatory learning strategies (value of $p < 0.05$; $0.152 = b$). In other words, in exchange for increasing one unit of social networks, self-handicapping with the mediating role of self-regulatory learning strategies increases by 0.152 units, and the coefficient of determination is equal to the

TABLE 4 Correlation between research variables.

	Social networks	Self-handicapping	Self-regulatory learning strategies	Academic achievement
Social networks	1			
Self-handicapping	0.742**	1		
Self-regulatory learning strategies	−0.685**	−0.663**	1	
Academic achievement	−0.676**	−0.657**	0.640**	1

**Correlation is *p*-value significant at the 0.01 level (2-tailed).

TABLE 5 Investigating the relationship between social networks and self-handicapping with the mediating role of self-regulatory learning strategies.

	Path coefficients	*T*-Value	*P*-Value	Condition
Social networks→ Self-regulatory learning strategies→ Self-handicapping	−0.685*−0.222 = 0.152	*2.049*	*<0.05**	Accept

*Significant at the level of 0.01 ($p < 0.01$).

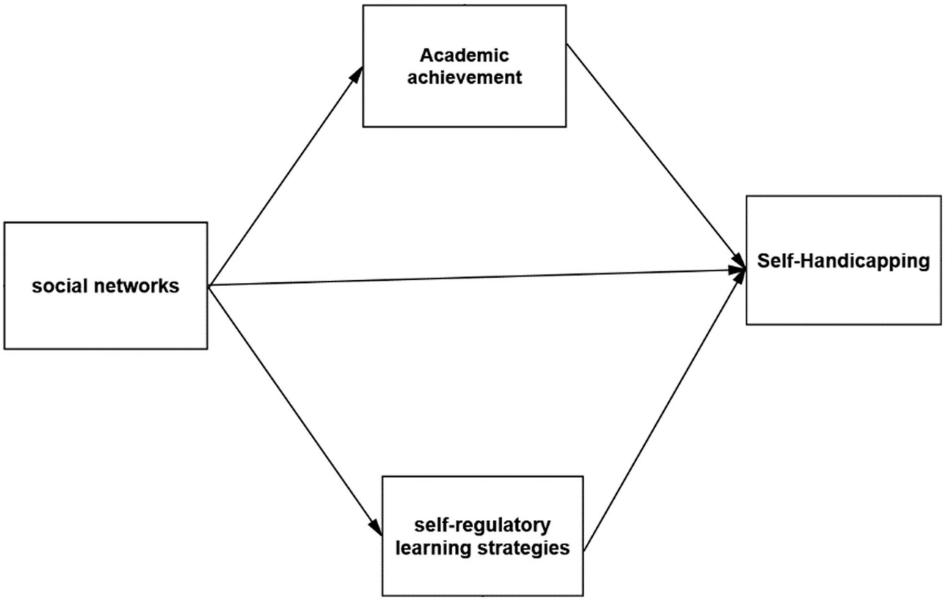


FIGURE 1
Research model.

TABLE 6 The relationship between social networks and self-handicapping with the mediating role of self-regulatory learning strategies.

	Path Coefficients	*T*-Value	*P*-Value	Condition
Social networks→ Self-regulatory learning Strategies→ Self-handicapping	−0.685*−0.222 = 0.152	*2.049*	*<0.05**	Accept

*Significant at the level of 0.05 ($p < 0.05$).

power of the path coefficient, which is 0.023, which shows 2.3% of the changes. Social networks cause self-handicapping with the mediating role of self-regulatory learning strategies.

> *Hypothesis 3*: Social networks significantly affect self-handicapping with the mediating role of academic achievement in language students of Tabriz University.

The results of this hypothesis are presented in Table 7.

The results of examining the mediating role of academic achievement using the Sobel test in Figure 3 and Table 7 show that the standard coefficient between social networks and self-handicapping with the mediating role of academic achievement is 0.146. According to t-test statistics, the Sobel test, which is 3.114 and is greater than 1.96, it can be concluded that with a 95%

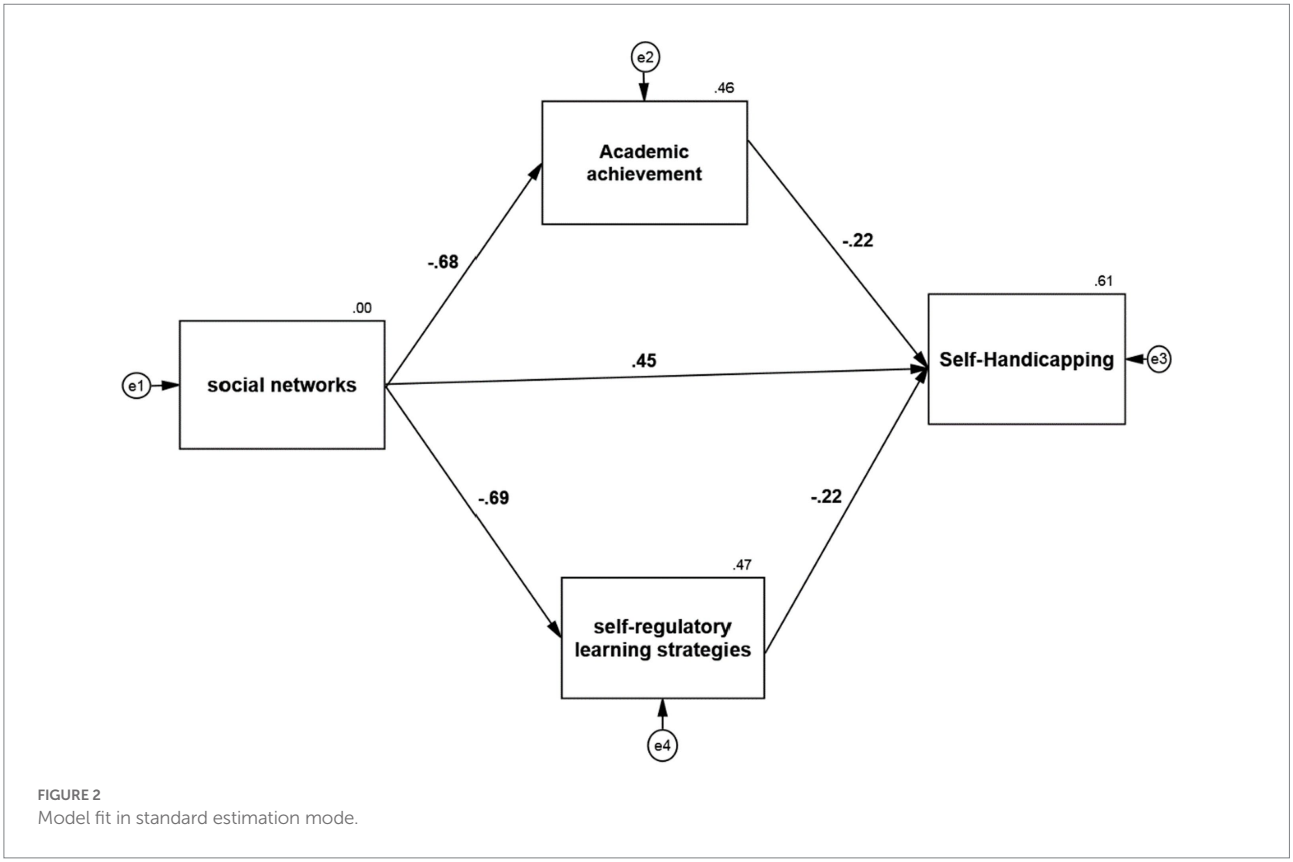


FIGURE 2
Model fit in standard estimation mode.

TABLE 7 Investigates the relationship between social networks and self-handicapping with the mediating role of academic achievement.

	Path coefficients	*t*-value	*P*-value	Condition
Social networks→ Academic Achievement→ Self-Handicapping	−0.676*−0.216 = 0.146	3.114	<0.05*	Accept

*Significant at the level of 0.05 ($p < 0.05$).

probability, social networks have a positive and significant effect on self-handicapping with the mediating role of academic achievement (value of p <0.05; β = 0.146). In other words, in exchange for increasing one unit of social networks, self-handicapping increases by 0.146 units with the mediating role of academic achievement. The coefficient of determination, which is equal to the power of the path coefficient, is 0.021, showing that 2.1% of the self-handicapping changes are caused by social networks mediating academic achievement.

Discussion

This study aims to investigate the effect of social networks on academic self-handicapping with the mediating role of self-regulatory learning strategies and academic achievement among EFL students of Tabriz University. Our research hypotheses are as follows:

(1) Do social networks significantly affect self-handicapping in language students of Tabriz University?

Findings showed a significant relationship between the use of social networks and students' self-handicapping. That is, with students' social networks, their academic self-handicapping increases. These findings are consistent with the empirical findings of researchers such as Uysal and Knee (2012), Callan et al. (2014), Fadhli et al. (2021), Vrij et al. (2021), Funkhouser and Hallam (2022), Schwinger et al. (2022).

When individuals fear or expect to fail in tasks that are important to them, they often engage in practices and behaviors that can increase the likelihood of failure (or at least lower achievement) so that they have an excuse for failure. This self-shooting can occur in any activity or domain. Academic self-handicapping has attracted a great deal of attention because academic achievement is reflected in an evaluative characteristic (represented as intelligence) and there are frequent opportunities for students to express their invisible abilities or shortcomings visibly. In other words, students often worry that they will look unintelligent if they are poorly tested on a test or task. Hence, they sometimes engage in self-handicapped behavior that provides an excuse for poor results.

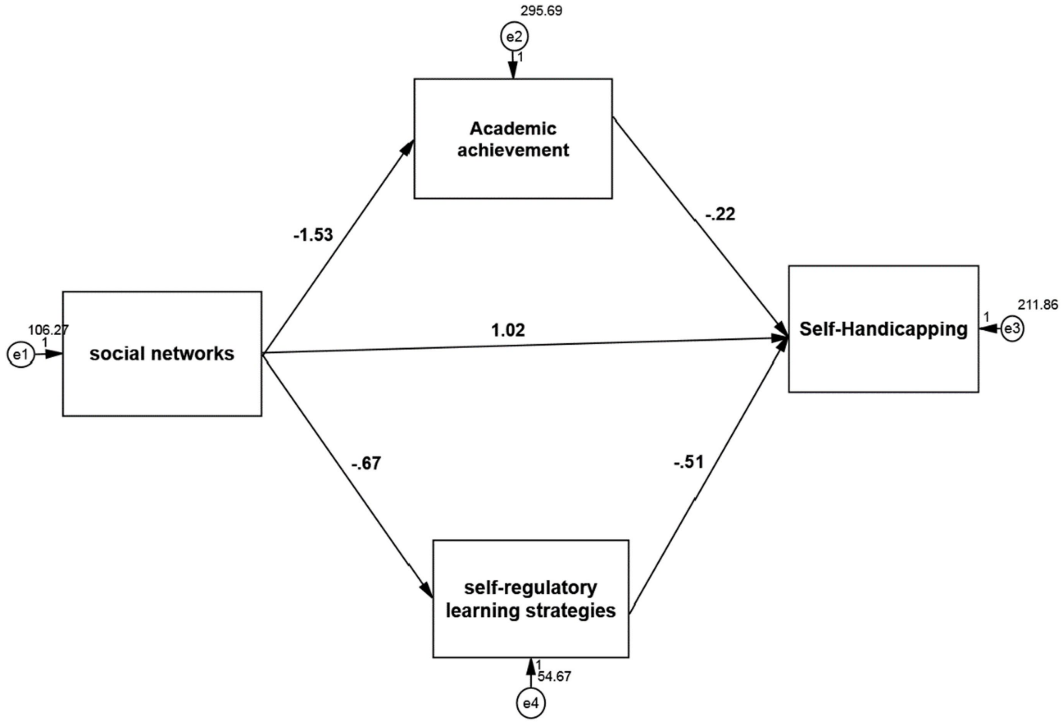


FIGURE 3
Model fit in non-standard estimation mode.

Self-handicapped behavior is associated with lower achievement. Since self-handicapping behavior represents a reduction or withdrawal of effort toward a given task (non-preparation for a test), it is not surprising that the tendency to self-handicap is associated with less impact on those tasks.

These studies' findings show that learners' academic self-handicapping can be predicted based on the use of virtual networks. In explaining this finding, it can be said that one of the things that are effective in the process of doing tasks related to university and class is seriousness and tasks; despite the use of social networks by students, tasks are not done. This action leads to academic self-handicapping, which experts consider to be a very important problem in the academic achievement of students and learners. Chavoshzadeh's research showed that too much time using the Internet and social networks causes academic problems and lowers students' grades.

(2) Do social networks significantly affect self-handicapping with the mediating role of self-regulatory learning strategies in language students of Tabriz University?

In recent years, academic self-handicapping has been proposed as a defect in self-regulation in the inability to control the subject's thoughts, emotions, feelings, and performance with the desired criteria (Schwinger et al., 2022). Therefore, self-regulation is one of the essential variables in explaining the cause of self-handicapping, so many researchers consider self-handicapping a defect in learner self-regulation (Funkhouser and Hallam, 2022).

Shin and Park (2021) believe that learners who use self-regulatory learning strategies are less likely to commit self-handicapping. Findings showed that the use of social networks has an indirect effect on students' self-handicapping through the mediation of self-regulatory learning strategies. In other words, the results showed that self-regulatory learning strategies indirectly affect the relationship between social networks and students' self-handicapping. Using social networks leads to increased academic self-handicapping. But due to the student's use of self-regulatory learning strategies in the learning process, the effect is reduced. Therefore, self-regulatory learning strategies can play a reducing and moderating role in the relationship between the two variables as mediating variables. It shows a close relationship between social networks and academic self-handicapping, and the use of learning strategies can affect the relationship between these factors. The use of social networks in the learning process by learners makes the individual more efficient in learning. It plays an influential role in reducing the factors that reduce the quality of learning. By including the variable of self-regulatory learning strategies, the relationship between the use of social networks and academic self-handicapping change; because self-regulatory learning strategies increase the efficiency of the individual, which is in contrast to academic self-handicapping.

Self-regulatory learning strategies are valuable mechanisms for advancing learning goals (Fadhli et al., 2021; Teng and Zhang, 2022). Research showed a positive relationship between the use of

virtual social networks and self-regulatory learning strategies and the components of self-regulatory learning strategies (cognitive and metacognitive strategies).

Theobald (2021) and Schwinger et al. (2022) also conclude that social media can facilitate the creation of personal learning environments and enable teachers to implement and develop self-regulatory learning processes such as setting appropriate personal goals, using work strategies to manage information, and engaging in self-monitoring. Self-assessment contributes to the advancement of social knowledge.

This study showed a significant relationship between self-regulatory learning strategies and students' self-handicapping. If the student uses more self-regulatory learning strategies in the learning process, it will reduce academic self-handicapping and vice versa. This finding is in line with the experimental findings of researchers such as Bakker and de Vries (2021), Shin and Park (2021), Theobald (2021), Azevedo et al. (2022), Khaneghahi et al. (2022), Melhem (2022), Papageorgiou (2022), and Schwinger et al. (2022). Explaining this finding, we can say that self-regulatory learning strategies are opposed to academic self-handicapping; because self-regulatory learning strategies are considered to set a goal and plan to achieve the goal; self-handicapping, on the other hand, is delaying tasks or delaying important tasks by substituting trivial things. Therefore, the nature of these variables conflicts with each other. So, using self-regulatory learning strategies by the learner in the learning process reduces academic self-handicapping.

Matzat also showed in a study that the use of social media is naturally related to self-handicapping learning. It also showed that teachers use social media to share information with students, both in and outside the classroom, and that using social media to facilitate self-regulated learning does not affect teacher-student relationships (Chizoba, 2017).

Beyond what has been said above, which is related to the positive aspects of using social networks, other research results show that virtual networks do not lead to self-regulatory learning. In this regard, we can point to the factors affecting the relationship between these variables. One of the influential factors is Internet addiction and improper Internet use. Internet addiction is generally defined as Internet use that can cause psychological, social, academic, and occupational problems in a person's life. Bakker and de Vries's studies showed a negative relationship between Internet addiction and academic achievement. In other words, if people use the Internet or virtual (social) networks too much, it will decrease academic achievement. Therefore, it can be said that inappropriate use of the Internet and related issues such as virtual networks affect a person's personality, which leads to disruption in life, the obvious signs of which can be a lack of attention to purpose, the value of time, and schedule—planning and managing available resources such as time, etc. Self-handicapping learning strategies are more related to issues such as goal selection, planning, and resource management to achieve the desired results (Schwinger et al., 2022).

3) Do social networks significantly affect self-handicapping with the mediating role of academic achievement in language students of Tabriz University?

The findings of this research show that the use of virtual social networks has positive effects on the academic achievement of language students. Results of Malmir et al. (2015), Emami Rizi (2015), Alwar and Maqam's research (2017), Chizoba (2017), and Tazer et al. (2017) confirm this research result. The positive influence of social networks on improving academic achievement can be seen in the main features of social networks such as interactiveness, participation, and the possibility of using multimedia content. In virtual educational environments, people are responsible for their learning and are active, and these factors improve progress.

These findings align with the empirical findings of researchers such as Cengiz-Istanbullu and Sakiz (2022) and Papageorgiou (2022). Explaining this finding, it can be said that using social networks can produce different results depending on the purpose and type of application. In other words, just as excessive and inappropriate use leads to unwanted and harmful effects on people's performance, in contrast, its purposeful and useful use leads to positive impacts on performance mechanisms and favorable outcomes in performance.

Excessive use of these networks causes a drop in academic performance as well as educational performance. Spending more time in these networks reduces the study of students. Also, since most students spend long hours of the night on these networks, they cannot attend the classrooms with enough concentration. As a result, spending too much time using virtual networks has a negative effect on students and disrupts their academic achievement and education.

Individuals who show failure may in the future develop an expectation of low achievement on similar tasks, especially if they believe that failure is caused by stable and uncontrolled causes, such as lack of ability. Once individuals believe they may fail in an upcoming task, they are more likely to engage in self-handicapped behavior. The cycle of failure → self-handicapping → failure can result in a gradual withdrawal of effort in college (or any domain), leading to complete withdrawal from activities. When students are concerned that they may be doing worse than their peers (although they are not assessed as academically incompetent), they are more likely to self-handicapping (Schwinger et al., 2022).

Conclusion

The purpose of the current study was to investigate the effect of social networks on academic self-handicapping with the mediating role of self-regulatory learning strategies and academic achievement among EFL students. This study showed that social networks have a significant impact on self-handicapping in language students of Tabriz University, second social networks have a substantial impact on self-handicapping with the mediating role of self-regulated learning strategies in language students of Tabriz University,

and third-social networks have a significant impact on self-handicapping with a mediating role of academic progress in language students of Tabriz University. Further investigation and experimentation into social networks are strongly recommended. In addition, studies show that self-handicapping is successful in helping individuals divert the assessments of others from attributing weak abilities to failure. Because self-handicapping behavior undermines achievement and can lead to long-term withdrawal from activities (such as school and college), parents and teachers must discourage self-handicapping and avoid behavior that may encourage it.

In the present study, there were limitations such as not investigating the role of factors such as academic motivation, self-efficacy, and beliefs related to academic affairs. Generalizing the results of the larger society and the entire country's students should be done with caution. According to the findings, it is suggested: National media should consider programs as informal education to inform about the harmful consequences of improper use of social networks. The Educational Research and Planning Organization of the country and the textbook authoring office and institutions related to the production of curriculum content should compile content to improve students' awareness about using social networks correctly. School managers should organize educational workshops to inform the student community so that students know the disadvantages and advantages of virtual networks and can make good use of social networks to advance their education. Administrators, teachers, and parents of students should cooperate to control students' optimal use of social networks. Teachers should inform students about the benefits and goals of using self-regulated learning strategies. Teachers should teach students how to use self-regulated learning strategies in the learning process in appropriate extracurricular opportunities.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Factors influencing the choice of private or public schools: Evidence from Georgia

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The existence and development of public schools is influenced by a plethora of factors. Through the creation of education policies, any state education system is striving to accomplish specific goals. Both informal and formal private schooling is taking the lead in all cultures and societies. Unmistakably, the distinction between private and public schools is evident. However, given the different circumstances, choosing the best alternative for a child is regularly a fervently discussed topic among parents. There is no universal answer to the question whether private schools are actually better than or superior to the public schools. Our research aimed to describe the school choice process, it focuses on unveiling the factors and their interrelation while the parent choosing between two types of schools—private and public. First of all, the research aims to describe the parent's perception of achieving success at school, what is the base for such belief, what the sentence—"School—base of future success" actually mean. How important is so called social index? The significance of the reputation and prestige of the educational institution during school choice process—as a guarantee for future success. The key questions for the research were as follows: (1) How interested the parents are to be actively involved in school choice process and spend certain period of time for that? (2) What factors are considered by the parents during school choice and what is the source they receive information from? (3) Does the family's socioeconomic condition and the kids gender have influence on the process? It's worth mentioning that, generally the research results fully coincide with the school choice theory arguments and the research findings conducted in the similar field. All these are described and presented in the first part of the article. The probabilities listed on the base of the current data, that the information source, the parent's information level, the parents' engagement as well as the family's socioeconomic and demographic status play integral role in the school choice process appeared to be genuine. Apparently, the parents are much interested to provide perfect future for their kids, though

socioeconomic conditions, environment, poor educational system limits their choice. Once our results compared to the existing literature and theory, one can see that our study conducted in Georgia follows the trends of the developed countries, known as the "Heyneman-Loxley effect."

KEYWORDS

education, school choice, public school, private schools, quantitative research, education research, Georgia

Literature review

Based on its multifactorial character, the school selection process is a popular issue of research and attracts the attention of various researchers and educational theorists. For instance, Fowler stated that choosing a school can easily be the most controversial education policy issue of any time (Fowler, 2002).

Generally, the discussion issues are following: should the parent be given freedom during the school choice process, if yes, what is the maximum level of interference, as well as should the government support the increased competition in the education sphere, if yes, give the hints how? The first part of the literature review will cover the Q & A regarding the abovementioned issues, later specifically the selection/choice process and the factors influencing the process itself will be discussed.

Private and public schools

The scholars attempt to outline private education as accurately as possible. Lewis and Patrinos (2012) identify three characteristics distinguishing private education from the public education: funding, sponsorship, and management/control.

The meaning of the term "public" and "private" has changed through years. Its meaning may vary from country to country. Private schools are often state-funded. For instance, charter schools in the US are the best examples. Georgia has a voucher system that implies that the private sector receives these vouchers additionally to extra payment from parents. Therefore, it is difficult to come up with a particular definition for private schools.

In developing countries, the private education system is a guarantor of academic and social security. Since the state fails to provide primary education for all, in some countries, private education is the only way to get quality education, filling the gap left by the state education system.

Many scholars focus on identifying the difference between the private and the public schools. They all undoubtedly agree that public and private schools are significantly different in terms of environment and management. "The private school is characterized by several factors and characteristics, admittedly associated with efficiency, they belong to different sectors of the market and policy controls, they vary in terms of a social control method: state schools represent a hierarchical system of subordination that is structured by democratic politics, while private schools have a wider degree of autonomy, controlled by the market demand and delivery mechanism" (Chubb and Moe, 1988).

Freedom in school selection/Choice process

According to John Stuart Mill "the objections which are urged with reason against state education don't apply to the enforcement of education by the state, but to the state taking upon itself to direct that education. . .. All that has been said of the importance of individuality of character, and diversity in opinions and modes of conduct, involves, as of the same unspeakable importance, diversity of educations" (Allison, 2015).[1]

Mill's "Diversity of Education" idea came to spotlight together with the opportunity to develop the school selection/choice right, that happened in Anglo-Saxon reality.

Friedman's (1955) proposed idea of educational vouchers, which would encourage the introduction of competition in the education, inspired the new theoretical course to be established giving the base to the innovation reformation policy in USA and then in the whole world.

Generally, in reforming states and not only there, there is rising tendency of the parents' distrust toward public schools, meaning that they will fail to meet their kids demands and goals (it is no surprise that parents are scrambling for enrollment in the limited functional sub-system; Blake and Mestry, 2021). Many parents doubt the government's dedication for providing the educational system with the appropriate standards.

School selection/choice right is an issue of enduring discussion. According to Goodwin (2009) the arguments named by the opponents of the choice can be listed as follows: (a)

1 John Stuart Mill, 1859, On Liberty.

The excising market is poor in managing certain issues; (b) The choice in education necessarily has deleterious effects on social justice. It underlines and deepens the excising inequality; (c) The choice is not an effective tool for increasing the standard. Thus, out of the above listed three opinions, the very first is an ideological argument in general, so in this particular article we will focus on the rest two issues.

According to the choice proponents the school selection/choice process is equal to other similar decisions, which the parents make on the base of the conditions created by the market, thus the parent, as a consumer should have freedom of choice and right either. At the same time the choice proponents are focusing not only on the parents' rights of freedom of choice, but they assure that the freedom of choice is ultimate stimuli for the schools' improvement (Davies and Aurini, 2011, p. 460).

Besides this, the parents are well aware of their kids knowing their strength and weakness, as well as their interests and demands. Thus they appear to be the best of the best choice and decision makers. In parallel with this, if the government provides the selection/choice process funding, the poor (not well-off) families will also have opportunity to select the school they favor (Friedman and Friedman, 1980).

According to minor chance of choosing in the traditional schooling system too, though only rich families, who either can pay the private school fee, or move closer to the better school, can afford this. Thus only reformed system, when there is a public funding for providing freedom of choice, can give chance to the poor (not well-off) families to make a choice.

Providing school selection/choice can be the merit of the following: by extending the variety of school types, by expanding the publicly available information about schools, and by expanding the parental capabilities to choose (Davies and Aurini, 2011, p. 460).

The following ideas can be used to provide the appropriate public funding for school choice: opening catchment programs, the creation of specialty schools within the public school boards, partial funding of independent schools, charter schools, voucher programs, laws that facilitate home-schooling, and tax credits for private school tuition.

All the above listed initiatives were vast popular in USA during last decades of the twentieth century and later the similar tendency was spread in other countries too (Belfield and Levin, 2002; Merrifield, 2008; Hess, 2009, e.g., Hepburn, 2001; Robson and Hepburn, 2002; Davies and Aurini, 2011).

The reform launched in the last decade of the twentieth century made it clear that the school choice right will reduce the bureaucratic control, decentralization and will improve the schooling system in general (Clune, 1993).

Compering educational pluralism[2] with uniformity, the current mechanisms in use (tax credits, vouchers, scholarships) Berner (2016) concluded that "[pluralism] is more intellectually honest and democratically aligned ... and schools with distinctive missions often produce better academic and civic outcomes for students."

Generally, school choice includes 2 aspects: (a) Policy or regulation defining the equality of power for private and public schools; (b) Public funding, providing the parent's freedom of choice on behalf of both for public or private schools (Robershaw et al., 2022).

In theoretical literature, during discussing the schools' choice issue the focus is made on the following three factors: (a) School choice results, which are generally measured on the base of the students' evaluation; (b) The schools provide the delivery of quality education, meaning how the school responds the market demand; (c) During the selection/choice which aspects are the vast priority for the parents, and how they behave; We focuses exactly on these issues.

School choice process by the parents

When we are discussing the parents' role in the school choice process, 2 fundamental questions should be asked: (1) Are the parents motivated enough to participate in the process and use all the chances existing on the market? (2) What are the key issues the parents pay the most attention during the choosing process? In other words, 2 things should be clear while talking about the parents: (1) What they demand from the school; (2) Are they capable enough to evaluate each school quality and make rational decision for their kids during the school choice process, or will the government be the better variant for that.

The school choice proponents assume that the most parents desire school variety, are primarily motivated to seek academic quality, and will use available information on achievement when selecting schools. Opponents doubt these assumptions, countering that many parents are more interested in a school's exclusiveness rather than its pedagogical quality, and that parents use criteria other than test scores when selecting the schools (Davies and Aurini, 2011).

The school choosing proponents stress the revitalization of public education through the creation of private alternatives, thus enhancing parental involvement, satisfaction, empowerment, and sense of community, and resulting in improved student achievement (Chubb and Moe, 1988; Driscoll and Kerchner, 1999; Smrekar and Goldring, 1999).

According to them this system prepares a solid base for competition between the schools as a result of which the schools

2 According to author educational pluralism charts a middle course, between libertarian approach and *status quo*, that offers an expansion of educational options within a common accountability framework.

appear to be more responsive to the needs and interests of parents and students by providing different types of programs for different types of families (Bosetti, 2007). Thus, on the one hand the individual demands from the students and their parents, and on the other hand the high competition between the schools should make the educational institutions to be attentive toward their clients (parents and students) demands, to attract more students which mean more funds as well.

Though according to the opponents, if the parents don't have desire or initiative to participate in the school choice process, the choosing system will fail to work and will never become the alternative of the traditional public school. On the other hand, the public schools own more formal and familiar tools and mechanism, which theoretically should help the parents in decision-making. The critics also underline that during the school choosing "parents are able to select their own vision of the 'good life' without considering the social goals. This could lead to a loss of diversity and educationally sound public schools and democratic values" (Erickson, 2017).

At the same time "school choice may result in the creation of value communities that reflect 'little fiefdoms' that cater to the needs, values, and interests of particular groups. This contributes to the further social fragmentation of society and a two-tier education system" (Gewirtz et al., 1995; Fuller et al., 1996). And this prioritizes the well-off middle class of the society, who owns social and cultural capital for gaining the appropriate information (Bosetti, 2007). For defining the social capital, let's use Bourdieu's explanation: "Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition [.]" (Bourdieu, 1986). In our case, the parents' social capital is defined they their own circle/environment, who helps them to have access to the appropriate information for making proper decision (Corcoran and Jennings, 2020).

To its end, the family's cultural capital is "knowledge and skills acquired over time, through 'socialization and education that exist within us,' 'material objects or cultural goods,' and 'institutional acceptance or recognition in the form of academic qualification and credentials'" (Bourdieu, 1986). Frequently the family's socioeconomic status is defined as the best indicator for outlining the family's cultural capital (Robershaw et al., 2022). When we are talking about the maintaining the existing social configuration and deepening the segregation danger while school choice process, Gorard, Fitz research is worth mentioning. The research results showed that, in 1988 the fulfillment of the Education Reform Act[3] didn't cause any of the above listed results in the schools of England and Wales. According to Bosetti (2004) rational choice theory suggests that parents are utility maximizers who make decisions from clear value preferences, and that they can be relied upon to pursue the best interests of their children.

At the same time, the theory says that they are able to demand effective action from local schools and teachers. Though the modern researches show that rational choice theory is totally useless to explain the school choice process from the parents (Jabbar and Lenhoff, 2020).

The rational choice model totally rejects the importance of the parent's social network, the fact how the preferences of the different groups vary or what harm can the lack of information bring during the school choice process (Levin, 2009).

One of the approaches used for studying the school choice is the Cultural-Historical Activity Theory (CHAT) described by Engeström in 2001.[4] In case of studying the school choice this covers multiple factors, which may influence each and every individual during his/her school choice process.

It's worth considering that each and every individual's approach and interpretation regarding the school choice goals and objectives, at least slightly differ. According to Sullo (2011) "choice theory posits that an individual's behavior or choices they make are driven by a never-ending quest to satisfy five genetically driven needs and four fundamental psychological needs" (Blake and Mestry, 2021). The critics frequently say that during the school choice process, the parents may prioritize their choice due to convenience or considering certain build-in activities including sports over the schools' academic level (Harris and Larsen, 2015). According to Erickson (2017), its beyond sophisticated to measure the academic level. It's even more sophisticated, to define its real meaning as it includes exams results, teachers' quality, educational environments and infrastructure, as well as educational programs. He also underlines that, generally it's not fair the parents to pay key attention only to the academic level as the families' demands and goals differ.

What factors influence the school choice

Generally, the school choice is quite a complex issue and is the mix of religion, practical demands and opportunities correspondingly. It's widely spread that those who believe in the vast necessity of freedom of choice, they use this opportunity/right. Would-be choosers are seen to want more input into school decisions, more responsive educators, and more transparent information about school performance.

3 The Education Reform Act 1988 (and subsequent case law) gave all families the right to express a preference for any school (even one outside their Local Education Authority) and denied schools the right to refuse anyone entry until a planned admission number was reached.

4 CHAT is a cross-disciplinary framework for studying how humans purposefully transform natural and social reality, including themselves, as an ongoing culturally and historically situated, materially and socially mediated process (Roth et al., 2012).

Furthermore, choice is seen to be particularly popular among parents who are deeply involved in their children's schooling (Davies and Aurini, 2011).

In the developing states, the parents progressively acknowledge the increased value of the education for their kids' future and for creating priceless opportunities in their lives. Thus, this doubtlessly upsurges the school choice process significance. It's noteworthy that those parents who are actively involved in the school choice process, are also actively engaged in their kids' education progression and appear happier with the school compared with those, who absolutely are not involved in the procedure (Bosetti, 2007). Lee et al. (2021) were researching the interdependency of quality and choice. On the base of the research they identified three conclusions: (a) The parents are happier when there is an opportunity to choose confirming that this makes the process much more fair; (b) Though later evolution of the selection objects (in case of experiment till 8) did not have any influence either on satisfaction quality or on the fairness level; (c) Whether performance declines or increases does not affect the effect of provider choice on satisfaction, and, by itself, performance decline lowers satisfaction and perceptions of fairness, consistent with what would be expected from the findings of previous research on public service performance outcomes and satisfaction.

According to Coleman et al. (1982) when a person has to make an important decision, he/she starts to gather information regarding the issue. The situation is all the same with the parent, who has to make choice about his/her kid's school. During the decision-making process the parent considers his/her personal values and the subjective perception of the existing educational system. The appropriate information is gathered through the parent's social and professional circle/environment. Thus, it's logical that those parents who have limited access to valuable and relevant information have trouble to make well-informed choice (Smrekar and Goldring, 1999). Social-economic factors play integral role in the selection/choice process, to be more precise, meaning the parents' education level and income (Bosetti, 2007). Many scholars mention that the level for having chance to make informed choice depends on the family's socioeconomic and demographic parameters.

To be more precise, socioeconomic status is seen to provide the knowledge and finances needed to engage in choice, while dominant racial and ethnic groups are seen to be motivated to segregate themselves from minorities (for a review, see Lauen, 2007).

Davies and Aurini (2011) researches show that: (a) The majority of Canadian parents support the freedom of choice right; (b) The using of the right of choice depends on socioeconomic and demographic indicators—in reality the parents with higher education use the right of choice more actively. At the same time, less educated parents, as well as ethnic minorities, express eagerness to support the freedom of choice, this means that they would use the chance if they had the opportunity. (c) Third, a mix of educational attitudes predicted choosing; the most consistent was that parents with higher levels of participation in their children's schooling tended to do more choosing (Davies and Aurini, 2011, p. 472).

According to Bosetti (2007) research the educated, employed parents with high income are more active in using the right of choice. At the same time the researches show that the families with high income prefer private schools (Bosetti and Pyryt, 2007) and in case of need, they are ready to move to the expensive districts to live in (Goyette, 2008).

Bosetti (2007) research also showed the role of family condition in school choice process, mainly in case of religious private schools. The vast majority of parents interviewed, indicated that they are married, with religious private school parents being most likely to be married (95%). It's quite interesting that the parents of the alternative and secular private schools, in frequent cases appear to be divorced or single parents. It's also worth mentioning that, the parents of the private religious schools' students own similar or lower socioeconomic status compared with the parents of the public schools' students' (Bosetti, 2007). All abovementioned indicate that while religious school choice the parents prioritize the values and they are ready to pay 'certain price' for their kids' future.

It should also be considered that the parents' socioeconomic status also defines their perception regarding the importance of education. Hatcher (1998) explains that "working-class young people can maintain their class position, and even achieve some upward mobility, simply by completing compulsory secondary education," when middle-class families are more anxious about the educational options for their children because the benefits of attaining certain educational qualifications and credentials are higher, and the risk of social demotion greater. Therefore, because of these perceived high stakes, middle-class parents are more likely to be predisposed to engage in education markets (Bosetti, 2007).

Some scholars think that, while analyzing school choice, the kid's gender should also be discussed as one of the integral factors. According to them, the parents have different approaches toward daughters' and sons' education. Bellani and Ortiz-Gersavi (2022) research shows that in Italy, for the low income families "parental time preferences matter more for sons than for daughters of lowly educated parents. This gender effect is found both for upper secondary choices and for entry into higher education." They explain this with different expectations linked to their children. The parents think that sons have higher chance for the career promotion compared with daughters, who should mainly focus on building good family. Such different expectation becomes base for different attitude while school choice. Sahoo (2017) shares similar tendencies though on the example of India. According to his research and analysis households choose to provide their sons rather than daughters with an education which is more expensive and

which they perceive to be better in quality. Such attitude is unveiled while selecting the school type—if the family has to choose, which kid should get private (high quality) education, in major cases they send sons to the private schools, as for the daughters, they are sent to public (lower education quality) schools. As it was underlined above for several times, the valuable info gained about the school appears to be one of the main factors for the parent to make final decision. Key sources for the information gathering are friends, neighbors, other parents, as well as teachers, school administration staff who share valuable info to the parents before they make any choice. This once again underlines the importance of the social-cultural role while making final decision from the parent. Thus because of this, the school choice theory opponents assure that, the parents with lower socioeconomic status have limited access to the useful and adequate info. Hence, they are lack of motivation to reserve themselves from sending kids to the neighboring schools, meaning that they won't spend much time and energy to seek for better options. As a result of this, according to Bosetti (2007) research, nearly half of the public schools' student's parents choose the schools before having appropriate information about the certain institution, and this basically exceeds the data regarding the alternative and private schools (21 and 7%, respectively).

Thus, to sum up Bosetti (2007) research results, for the private secular schools' parents, the most important factors are the class size, values, teaching style and academic reputation; in case of private religious schools—the most important are values and academic reputation; as for the family/public schools—the most significant factor is closeness to house, then comes academic reputation, teachers' qualification and teaching style.

To keep it simple, the private schools' students' parents do their best to choose school based on their kids' individualism and demands; though public schools' students' parents simply accept the existing reality; only exceptions are the lower class religious parents, for whom religion is much important and they are ready to make certain commitments above their power and provide proper education for their kids in private religious schools.

Sending kids in public schools in frequent cases is the result of limited alternatives or just limited access to the information (parents just don't have info about other educational facilities). As a rule, the parents of the public schools' kids, state that if the government provide funding, they would have sent their kids to the private schools with the great pleasure (Bosetti, 2007).

According to Blake and Mestry (2021), in frequent cases the parents have utopic expectations as a result of which they fail to make proper decision. This happens when the parent is lack of proper knowledge/experience regarding educational system or has limited financial condition.

It's obvious that the family's financial condition influences the freedom of choice, vividly showing the government's policy to support the school selection/choice principle to be fair and right, because "without tuition vouchers or bursaries the competitive market pressures generated by these parents is restricted to charter schools or alternative schools in the public education system." This once again shows that while making school choice, the parents personal attitude is vast important, as according to it, the parents make clear what kind of education, skills and values should their kids' elaborate during their years at school (Wells, 2000).

As a rule, the parents agree that the key function of the school is to deliver academic knowledge, good working skills, self-discipline, and critical thinking to the kids, though different groups of parents differently prioritize those characters.

To sum up, the parents' final decision regarding the school choice is defined by following factors: family characters (socioeconomic status, education, income etc.); other demographic characters—kid's educational demands; Parent's knowledge of system/appropriate information (exciting school types, exciting school choice programs/policy, and opportunities); Parental perspective of school choice (exciting school types, exciting school choice programs/policy, and opportunities) (Robershaw et al., 2022).

Erickson (2017) underlines three patterns in literature: (1) There is great consistency in parents' stated preferences of school characteristics across choice programs; (2) Parents value academic quality, but it is not always their most prized school feature; (3) Parents make trade-offs among their preferences when selecting a school."

According to Fowler (2002) "School choice is going to continue to expand whether we like it or not. Parents like the idea of being able to select their children's schools, and public support for the idea has grown enormously over the last decade or so."

It is common knowledge that providing education is a parent's responsibility, and a parent tries to create the best learning environment for a child. It is the parent's responsibility to take care of a child's health, safety, development, and success. Below is listed literature that identifies ten key factors affecting parental decision-making regarding the school type selection: (1) parental social status; (2) income; (3) school syllabus; (4) school environment/infrastructure; (5) school achievement/location; (6) location; (7) qualification of teachers; (8) school image/reputation; (9) the role of religion or moral values in school choice; (10) social selection and social experience for children.

The Heyneman-Loxley effect

According to the study of Heyneman and Loxley (1983), the family and school impact on students' academic achievement is highly depended on the degree of economic development of a country/community. Socioeconomic status (SAS-socioeconomic status). While the family impact is more

significant in developed countries, school resources and quality of school education is a more reliable determinant for low-income countries.

The research has also shown that when it comes to the mathematics and science, high-income countries have higher academic achievements compared with low-income countries. This finding has been named the "Heyneman-Loxley Effect." To explain it briefly, Heyneman and Loxley developed a theory in which family characteristics correlated with school characteristics and student achievement rates.

This case was later explained by Baker et al. (2002) as follows: Education policy in the developed countries and existing areas provide a certain degree of public schooling, creating the environment where the distinction between public and private schools is not so significant. What we are left with is a family socioeconomic condition as a key distinctive feature. In less-developed countries, a uniform minimum standard of schooling does not exist, and therefore, a school factor may turn out to be a decisive determinant, exceeding the quantity of family factors.

After the study referenced above, no study has been carried out in various countries utilizing the same standard until 1990. There was just one—we would be able to generate results and compare the data. Since 1990, this has changed with single-standard international studies that were conducted in different countries (TIMSS, PISA). However, the research conducted under the auspices of TIMSS (1994), considered a minimal number of the family characteristics—such as mothers' and fathers' education and the number of books in the family. The research analysis led in 1994 failed to prove the "Heyneman—Loxley effect." Yes, there were existing differences, but not significant enough in terms of variables. A 21-year-old analysis showed that among three factors—school quality, family socioeconomic status, and student academic achievement, are not interrelated with the country's economic performance as described above—the authors conclude that the "Heyneman-Loxley effect" either did not exist or it has undergone the transformation during 21 years. One of the objectives of our research/study is to check the abovementioned conclusion's accuracy in case of Georgia, as an example country.

Development of education system in Georgia

Prior to the Proclamation of the First Republic on May 26, 1918, Georgia was a part of Tsarist Russia and the school system was governed by the rules of the Russian Empire. The gradual subjugation of the Georgian kingdoms by the Russian Empire (first half of the nineteenth century) coincided with an ongoing school reform in the empire.

A fundamental educational reform, prepared by the closest associates of Tsar Alexander I (1777–1825), created a hierarchical school system headed by the Ministry of Public Education and regulated by *The Charter of the Universities of the Russian Empire* (1803). It included six educational regions with four types of institutions beyond elementary schools: parish schools, *uyezd* (district) schools, *gymnasiums,* and universities. Russian education evolved with both minor and major changes. In 1828 the course of study at gymnasiums was extended to 7 years, with priority given to classical education. Schools with instruction in Armenian, Georgian, and Azerbaijan languages were opened in the Caucasus. The turning point in the development of the Russian educational system was the reform of the 1860s carried out as part of cardinal transformations under Czar/King Alexander II (1818–1881). *The Statute on Elementary Public Schools* of 1864 declared elementary education open to all social ranks. The reform strongly encouraged private and local initiative in establishing new schools.[5]

In 1918–1921, the Democratic Republic of Georgia implemented crucial reforms in the field of education. The Law on Public Education was adopted. The education system was based on the principles of democracy, equality, universality, human rights. Schools taught the following subjects: Georgian language and speech, Russian and world literature, second foreign language (French, German, or English), history, political economy, law, psychology, logic, natural sciences and mathematics, hygiene, physical education, chanting and music, handicrafts and fancywork/needlework. Latin was an elective/optional subject. Alongside with the world history and non-Georgian language, teaching Georgian language and Georgian history was compulsory in all non-Georgian schools. At this time there were some privately operated schools. Their compliance with the country's legislation and students and teachers' rights were all monitored by the government. A significant number of schools were based in Tbilisi (Georgia). There were some private schools in Kutaisi as well. Their programs, plans and textbooks were reviewed by Ministry of Education. The annexation of Georgia by Russia in 1921 was followed by the changes in the school system as well. In April 1921, by the decision of the Revcom of Georgia, the People's Commissariat for Education was established. The first task of the Leninist Cultural Revolution was to eliminate/eradicate illiteracy and transform public education on a social basis. In 1921, a commission set up by the Department of People's Commissariat for Education of the Georgian SSR drafted the Republic's "Uniform Labor School Regulations." It was to provide free, universal polytechnic education for both sexes in Georgia to expand the network of pre-school institutions that were the basic principles of the new Soviet

5 Russian Federation - History Background - Education, Schools, Educational, and School - StateUniversity.com https://education.stateuniversity.com/pages/1265/Russian-Federation-HISTORY-BACKGROUND.html#ixzz6swsAsSYb.

public education system. The education system of the Soviet Union was a classical model of education that was introduced from Germany and Israel.

Elementary schools were called the "beginning/beginner" level (in Russian: начальное, *nachalnoye*), 4 and later 3 classes. Secondary schools were 7 and later 8 classes (required complete elementary school) and called "incomplete secondary education" (in Russian: *неполное среднее образование*, *nepolnoye sredneye obrazavaniye*). This level used to be compulsory for all children (since 1958–1963) and optional for under-educated adults (who could study in so-called "evening schools"). Since 1981, the "complete secondary education" level (10 or, in some republics, 11 years) was compulsory. 10 classes (11 classes in the Baltic States) of an ordinary school was called "secondary education" (in Russian: *среднее образование*, *sredne obrazovanye*—literally, "middle education"). PTUs, tekhnikums, and some military facilities formed a system of so-called "secondary specialized education" (in Russian: *среднее специальное*, *sredneye spetsialnoye*). PTU's were vocational schools and trained students in a wide variety of skills ranging from mechanic to hairdresser. Completion of a PTU after primary school did not provide a full secondary diploma or a route to such a diploma (Grant, 1979).

Such was the education system in Georgia when the country declared its independence on April 9, 1991, which then gained international recognition in 1992.

The rise of private schools in Georgia has been growing for more than 20 years since its independence from the Soviet Union (see the map of modern Georgia in addition 1). Throughout this period, it has undergone several stages of development. The first Georgian private school was established in 1991. Since then, its number has been growing over the decades. The most dramatic jump was in 2005 and 2006. The reasons behind the drastic increase are many, though the most significant changes can be linked to economic growth and educational policy. Almost at this time, a new model of educational system management was introduced. The government chose to finance students but not educational institutions. An education voucher enables a parent to choose to spend the received fund either on private or public schooling. As a consequence, private schools receive up to 20 million GEL from the state budget. The education policy has increased not only the number of private schools but the number of students as well.

In the beginning of the 2021/2022 academic year, there were 2,313 general education institutions in Georgia, including 2,086 public, and 227 private schools (National Statistics Office of Georgia, 2019).[6] Prior to the reform, the public education system in Georgia was not responsible toward the government. The system was overloaded with bureaucratic functionaries that had dozens of overlapping obligations and duties, characterized by the lack of effective coordination, administration, and financial management mechanisms.

The introduction of a voucher system in the field of school education, has transformed the system, which was under state control. The market economic principle came into play and developed a supply and demand marketing mechanism for education. The introduction of the voucher funding in the school education served to improve school education and environment for a parental choice. School funding has also been a source for private schools. Despite the state voucher funding, the primary input is the fee paid by the parents. The data shows that fee is higher in cities, and it is significantly higher in Tbilisi, the capital of Georgia.

Rarely schools have sponsors or partner organizations that fund them. In most cases, this involves initial infrastructure development and school running costs (utility costs and hand-over costs). The patterns of manufacturing and education partnerships which are common in the western countries are rarely found in Georgia.

However, along with the advantages, this process has its adverse sides. The increased public funding has expanded the state dependence, letting the state interfere in the operation of private schools, invoking more standardization of the curriculum—the new systems of issuing school certificates through a unified national exam, the so-called branding proposed system. The latter encourages private schools to modify their success criteria (in some cases to worsen it) exchange for certain benefits from the state.

Currently, the primary indicator of private schools' weakness can be their dependence on the state and the lack of instruments necessary for internal financial sustainability.

The researches show that the private schools are far more successful considering academic performance compared with the public ones. **Figures 1**, **2** shows the quality level difference between various types of schools (including private schools). The table demonstrates the private schools advantage over other public ones.[7] TIMSS International Research of Study, 2015-2016.

In private schools, higher academic performance level is the merit of not only quality learning, but various other reasons as well. Some private schools have their own policy and criteria of accepting the students, such as: testing and interview. Considering this factor, it may sound unfair to judge the schools according to their academic performance. The academic results depend not only on schooling surroundings, but on the conditions and support from the family either. Thus, because of this, it's rather interesting point how the parent prioritizes the educational institution's academic performance level during school choice process and final decision-making.

6 https://www.geostat.ge/en

7 National Assessment and Examinations Center official website https://timssandpirls.bc.edu/timss2015/international-results/wp-content/uploads/filebase/full%20pdfs/T15-International-Results-in-Mathematics.pdf.

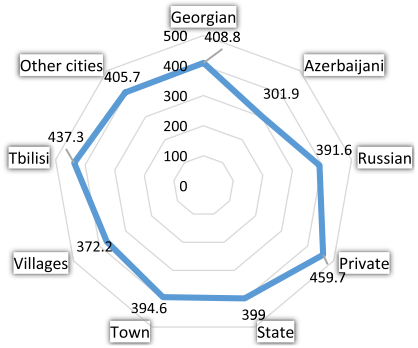


FIGURE 1
Students' grade in mathematics by type of schools.

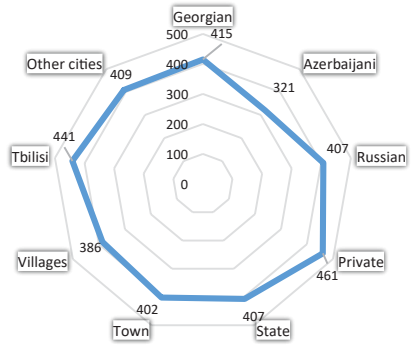


FIGURE 2
Students' grade in natural sciences by type of schools.

Research context and methodology

Goals and objectives of the research

The research aims to describe the school choice process, it focuses on unveiling the factors and their interrelation while the parent choosing between two types of schools—private and public. First of all, the research aims to describe the parent's perception of achieving success at school, what is the base for such belief, what the sentence—"School—base of future success" actually mean. How important is so called social index? The significance of the reputation and prestige of the educational institution during school choice process—as a guarantee for future success.

The key questions for the research were as follows: (1) How interested the parents are to be actively involved in school choice process and spend certain period of time for that? (2) What factors are considered by the parents during school choice and what is the source they receive information from? (3) Does the family's socioeconomic condition and the kids gender have influence on the process?

Considering the research objectives, so called structural questionnaire composing of 68 questions was prepared.

During composing the questionnaire, various factors were considered including: international experience, advice from field experts,[8] comments and the research results[9] conducted in Georgia.

Considering the reviewed literature, several acknowledgments were worked out:

- The parents have access to the information mainly through their social environment, as a result of this the parents of the private school students are far more informed regarding various aspects of school, compared with the parents of the public school students;
- The parents of the private school students are more motivated about the information gathering and are also more involved in the school choice process;
- In case of highly educated and well-off parent, the probability that he/she will send the kid to the private school is of course high, as private schooling is associated with better education;
- Selection criterion is much sophisticated and in frequent cases the social factor appears to be more important than academic performance of the school. This happens because neither private nor public school is capable of fully satisfying the parent's demands.

Research methodology

The present study is a quantitative study of face-to-face interviews, conducted with a fully structured instrument. The average duration of an interview was 1 h. A pre-stratified three-stage cluster sampling was used for the study. 25 public, and 25 private schools were selected, and 12 students were randomly chosen (one student per class) from each selected school. Totally, 300 students were selected from each types of schools. The interviews were conducted with the

8 10 detailed interviews were conducted with the field experts beforehand. During the interviews current situation in Georgia was discussed, as well as problems and issues for research. Later the draft of used questionnaire was also discussed with them.

9 We studied following researches: Caucasian Barometer 2010–2016 (www.caucasusbarometer.org); The General Education Voucher Funding Effectivity Research in the Context of Equality, 2014; The research was conducted by Centre for Civil Integration and Inter-Ethnic Relations (CCIIR) in the frames of the East West Management Institute (EWMI) Policy, Advocacy, and Civil Society Development in Georgia project (G-PAC), funded by USAID. The costs spent on general education and its results, 2013–2016; Private Schools Research in Georgia, 2018; Besides this 70 private school teachers and 70 public school teachers were interviewed.

parent/guardian of the selected student. The student in the selected class was chosen from the school journal through simple random sampling. If the parents of selected student were absent or refused to be interviewed, the parent of next student on the list was chosen. It should be mentioned that there was no significant difference in non-response rate between private and public schools. Such a sampling design for each student in Tbilisi guaranteed equal probabilities of being chosen. The field study was conducted in May and June 2017 (see details in Addition 2).

Research limits

The main limits of the research were limited resources and time, thus only Tbilisi schools appeared to be beneficiaries.

Thus we can't talk about those parents' choices, living in other cities. Though it's also noteworthy that 50% of private schools located in Tbilisi balance this problem. Another error was that we didn't have chance to use qualitative methodology while analyzing the quantitative research results (including more detailed interviews and/or focus groups).[10] Hopefully these errors will be balanced through future researches.

10 For instance: Parents motivation when they have different approach while making school choice in case of sons and daughters; Private school choice motivation, when they still have to pay money for extra tuition etc.

Research main findings

The principle of choice

As the received data showed, the parents who decided to send the kid to the private school appeared to be far more informed regarding various aspects of schooling, compared with the parents of the public school students.

Comparing the average index of two groups of parents (private and public schools' students' parents) regarding the quality information gathering before sending kids to school is much significant: private—78.5%, public—63.9% (Table 1).

Besides the fact that private and public school students' parents have different level of information regarding the educational institutions, there are other contradictions between them:

Access to information—the research showed significant difference between the private and public schools student's parents'. The private schools' students' parents are more interested to receive valuable information happening in educational sphere through various channels including television (on a daily bases private-28,3, public-24.0), radio (on a daily bases private-3,8, public-3.1), internet (on a daily bases private-43,5, public-34.6) (Table 2).

The quality of demand on the services offered by the school also differs: the private school consumers are far more demanding toward their school (that can be proved multiple times throughout the research) and demand on information

TABLE 1 Do you have information about the school details before making decision?

	Private	Public	Difference
	Was informed		
School fee	93.6%	90.0%	3.6%
School reputation	92.4%	83.8%	8.6%
School academic performance	81.2%	61.7%	19.5%
School infrastructure	78.4%	65.1%	13.3%
School staff, teachers' qualification	80.0%	59.8%	20.1%
Teaching hours/duration each day	86.8%	76.3%	10.4%
Number of students in class	79.2%	58.9%	20.3%
Attitude toward the students	79.2%	59.5%	19.6%
Transportation	81.2%	79.4%	1.76%
Food	76.8%	67.6%	9.2%
Additional activities (Music, dance, singing)	75.6%	57.3%	18.2%
Preparing home task at school, the need of parent's participation during the studying process	81.6%	56.7%	24.9%
Teaching of religious subjects	56.8%	39.9%	16.9%
Unconsidered/extra costs	48.8%	41.1%	7.6%
Sports activity, encouraging healthy lifestyle	70.4%	43.0%	27.4%
Communication with the representatives of specific social environment	62.8%	41.7%	21.0%
Safe surroundings	95.2%	74.5%	20.7%

Own results.

TABLE 2 How often do you read about education sphere updates *via* internet?

	Private schools students' parents	Public schools students' parents
Daily	43.5%	34.6%
Couple of times a week	14.9%	18.1%
Once a week	8.1%	8.4%
Couple of times a month	14.1%	12.5%
Once a month	8.9%	12.1%
Couple of times a year	6.0%	4.0%
Never	4.4%	10.3%

Own results.

TABLE 3 Where do your friends' kids study (mainly)?

	Private schools students' parents	Public schools students' parents
Private school	60.0%	7.5%
Public school	40.0%	92.5%

Own results.

is high too. That's normal, as the private school student's parents pay certain amount of money and their attitude is much demanding toward the service they receive, including the information sharing. Thus, the private school students' parents are more informed compared with the public school students' parents.

Social and Cultural Capital. According to the data, those who decided to send kids to private schools were influenced by their own social circle/friends, as 60% of the people they communicated with had their kids in private schools, the same was with the public schools—those who decided to send their kids to public school were influenced by their own social circle/friends as 92.5% of the people they communicated with had kids in public schools (Table 3).

Thus we can talk about (1) the sharp segmentation of the society, where the people are divided having their own social circle, and attitude toward private/public/state education system. (2) Education is very relevant for both groups of people and a serious issue of everyday discussion (private 20,8 and public 20,5—talks about education issues with their friends/relatives on a daily basis).

One more indicator showed such strict segmentation

On the following question: during the school choice process, did you make choice between public schools, private schools or both? The parents gave following answers:

63.5% of the private schools' student's parents were choosing only between private schools; 72.3% of the public schools' student's parents were choosing only between public schools (Table 4).

TABLE 4 School selection criteria; 600 respondents, SE 4%.

Criteria	Private school children's parents	Public school children's parents
From private schools only	63.5%	3.1%
From public schools only	2.8%	72.3%
Between public and private schools	33.7%	24.6%

Own results.

TABLE 5 How would you rank your family's social level?

	Private school children's parents	Public school children's parents
High income/Rich	3.2%	0.9%
Between high and middle income	20.9%	9.0%
Middle income	68.7%	60.7%
Low income	7.2%	28.7%
Poor		0.6%

Own results.

TABLE 6 Parents' education.

	Private school children's parents	Public school children's parents
Junior high school/high school	2.8%	8.7%
VAT	7.2%	13.0%
Incomplete higher education	3.1%	7.0%
Higher education	86.9%	73.1%

Own results.

The parents' education and income connection with school choice

The demographic questionnaire vividly showed serious difference between the private and public schools' parents' income. This can be seen by the following data (Table 5):

It also appeared that private schools' students' parents have better education (Table 6).

Both data show that the school choice is much linked to the parent's education and income.

When the private schools' students' parents have higher education and good income (compared with the public schools' students' parents), the chance of sending their kids to private schools in future is inevitably high.

TABLE 7 Distribution of pupils in private and public schools.

School status	Girl	Boy	Girl%	Boy%
Private	25,683	31,560	44.9%	55.1%
Public	248,187	269,562	47.9%	52.1%

Ministry of education.

The gender of a child and a parent's choice

Below in Table 7 is an official data set issued by the Ministry of Education—the number of students in private and public secondary schools by gender (October 2017).

The data showed that both in private and in public schools, boys outnumber girls. In a private school, this difference is even more noticeable. If the proportion of girls among public school students is 4.1% lower than the boys, this difference is 10.3% in private school.

That allows us to assume that while choosing a school (whether private or public), along with other factors, the child's gender plays an important role. In other words, boys are slightly more likely to be taken to private schools than girls.

The research showed significant difference between the private and public schools' students' parents regarding the access to information. The parents of the private schools' students have better access to information and media channels as well as they are more interested to be better informed. Here are listed the factors defining school choice:

- Different level of demand toward the schooling services;
- The parents' social environment;
- The parents' education;
- The parents' income;
- Kid's gender.

Selection criterion

According to the results, there is a low competition between the private and public schools.

There is a competitive environment between the private and public school sectors. A public school cannot compete with a private school. The low competitiveness of public schools is reflected in parents' assessments of various factors.

During our study, 38 factors were identified that affected the parents' decisions. The date was analyzed using multifactor dispersion analysis. The factors later were grouped into 10 factors according to the statistical significant (0.5 and more). The results are given in Table 8.

The table shows that higher the evaluation is, the parents' attitude and assessment of the similar factor is high too. Higher than 0.1 evaluation factor is much significant for the school review that for sure influences the parent's school choice process. The figures listed above make clear how the average factor assessment indicator differs in case of private and public schools (high and low). For instance: #1 factor—comfort, material-technical base—private schools have higher than average evaluation, 0.56 points (on 10-point rating scale) to this direction, though the similar factor evaluation for the public schools totals 0.51 points (on 10-point rating scale).

Thus, in case of private schools, the highest evaluation is defined by school's material-technical base—0.56 points. Next important indicator is relationship between students and teachers—0.24 points; as well as preparing homework at school/extra study—0.22 points; no need of additional tuition—0.12 points and parental engagement, orientation on parents—0.12 points. In case of public schools, the table above shows that the evaluation of the majority indicators is lower than average.

It's also interesting to compare the abovementioned answers to the fact, why did they send their kids to that particular school? (Table 9).

The data above shows that, in reality, during school choice process, the key factor for the private schools' students' parents appeared to be following: good educational conditions—57.0%; high quality education—49.2%; safe environment—29.2%, comfortable for parents, offering extra services including transportation, extra study—28.3%. As for the public schools' students' parents, during school choice process, the key factors were as follows: affordability—50.7%; closeness to living area—31.7%; good educational conditions—31.0%; high quality education—23.3%.

A private school choice is mainly determined by a "family (high) financial status" factor and accounts for 24% of choice in favor of a private school.

Discussion of results

As it was mentioned above, during school choice process, the key factor for the private schools' students' parents were as follows: good educational conditions; high quality education; safe environment and parents comfort (extra services including transportation, extra study etc.). As for the public schools' students' parents, during school choice process, the key factors were as follows: affordability; closeness to living area and good educational conditions. As we see, these results totally coincide with the world examples and theories discussed in literature review.

Now it's interesting to compare the parents' expectations and real results assessment.

Our results demonstrate that primarily, a private school parent pays for the safety and emotional wellbeing of a child, and a quality education takes only a third place. About half of the parents of private school students believe that their children

TABLE 8 School selection/choice criteria in Georgia? 600 respondents, SE 4%.

	Criteria that are significant for private school	Criteria that are significant for public school
School comfort, infrastructure, equipment	0.56	−0.51
Teaching quality	0.22	−0.20
Relationship between students and teacher	0.24	−0.22
Development of students social and communication skills	0.04	−0.04
No need of additional tuition	0.12	−0.11
Parental engagement and orientation on parents	0.12	−0.11
Students' rights	0.00	0.00
Sport and healthy life style	-0.02	0.02
Sport and healthy life style	0.22	−0.20
Preparing homework at school/extra study	0.4	0.0
Family income and socio-economic status	0.56	−0.51

Own results.

TABLE 9 Why did you choose the school named by you?

	Private school children's parents	Public school children's parents
Good educational conditions	57.0%	31.0%
High quality education	49.2%	23.3%
Safe environment	29.5%	10.0%
It's comfortable for parents, offering extra services including transportation, extra study	28.3%	5.3%
Prestigious	11.5%	3.0%
Close to living area	9.0%	31.7%
Affordable	7.0%	50.7%
The kid will have good friend as the majority of the students are from good families	7.0%	2.7%

Own results.

get a high-quality education, which allows us to assume that the other half of parents are not entirely sure whether the chosen school, which they pay money to, gives a child an excellent quality education. The answer "school gives everything for a successful future" comes in fourth, and half of the private school parents think so (**Tables 10**, **11**).

According to the answers given by public school parents, there are far worse outcomes: The 2/3 of the parents of public-school students are not convinced that the school provides quality education, and 4/5 of parents do not believe that the school provides everything for a successful future.

Private school children's parents are convinced that: a school can provide a safe environment—86.8%; their child feels good at school—82.0%; the school provides quality education—58.8%; the school gives everything for a successful future—53.6%. In the case of public schools, the sequence is as follows: A parent feels sure that: a child feels good at the school they choose—61.1%; the school can provide a safe environment—52.6%; the school provides quality education—31.8%; the school gives everything for a successful future—22.7%.

Despite such conflicting assessments, about half of both public and private school parents (43.4% of private school parents and 57% of public-school parents) believe that it is impossible to obtain a quality education without the help of tutors and family.

These results just partly coincide with the forth probability we made, to be more precise, overall neither private nor public schools totally satisfy the parents' demands. Thus, here we come to Blake and Mestry (2021) opinion, discussed in literature review above, regarding the parents' utopic expectations. If we consider the fact that the parents receive information mainly from their relatives or friends, it will be much interesting if the interviewed parents' experience can have influence over the decision criterion and structure, of their relatives and friends in future. Thus, this can become the issue of additional research.

Both private and public-school parents try to compensate for the school's shortcomings by arranging tutoring and home studying. The results of the study demonstrate that public school students are more likely to study with

TABLE 10 Why are private schools better than public schools?

Better quality education	48.4%
Small number of students at classes	35.6%
Safer environment	24.2%
Better relationship with students from teachers	18.9%
Extra study	10.8%

Own results.

TABLE 11 Why are public schools better than private schools?

No fee	77.2%
Close to the living area	19.4%

Own results.

tutors than private school students. When it comes to the arts, sports, other extracurricular activities, more private school students are engaged in the activities than public school students.

The question is why parents pay (quite a lot) money to a private school if they are not sure about high-quality education. It is possible to conclude that this sequence of factors reflects the priority of the private school student's parent—firstly safety, later emotional satisfaction, and only then quality education and the necessary conditions for future success and here we can compare and see similarity of our study results with Kisida and Wolf (2015).

Theoretically, it is possible that, among the various factors (described in detail in the central part of research results), presented to the respondents, we missed to include the criteria which would explain why parents still send their children to public schools even when there is nothing that prevents them?

In order to address this suspicion, the survey included two open questions, to which the respondents replied unlimitedly—1. Why are private schools better than public schools? 2. Why are public schools better than private schools? The answers were as follows:

It can be assumed that for most parents of public schools due to economic conditions, they cannot provide their children with private school education, and the choice of public school is a forced decision. To this end, the educational situation in Georgia somehow coincides with the Bosetti (2007) study explaining that—having alternatives and right to make choice is rather important.

Having considered the above, we can conclude that private and public-school parents have different attitudes toward school education, as well as parental beliefs about their child's future success in school education. This totally coincides with the conclusions and examples by Hatcher (1998).

We can only assume that, since the data do not allow interpretation—it may be due to the different socioeconomic state of the families of private and public-school students (according to the survey). Income gives more choice to high-income families than low-income families—this is what the given findings/results reflect.

One of the limits of our study/research is that we don't have enough material/evidence for finally strengthening this conclusion and that can become the issue of further/future research as well. Though the results discussed in previous paragraphs enables us to say that the school choice process is much linked with the parents' education and income, and these results coincide with our third probability and with Robershaw et al. (2022) conclusions as well.

One more issue studied by us was a wish to change the school. The study asked: "Do you think you would take your child to another school if there were not any financial or other problems?" By this question, parents are hypothetically given a choice that they may not have. 89.6% of the parents of private school students would choose the same school, which is understandable. All survey data show that the parents of private school students are more-or-less satisfied with their school choices. In case of public school students' parents', the majority of them would like to move their kids to private schools (33%). To this end, our results coincide with Bosetti (2004) research results. Though we should also underline the parents who don't support the idea to move their kids to other schools and they name 2 arguments for that:

- They think that "more or less all schools are the same," thus school changing is pointless;
- In public schools the students gain serious social experience as they communicate with various types of people that can be a base for successful future.

As we see both arguments coincide with the ones named by the school choice theory opponents we discussed during literature review.

Concerning the information gathering, the study showed that during the school choice process, the private schools' students' parents are far more informed regarding various aspects of school, compared with the parents of the public school students. Thus, all these is conditioned by several requirements:

- In private sector there is a bigger choice and the parents are interested to gather as much information as possible to select the most appropriate and affordable variant for them. Thus, the parents of the private school students are more motivated about the information gathering and are also more involved in the school choice process than public school students' parents;
- Because of superior social-cultural capital, the private school student's parents have better access to useful information;
- The private school student's parents pay certain amount of money and their attitude is much demanding toward

the service they receive, including the information sharing. Thus this is the reason why the private school students' parents are more informed compared with public school students' parents.

All in all, our results have clearly shown that there is a difference between private and public school students' parents. 75% of private school parents and 25% of public-school parents stated that they started thinking about to which school they would take the child when a child was 1-year-old. When parents started thinking about the school preference, the average age of a child was 1–2 for private school parents, and 3–4 for public school parents.

All these totally meet our expectations (see the probability 1 and 2) and the cases discussed in the literature review (see Smrekar and Goldring, 1999; Bosetti and Pyryt, 2007; Davies and Aurini, 2011).

Comparison of private and public-school students' outcomes is a heavily debated topic among many researchers. Most of them show the unquestionable success of private schools compared to public schools. The study conducted by Coleman et al. (1982) also shows this advantage even when the socioeconomic status of the student is considered. The same results can be found in our study. The research results make it clear that the school choice much depends on the parents' education and income. These results totally coincide with our third probability theory.

Furthermore, children's gender also plays an essential role in school choice. The number of boys in both private and public schools exceeds the number of girls. In a private school, this difference is even more noticeable. In this respect our survey is echoing the findings of Bellani and Ortiz-Gersavi (2022).

One of the issues, that appeared in your research and was not the part of other international researches, was the number of kids in family and its influence on school choice process. Our study demonstrated a link between the number of children in the families (families with children under 18) and the parents' choice—the more children in the family are, the more likely they are to go to public school. On average, families whose children attend a public school have more members. The families of public-school students consist of 4.58 members on average, and the families of private school students consist of 4.44 members on average. There are also, on average higher numbers of school-aged children—the ratio of children under 18 is 4.58 on average, and on average, 4.44 for private-school families. Thus, for sure this factor defines the family's financial condition, and this coincides with the third our probability and abovementioned theories.

As we saw, the private school students' parents' are more likely engaged in schooling process. Private school parents are also encouraged by the schools themselves. As Chubb and Moe (1990) state, for private schools, a parent and a student are extremely central figures compared to public schools. Schools are more active in communicating with parents, as their successful communication is significantly related to their awareness, so a parent who is motivated to choose between the private schools is also helping private schools with their information policies. According to same authors a state school is a product of the state policy. State schools are controlled by a hierarchical system of state administration and democratic control. The policies adopted for the public schools are the result of the conflicting and reconciling interests of the various hierarchical branches of administration. Consequently, state schools offer a similar product to parents. Consequently, the need to obtain information about a particular public school in comparison to a private school is much less. Public school student's parents try to fill the school gaps with private tuition and with the education the kids can receive from the family itself. This shows one more time that generally, the parents are much interested to provide perfect future for their kids, though socioeconomic conditions, environment, poor educational system limits their choice.

Once our results compared to the existing literature and theory, one can see that our study conducted in Georgia follows the trends of the developed countries, known as the "Heyneman-Loxley effect."

Conclusion

As it was mentioned above for several times, the aim of the research was to study and describe the school choice process. The research focused on unveiling factors and their correlation during private and public schools' choice process by the parents. Key issues of the research were as follows: (1) How interested the parents are to be actively involved in school choice process and spend certain period of time for that? (2) What factors are considered by the parents during school choice and what is the source they receive information from? (3) Does the family's socioeconomic condition and the kids gender have influence on the process?

The study/research results are summed up in the following conclusion:

- The sharp segmentation of the society, where the people are divided having their own social circle, and attitude toward private/public/state education system;
- Education is very relevant for both groups of people and a serious issue of everyday discussion (talks about education issues with their friends/relatives on a daily basis). During the school choice process, the parents of the private school students are far more informed regarding various aspects of school, compared with the parents of the public school students; The parents of the private school students are more motivated about the information gathering;

- There are listed several factors defining the specific school choice:
  - Different demands toward the service provided by the schools
  - Parents' socioeconomic condition
  - Parents' education
  - Parents' income
  - Kids' gender
  - Number of kids in the family
- During the school choice process, the key factor for the private schools' students' parents were as follows: good educational conditions; high quality education; safe environment and parents comfort (extra services including transportation, extra study etc.). As for the public schools' students' parents, during school choice process, the key factors were as follows: affordability; closeness to living area and good educational conditions. As we see, these results totally coincide with the world examples and theories discussed in literature review;
- It can be assumed that for most parents of public schools due to economic conditions, they cannot provide their children with private school education, and the choice of public school is a forced decision;
- The private school students' parents are more confident in their choice (that they chose the right school for their kids) than the public school students' parents;
- Our results demonstrate that primarily, a private school parent pays for the safety and emotional wellbeing of a child. In the case of public schools' parents feel sure that: a child feels good at the school they choose and the school can provide a safe environment. The data show that the following answer—"provides quality education" is much important for both public and private schools' students' parents and in the list of trust is ranked on the third place;
- The parents of the private schools' students' are more confident and think that there is enough choice of schools in Georgia than the parents of the public schools' kids'. But about half of both public and private schools' students' parents believe that it is impossible to obtain a quality education without the help of private tuition and family.

It's worth mentioning that, generally the research results fully coincide with the school choice theory arguments and the research findings conducted in the similar field. All these are described and presented in the first part of the article. The probabilities listed on the base of the current data, that the information source, the parent's information level, the parents' engagement as well as the family's socioeconomic and demographic status play integral role in the school choice process appeared to be genuine. Apparently, the parents are much interested to provide perfect future for their kids, though socioeconomic conditions, environment, poor educational system limits their choice.

Once our results compared to the existing literature and theory, one can see that our study conducted in Georgia follows the trends of the developed countries, known as the "Heyneman-Loxley effect."

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (Ethics Committee) of Ilia State University Tbilisi, Georgia, protocol code ECISU 0l0gl20r7. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

AT carried survey. AT, LT, and WS analyzed the survey results. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The relationship of inclusive climate and peers' attitude on children with disabilities in China: A mediating role of empathy

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Objective: Peer attitude towards children with disabilities can significantly impact on the successful implementation of inclusive education. The current study examined the attitude of Chinese students toward peers with disabilities in relation to inclusive climate and empathy.

Method: A total of 392 typically developing students (aging from 10 to 17 years old, with average age of 12.7) in primary and middle schools participated in the study by reporting the Inclusive Climate Scale, Peers Attitude to Students with Disabilities Scale, and Balanced Emotional Empathy Scale.

Results: We found that students held a neutral attitude to peers with disabilities, and girls were more acceptable than boys. There were positive relationships among inclusive climate, empathy and attitude to classmates with disabilities. The mediation analysis showed that empathy played a partial mediation role between inclusive climate and the peers' attitude towards children with disabilities.

Conclusion: Implications for improving students' attitude on peers with disabilities were discussed in the paper.

KEYWORDS

attitude to peers with disabilities, inclusive climate, empathy, China, school climate

Introduction

Inclusive education is a worldwide trend in the education of children with disabilities. The government in China makes efforts to promote the inclusion of children with disabilities as well. From 2012 to 2019, the number of students with disabilities attending ordinary schools increased from 199,800 to 394,300, with an increased rate of 97.3% (Moe, 2020). Attitude of classmates have been considered one of the major problems in inclusive education (Çiçek Gümüş and Öncel, 2022), negatively influencing the participation of students with a disability in school contexts (Maggio et al., 2021). Research shows that peer relationships are an important context for developing children's socialization and are a source of social support and security in order to meet children's social needs (Zou, 1998; Aparicio Puerta and Polo Sánchez, 2022). Peer attitude toward children with disabilities can significantly impact their self-confidence and, hence, their social acceptance. The degree to which children are liked or accepted by their peer group plays a decisive role in the healthy personality development of children with disabilities (Sang, 2003; Yang et al., 2012).

Students with disabilities are more sensitive and vulnerable due to their special characteristics and are more likely to be rejected by their peers (Ostrosky et al., 2015; Nota et al., 2018). For instance, students with disabilities have greater levels of interpersonal conflict at school, loneliness, and isolation (Hogan et al., 2000). It was found that for children with autism spectrum disorder, their peer relationships were not promising. They were less accepted in their interactions with peers, had fewer and lower quality friendships, were more isolated, had less social network centrality, and had difficulty integrating into the classroom social network than a typically developed child (Kasari et al., 2012; Locke et al., 2012; Zhang et al., 2019). Even a small group of students holding negative attitude can make the school life of children with a disability very difficult (McDougall et al., 2004). In an inclusive education setting, peer attitude has a significant impact on students with disabilities. The attitude of the general student population toward students with disabilities will be directly related to the ability of students with disabilities to adapt to school life, acquire social values and competencies, and achieve healthy cognitive and personality development (Zou, 1997). On the one hand, negative attitude make students with disabilities more vulnerable to physical and psychological bullying at this stage. On the other hand, the psychologically damaged in peer relationships may contribute to character deficits in the current and future individual development of children with disabilities.

Apart from the influence on children with disabilities, the peers' attitude toward inclusive education is also associated with typically developed children's development. Peers who befriend students with disabilities hold more positive attitude, and these peers might develop a greater understanding of and more sensitivity toward such students and perceive them more positively (De Boer et al., 2012a). Peers holding positive attitude toward both their peers with disabilities and inclusion can also benefit themselves from the experience of being in an inclusive school environment (Peck et al., 1990; Helmstetter et al., 1994; Kishi and Meyer, 1994; York and Tundidor, 1995; Fisher et al., 1998; Fisher, 1999; He and Zuo, 2012). General students may generate a more positive attitude toward difficulties through their engagement with students with disabilities.

The process of information disclosure and mutual understanding, typified by friendship relationships, triggers positive feelings that can be transferred from the individual concerned to his or her entire social group (Pettigrew and Tropp, 2008). Intimacy has been shown to be an indicator of friendship quality: the higher the level of intimacy, the more friends are treated as part of themselves (Davies et al., 2013). The positive atmosphere created among students in an inclusive educational environment leads to cross-group friendships and changes the negative attitude of ordinary students. Despite the importance of peers' attitude to children with disabilities for the development of both children with disabilities and themselves, the research in China mainly focuses on the attitude of teachers' groups rather than peers' attitude. Much less about examining the influencing factors on peers' attitude on children with disabilities. From a bioecological perspective, individuals' attitude toward inclusive education is not only influenced by contextual factors (e.g., school climate) but also related to personal factors (McDougall et al., 2004; Ginevra et al., 2021), which should be further explored in order to better understand it and take measures to improve it in the Chinese context.

Inclusive educational climate and peers' attitude of inclusive education

Peers' attitude toward inclusive education is associated with many factors, such as gender, age, frequency of contact with students with disabilities (Chen and Lu, 2006; Maggio et al., 2021), knowledge of disabilities (Lu et al., 2021), and school context (e.g., school climate) (McDougall et al., 2004). School climate in which students live is an important factor in their attitude toward inclusive education. School climate reflects the quality and character of school life, the norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structure of a school (Cohen et al., 2009). In the context of inclusive education, an inclusive school climate refers to a relatively permanent and stable atmosphere in which teachers and their surroundings interact with each other over a long period of time in order to implement inclusive education (Wang et al., 2020). McDougall et al. (2004) suggest that school climate is important in order to promote student attitude toward peers with disabilities, including equitable school goal structures and interpersonal support for students from other students and teachers.

Positive school climate created in the general school environment, between teachers and students, and among students plays an important role in changing the negative–neutral attitude of the average student toward inclusive education. The effect includes the support and attention to the smooth promotion of inclusive education under the leadership of the principal, the implicit influence of the campus culture, and institutional protection at the school level. The Chinese government makes effort to promote inclusive climate in general schools, including organizing the training of all principals and teachers in general schools on inclusive education, emphasizing a barrier-free environment (Central People's Government of China, 2021).

Relationship between empathy and peers' attitude toward inclusive education

Empathy is an emotional response based on an individual's understanding of another person's emotional state or condition, which is equal to or similar to the feelings being experienced

or likely to be experienced by another person (Eisenberg et al., 2006; Segal, 2018). Empathy can help individuals move away from self-centeredness, build peer relationships, develop prosocial behavior and emotion regulation, and is the basis for the development of social competence (Guan, 2018), which is significant in order to form and maintain different forms of social relationships (Robert et al., 2014). Cohen et al. (2009) argue that in social interactions, individuals need to refer to the mental states of others and cannot understand their intentions and respond appropriately without taking into account verbal and non-verbal factors. In the interactions with students with disabilities, the empathy of typically developed students plays a positive role in the development of good attitude toward inclusive education (Vuorinen et al., 2019).

Students' empathy is a multidimensional structure that encompasses both cognitive and emotional responses (Boele et al., 2019). Emotional empathy is when individuals empathize and have alternative experiences to the emotions of others, and cognitive empathy is when individuals are able to identify and understand the emotions or perspectives of others (Huang and Su, 2012). Empathy has been shown to assist in individuals' abilities to build deeper connections, regulate emotions, and has also been found to promote helping behavior (Griffin, 2019; Loerger et al., 2019). Mirete et al. (2020) find empathic concern can predict good attitude toward people with intellectual disabilities among university students. Peers' attitude toward inclusive education are influenced by their own life experiences and knowledge of disability, which increases the individual's understanding of the emotions and feelings of others, thus, increasing the likelihood that the individual will respond empathetically to others. In addition, individual students belong to their own groups and have multiple group identities. When individuals come into contact with other groups, they try to put themselves in the other group's perspective, understand the reasons for the other group members' emotions and experience the corresponding emotional state, and this is the process of group empathy. Group empathy occurs when the general student group tries to think from the perspective of a disabled student group (He and Xie, 2018). Therefore, typically developed children's empathy is positively related to positive attitude toward inclusive education.

The mediating effect of empathy

Environment shapes attitude to varying degrees and predisposes them to reject or accept something (Verkuyten and Steenhuis, 2005; Griffiths and Nesdale, 2007). General students can be influenced by a variety of factors in his or her environment, resulting in different attitude toward inclusive education. School climate in which the students live is associated with their attitude toward inclusive education. In cognitive response theory, individuals are active in processing information to produce cognitive responses, rather than just passive receivers of any information of the environment (James and Gutkind, 1985). That is, personal psychological factors (e.g., empathy) may play a mediating effect.

From the point of view of self-determination theory, in a good atmosphere of inclusive education, the basic psychological developmental needs of the average individual student are met based on environmental support (Reeve, 2012; Diseth et al., 2018), after which, the individual develops more prosocial behavior (Gagné, 2003), thus, helping them to develop good attitude toward inclusive education. Moreover, empathy is a key factor in the formation of a good atmosphere between individuals and even groups during the process of contact (Batson and Ahmad, 2010). In a good atmosphere of inclusive education, the two develop empathy through contact with each other. On the one hand, the empathy that ordinary students have for students with disabilities reduces stereotypes and increases positive evaluations of individuals and groups of students with disabilities (Batson et al., 1997). On the other hand, it extends from forming a positive and positive evaluation of an individual to forming a positive evaluation of a group, and based on forming a positive evaluation of students with disabilities, it promotes positive actions for ordinary students, which in turn, helps ordinary students to develop a positive attitude toward inclusive education.

Overall, previous studies have shown that peers' attitude toward inclusive education is very important to the development of students with disabilities in inclusive settings. Furthermore, it is also related to typically developing children's development. Many studies indicate that school climate and empathy bear importantly on peer attitude. However, there are some limitations. First, there has been a significant expansion in the enrollment of students with disabilities learning in regular schools in China, while only a few studies investigated peers' attitude, reporting peers' holding negative attitude (Ning, 2018; Zhang et al., 2018). In the trend of comprehensively promoting inclusive education for children with disabilities in China (Central People's Government of China et al., 2017), it is important to be able to understand the attitude of students without disabilities toward the inclusion of students with disabilities. Some of the obstacles experienced by students with disabilities are associated with how best they can be accepted by their peers (Kapinga, 2020). Second, many studies examined one or two attitude components for which different questionnaires were used (De Boer et al., 2012b). Vignes et al. (2009) recommend an instrument in which all three components are included, as findings may vary according to the type of component assessed. In addition, although there is a vast literature on the topic of peers' attitude toward inclusive education worldwide, most studies tried to investigate the connection separately focusing on either school climate or empathy contributing to peers' attitude (Batson and Ahmad, 2010) and the systematic empirical research to considering the relationship of school climate and empathy in the influence of peers' attitude is few.

TABLE 1 Demographic information of participants.

		N	%
Gender	Boys	200	51.02
	Girls	192	48.98
Age	10–12	89	22.7
	13–15	285	72.7
	16–17	18	4.6
Only-child in family	Only one	196	50
	One above	196	50
Grade	5–6	71	18.11
	7–9	321	82.89
School level	Primary school	71	18.11
	Secondly school	321	81.89

To address these gaps, we examined peers' attitude toward children with disabilities in China. Successful implementation of inclusive education in developing countries such as China is not an easy venture; therefore, it is important to achieve a comprehensive understanding. It can contribute to the multicultural finding on the topic as well. Furthermore, we explored the relationship between school climate, empathy, and peers' attitude in order to suggest steps that may be undertaken to ameliorate this problem by mediation hypotheses. According to Shadish (1996), it is useful to utilize the mediation hypotheses in order to develop and advance the theories of human behavior. In addition, they can contribute to the practitioner having an insight into (a) the process and the reason relationships unfold and (b) where in the behavior people having problems, practical interventions need to be taken.

Methods

Participants and procedure

The data were collected from six primary and secondary schools implementing inclusive education in Beijing, which meant that students with disabilities were enrolled in those schools. We contacted the principals of the elementary schools to get permission to deliver the questionnaires to their schools. The volunteer principals helped to obtain the consent of students and their parents. Considering the reading ability of completing the paper questionnaires by students, the research subjects were students above the fifth grade of primary school as well as middle school, who were between the ages 10 and 17 (average age = 12.7). The demographic information is shown in Table 1.

It is widely understood that the use of larger samples in applications of factor analysis and mediation analysis tends to provide results such that sample factor loadings are more precise estimates of population loadings and are also more stable, or less variable, across repeated sampling. According to Cattell (1978), the ratio of sample size and the number of variable items should be in the range of 3–6. To meet the criterion, the sample size should be more than 320 (with 10% invalid questionnaires in assumption) in the study. A total of 400 questionnaires were delivered to the six schools and eight questionnaires were checked for double choice and incompleteness, resulting in 392 valid questionnaires. The sample consisted of 48.98% girls and 51.02% boys. Of those, 18.11% were students in the fifth year of primary school, and 81.89% were students in the fifth year of middle school.

In the basic information of the questionnaire, we investigated the category of disabilities for students with disabilities met by typically developing peers. Although inclusive education has been implemented for decades in China, there has been no specific policy for general schools to create an inclusive environment; about 45.2% of students in our study reported that they did not know the category of disabilities. That was the basic knowledge about disability was not taught to the typically developing students even in the schools enrolled the children with disabilities. Thus, we did not include the variable of the category of disabilities for students in our study.

Measurement

Inclusive climate

The inclusive climate scale (ICS) designed by Schwab et al. (2018) was used in this study. We translated it to the Chinese version and asked two professors in special education to check the expression. The scale consists of 28 items and covers two main components. One is teachers' support and care (e.g., "My teacher cares about all students," "My teacher makes sure all students are actively involved in most school and classroom activities"), and the other is emotional experience (e.g., "I like coming to school every day," "I am happy to be at this school"). The ICS uses a five-point Likert scale ranging from 1 (not at all correct) to 5 (completely correct). The total score of 28 questions was used as the student's score after reverse coding some of the questions for scoring.

Peers' attitude to students with disabilities

The peers' attitude to students with disabilities scale (PASD) was developed by Rosenbaum et al. (1986) to measure children's attitude toward their peers with disabilities. In its original form, the PASD contained 36 items covering an affective component (e.g., "I am happy to have a child with a disability as a special friend"), a behavioral component (e.g., "I will invite a child with a disability to my birthday party"), and a cognitive component (e.g., "The child with a disability feels sorry for himself"). In Rosenbaum et al.'s (1986) development, it was found that nine of these items did not address the above three components

and were deleted. For this study, 27 items were used, with the positively stated and negatively stated items randomized. The PASD was a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Negatively stated items were reverse coded so that the higher scores represented more positive attitude and the total score of the 27 questions was used as the student score.

Empathy

The present study used the Balanced Emotional Empathy Scale (BEES) (Mehrabian, 1997) to assess the subjects' levels of empathy. Mehrabian and Epstein (1972) originally developed the Emotional Empathy Tendency Scale (EETS) and continued to update and refine the scale over the next two decades until 1996 when the BEES was finally devised (Mehrabian, 1997). The scale consists of 30 questions, including 15 positively stated questions (e.g., "I am moved when I see a stranger trying to live," "I am distressed when I see a young person in a wheelchair") and 15 negatively stated questions (e.g., "A crying child does not get my attention," "I do not get too involved in my friends' difficulties"). Subjects responded to these prompts using a nine-point Likert format ranging from−4 (for "strongly disagree") to +4 (for "strongly agree") (Mehrabian, 1997). In this study, the nine-point Likert format was replaced with a five-point Likert format ranging from 1 (for "not at all true") to 5 (for "completely true") in order to facilitate a scoring study. The total score for the negative statements was subtracted from the total score for the positive statements in order to obtain the total scale score.

Data analysis

In the analysis, the valid sample size was 392. Inclusive climate, empathy, and attitude toward peers with disabilities are observed variables. The standard score of each dimension was taken as the value of each observation variable. To test whether empathy plays a mediating role in inclusive climate and attitude toward peers with disabilities, the mediation model was applied using the PROCESS SPSS 20.0 computing tool.

Results

Descriptive statistics

The reliability of the questionnaire was calculated using Cronbach's alpha coefficient. Confirmatory factor analysis was conducted to test the item factor loading. The reliability and factor loading range of each questionnaire are shown in Table 2.

The study investigated the inclusive climate, empathy, and attitude toward peers with disabilities of typically developing students in China. Descriptive variables are shown in Table 2. As shown in Table 3, the typically developing students in China perceived a high level of inclusive climate in schools and held a medium level of empathy and attitude toward peers with disabilities. Specially, in the sub-dimension of attitude toward peers with disabilities, they scored highest in the dimension of behavior, with a mean of 3.53. The following sub-dimensions were affection and cognitive in order.

TABLE 2 Questionnaire reliability and factor loading.

Variable	Cronbach's alpha	Factor loading
Inclusive climate	0.917	0.602–0.794
Empathy	0.711	
Attitude to peers with disabilities	0.778	0.399-0.764

TABLE 3 Descriptive data of variables.

		M	SD	*t*	sig
Inclusive climate	Male	4.234	0.611		
	Female	4.249	0.699		
	Total	4.241	0.655	0.24	0.82
Empathy	Male	3.386	0.435		
	Female	3.573	0.421		
	Total	3.478	0.438	4.31	0.000***
Attitude	Male	3.320	0.478		
	Female	3.445	0.494		
Sub-affection		3.33	0.55	1.49	0.137
Sub-behavior		3.53	0.63	3.14	0.002
Sub-cognitive		3.29	0.62	1.47	0.144
	Total	3.382	0.489	2.52	0.012

***$p < 0.001$.

TABLE 4 Correlations among inclusive climate, empathy and attitude to peers with disabilities.

	Inclusive climate	Empathy	Attitude
Inclusive climate	1	0.360**	0.428**
Empathy	0.360**	1	0.328**
Attitude	0.428**	0.328**	1

**$p < 0.01$.

Correlations among inclusive climate, empathy, and attitude toward peers with disabilities

The study also investigated the relationship among all variables. To this aim, Pearson correlation was conducted on inclusive climate, empathy, and attitude toward peers with disabilities. Correlative statistics are shown in Table 4.

As the earlier table indicates, there was a positive correlation coefficient among inclusive climate, empathy, and attitude toward peers with disabilities. Inclusive climate was significantly associated with attitude toward peers with disabilities of typically developing students ($r = 0.43$, $p < 0.01$) and empathy ($r = 0.36$, $p < 0.01$). Meanwhile, empathy was significantly associated with attitude ($r = 0.33$, $p < 0.01$). Therefore, it can be inferred that the higher the inclusive climate or empathy, the better attitude of typically developing children toward peers with disabilities.

The mediation effect of empathy

Next, the structural equation model (SEM) was conducted to explore the role of inclusive climate and empathy on attitude toward peers with disabilities. The model shows that empathy mediates the influence of inclusive climate on attitude toward peers with disabilities (see Figure 1).

The standard score of each dimension was taken as the value of each observation variable. We tested whether empathy played a mediating role in inclusive climate and attitude toward peers with disabilities (see Table 5). The result showed that the model had a direct role in the influence of inclusive climate on attitude toward students with disabilities, and an indirect path from inclusive climate to empathy then from empathy to attitude toward students with disabilities. The total effect of inclusive climate on peers' attitude to children with disabilities was 0.27, the direct effect of them was 0.21, and the mediating effect of empathy was 0.06. And 95% percentile bootstrap confidence intervals = [0.02,0.10], the interval didn't include 0, indicating that the mediating effect was significant.

Discussion

This study has begun to address the gaps in our knowledge about the peers' attitude toward students with disabilities in inclusive settings in China, and the relationship between school climate, empathy, and peers' attitude.

The results of this study have found that students' attitude toward their peers with disabilities were neutral, which was in line with some previous studies (e.g., McDougall et al., 2004; De Boer et al., 2012a). However, it is different from several studies in China, which found that peers held a negative attitude toward children with disabilities in inclusive settings (Ning, 2018; Zhang et al., 2018; Ma, 2019). The low acceptance of peers in this sample could be due to on the one hand that it investigated the attitude for all kinds of disabilities, while Ma's (2019) study focused on the attitude to children with ASD. Children with ASD are often less included in their classroom's social structure (Chamberlain et al., 2007; Rotheram-Fuller et al., 2010; Kasari et al., 2011). On the other hand, Ning (2018) and Zhang et al.'s (2018) studies surveyed preschool children and their attitude toward peers with disabilities, who may hold a more negative attitude than elementary students' since they rely more on the external behavior of the recipient and less on the reasons behind their behavior (Chen et al., 2012; Yu et al., 2012; Huckstadt and Shutts, 2014). Typically developing children may not reject children with disabilities because of the disabilities but instead, they may just not like children who are harmful or aggressive (Liu, 2015). Results also showed that girl students generally hold more positive attitude toward peers with disabilities. This result reflects those reported in previous research (e.g., De Boer et al., 2012b; Armstrong et al., 2017; Maggio et al., 2021). Specifically, in the comportments of attitude, the cognitive comportment referring to their psychological impression of peers with disabilities, including relevant facts, knowledge, and beliefs was the lowest. Ning (2018) found that physical inclusion can improve the positive affection and behavioral tendency of typical children toward peers with disabilities, while it does not promote recognition and understanding. It may result from the relationship among the three behavior level of attitude. Le (2006) states that there is a close relationship between the affective component and behavioral tendency component, whereas the cognitive component has higher independence.

Correlation analyses confirmed that there were positive correlations among inclusive climate, empathy, and attitude toward peers with disabilities. The positive association between inclusive climate and attitude toward peers with disabilities is consistent with previous studies by Horrocks (2006), Weller (2012), Gang et al. (2014). School climate is based on patterns of people's experiences of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures. The positive inclusive climate created in the general school environment, between teachers and students, and among students plays an important role in changing the negative–neutral attitude of the average student toward inclusive education (Cohen et al., 2009). The inclusive climate in the study is composed of teachers' support and students' emotional experience. On the one hand, successful implementation of any inclusive policy or programming is extremely dependent upon the educators being receptive and positive (Avramidis and Norwich, 2002). If students perceived teachers are caring, developing active programs, and providing individual attention to them, they are motivated to be more supportive and inclusive to others, including peers with disabilities (Potter, 2008). That is, they hold more positive attitude toward peers with disabilities. On the other hand, students who have positive emotional experiences with peers with disabilities may have developed a greater understanding of and sensitivity toward those peers and, therefore, perceives them more positively (McDougall et al., 2004).

We found that empathy was positively associated with typically developing students' attitude toward peers with disabilities. That is, students with a high level of empathy have higher acceptance of peers with disabilities in inclusive

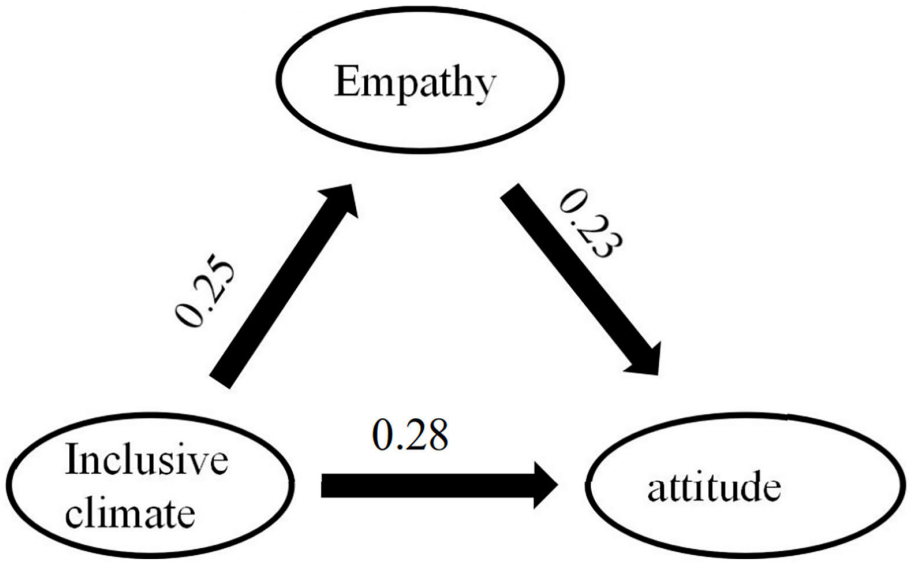


FIGURE 1
Mediation effect of empathy between inclusive climate and attitude.

TABLE 5 Mediation analyses (5,000 bootstraps).

Independent variable (IV)	Dependent variable (DV)	Effect of IV on M		Effect of M on DV		Effect of IV on DV		Direct effect		Indirect effect		Total effect	
		Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	95%CI	Coeff	SE
Inclusive climate	Empathy	0.25***	0.03	0.23***	0.05	0.21***	0.05	0.21***	0.05	0.06	0.02, 0.10	0.27***	0.04

***$p < 0.001$.

settings. This is in line with and strengthens further the results obtained by existing studies (e.g., Miller, 2013; Atkinson-Jones and Hewitt, 2019). The studies showed that the ability to enter into another individual's thoughts and feelings is important to develop in order to achieve a more inclusive attitude toward students with disabilities. Boele et al. (2019) consider empathy not only to develop high-quality relationships with peers but also to facilitate the quality of these relationships. Higher ability to share and understand others' emotions is related to more prosocial and less aggressive behavior toward others (Eisenberg et al., 2006) and better conflict resolution strategies (e.g., De Boer et al., 2012a). Students with high empathy are more likely to develop mutual trust, shared understanding, and optimal communication, allowing them to feel understood and listened to (Reynolds and Austin, 2000), which may contribute to their perception that the situation in inclusive settings for peers with disabilities situation is not fully appreciated. Ultimately, the typical students hold a more positive attitude toward peers with disabilities.

In order to verify whether the proposed interrelationships of inclusive climate, empathy, and attitude toward peers with disabilities hold true, the structural equation model statistical method was taken. The mediation analysis demonstrated that empathy was an intermediary factor affecting inclusive climate and typically developing students' attitude toward peers with disabilities. That means that typical students' attitude can be influenced by inclusive climate through empathy. When school systems are organized to include and meet the needs of all children from the local community, including those with a disability (Chen and Lu, 2006; Maggio et al., 2021), they are in the inclusive climate. In those schools, teachers are supportive and guide typical students to care and interact with peers with disabilities (Chen and Lu, 2006). Meanwhile, when students take the perspective of a peer in need, imagining how that peer is affected by his or her disabilities, empathetic feelings often occur (Panfile and Laible, 2012). Empathic feelings will be more generalized in schools with an inclusive climate. Once students feel empathy toward peers with disabilities, they induce the audience and improve their attitude toward their peers (Batson and Oleson, 1991).

Limitations and further direction

Our study investigated the current status of peers' attitude to children with disabilities in inclusive settings and figured out the relationship between inclusive climate, empathy, and students' attitude. Regarding the investigation of peers' attitude toward students with disabilities, we applied a questionnaire including three attitude components. Some limitations need to be addressed. First, the sample of participants was not national, and the study was conducted in a developed city in China, which cannot represent the whole level of peers' attitude to children with disabilities in China. A national survey including different regions with different levels of economic development and different cultures on that research topic should be conducted in future studies. Second, considering the sociocultural characteristics of attitude toward individuals with disabilities, comparing them with students from other counties would be beneficial. Additional work should look closely at the context factors to provide more practical implications. Third, due to the primary students participating in the study knowing little about the category of disabilities, we did not analyze the influence of the category of disabilities of peers on the typically developing students. Further studies can explore the effect of the category of disabilities, which may provide more details on the implication of intervention to improve their attitude toward peers with different disabilities.

Practical implications

First, the influence of the general school environment on the climate of inclusive education includes the support and attention to the smooth promotion of inclusive education under the leadership of the principal, the implicit influence of the campus culture, and the institutional protection at the school level. The support of principal provides both hard and soft support for the further development of inclusive education in regular schools, making it possible to develop a positive climate for inclusive education within the school and creating conditions for the formation of good relationships between students with special needs and their teachers and peers. Meanwhile, teachers should emphasize how to introduce children with disabilities to their typically developing classmates, and the information provided should promote a positive image of their peers with disabilities. Teachers can also take into account the work of emotional intelligence and self-regulation as fundamental strategies for improving the classroom climate.

Second, strategies should be taken to promote typically developing students' empathy. Behavioral strategies based on cooperative, equal-status, and personal contact can be applied to promote students' empathy toward peers with disabilities. Batson et al. (1997) found that once empathetic emotions are aroused, they are less vulnerable to information about victim responsibility. Once aroused, empathetic feelings appear to have some inertia and contribute to a positive attitude (Sharma et al., 2021). Teachers can use media and other visual materials to evoke empathy toward individuals with disabilities and guide them, forming positive attitude and sensitization among students of all ages toward disabled persons.

Data availability statement

The datasets generated during and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by Beijing Normal University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

Conceptualization and funding acquisition: WF. Methodology and writing—original draft preparation: WF and YX. Data collection and analysis: CY and TZ. Writing—review and editing: WF and CY. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Research on the formation mechanism of information cocoon and individual differences among researchers based on information ecology theory

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Introduction: Choosing to only retrieve and read academic information related to their own research field is conducive to researchers' in-depth understanding of their own research issues, and also reduces the pressure of researchers' information retrieval, but may bring about the effect of information cocoon.

Methods: Based on the information ecology theory, a theoretical model is built from the aspects of information people, information, information environment and information technology, and relevant data is collected through questionnaires to verify assumptions. To explore the formation path of information cocoon for scientific researchers and the differences between different types of scientific researchers.

Results: Different gender, education background, identity, age and team size of scientific researchers will lead to different dimensions in the process of producing information cocoon; Community influence, information homogeneity and value identification are important factors influencing the formation of information cocoon room for scientific researchers; Community influence and information homogeneity positively affect value identification.

Discussion: In the future research work, researchers should pay attention to the influence of information homogeneity, community influence and value identification.

KEYWORDS

information cocoon, formation mechanism, scientific researchers, information ecology theory, individual differences

1. Introduction

The explosion of information in the era of big data and the overload of information make people's information behavior show characteristics such as increased network dependence, "fragmentation," and selective exposure. Digital technology allows us to filter information, but it also leads us to exchange information with like-minded people. In addition, because the limited rationality of human beings can not cope with the amount of information on the Internet, we are faced with the problem of cognitive dissonance. We try to solve these problems by ignoring the views that are too different from our own (Gossart, 2014). With the development of information technology, digital academic

information also shows the characteristics of massive and multiple. Researchers often search and read-only academic information related to their research fields to find practical information more quickly and effectively. This information behavior is conducive to researchers' in-depth understanding of their research problems and reduces the pressure of information retrieval for researchers. However, focusing only on homogeneous information for a long time may bring about problems such as information narrowing and group polarization, eventually creating information cocoons. This will be detrimental to cross-disciplinary scholarly communication and harms the development of individual researchers and even the progress of related research fields. Fan et al. pointed out that information cocoons can deepen users' inherent biases, leading to their self-perception bias and irrational inflation, making them prone to form radical and extreme views, statements, or behaviors (Fan and Sun, 2019). The extreme consequence of academic information cocooning leads to the polarization of individual researchers and groups. Zhang pointed out that to avoid the information cocooning phenomenon, researchers should be committed to breaking the established cognitive framework, constantly breaking through cognitive boundaries, and having problem awareness and rootedness in research methods (Zhang Y. H., 2020).

The key to solving the problem of information cocoon for researchers is to focus on the information behavior of researchers and clarify the formation mechanism and operation mechanism of information cocoon researchers. Avoid the adverse effects of information cocoon while meeting the information needs of researchers in the research field, and create a good information environment for researchers.

2. Literature review

2.1 Researcher information behavior

Information behavior refers to human behavior regarding information sources and channels, including active and passive information retrieval and utilization (Li and Xu, 2022). With the rapid development of information digitization, researchers' knowledge creativity Zhou et al. pointed out that the information behavior of researchers contains four aspects: information attention behavior, information acquisition behavior, cognitive information behavior, and information release behavior (Zhou and Zou, 2015). Among them, information concern behavior, information acquisition behavior, and information cognition behavior belong to the input of the information by researchers, and information release behavior belongs to the output of information. The output of researchers' innovative results cannot be achieved without the input of high-quality information in related fields. Therefore, when studying researchers' information behaviors, we should focus on the behaviors related to information input.

The information-focused behavior of a researcher is the beginning of scientific work. Only when scientific researchers start to pay attention to a certain field can they move to the next stage of information acquisition. In the Internet era, the explosive growth of information makes people suffer from information overload and have to avoid information subjectively to reduce the burden. Scientific research knowledge exchange is an information-intensive interactive activity, and researchers, as the receiver, need to input a large amount of information in a relatively short period of time and inevitably ignore and avoid the knowledge transmitted by the knowledge sharers in order to clarify the scientific research information avoidance behavior of researchers Gong et al. constructed a mechanism framework for the influence of information avoidance behavior in scientific research knowledge exchange (Gong et al., 2022).

The current academic community has paid more attention to the information acquisition behaviors of researchers. The information acquisition behaviors of researchers mainly include data reuse behaviors, collaborative information behaviors, self-storage behaviors, and data-sharing behaviors. For example, in terms of data reuse behavior, Zhang et al. explored the characteristics of data reuse behavior of social science researchers, taking the field of management in China as an example (Zhang et al., 2020). Sun et al. explored the influencing factors of data reuse behavior of social science researchers based on the MOA theoretical framework. They found that the motivation, opportunity, and ability of social science researchers' data reuse were important influences on their data reuse behaviors (Sun et al., 2021). Regarding collaborative information behavior, Xie et al. analyzed the collaborative information behavior between researchers and disciplinary librarians at different stages by combining life cycle theory and coconstructing collaborative information behavior guarantee systems for scientific data services (Xie et al., 2020). In terms of self-storage behavior, Yuan sorted out relevant studies on researchers' awareness and recognition of self-storage, the current situation of participation behavior, and influencing factors. The results showed that supporting the concept of free and open access to scientific research results and improving scientific performance is conducive to promoting researchers' participation in self-storage. In contrast, factors such as copyright disputes hinder researchers' self-storage behavior (Yuan, 2018). Regarding data-sharing behavior, Zheng used Meta-analysis to explore the factors influencing researchers' willingness to share data and showed subjective norms. Perceived benefits and perceived ease of use positively enhance researchers' willingness to share data, while age, perceived costs, and perceived risks play a negative role (Zheng, 2021). In addition, in the current mobile Internet information environment, researchers' information behavior is characterized by increased network dependence and "fragmentation" of information access, making information encounters an essential mode of information search and discovery. Hu et al. explored the mechanism of researchers' information encounters from a process perspective with the help

of a system dynamics model and emphasized the critical roles of three types of factors, namely, users, information, and context, in the information encounter system of researchers (Hu et al., 2020).

In addition, the cognition of research information is also an essential part of the information input process of researchers. Brenda Dervin proposed in the meaning construction theory that "information is the result of human understanding (Dervin, 1998)." Research innovation originates from thinking about and reconstructing information (Bailey and Tierney, 2002), and researchers' information output behavior depends on the input information's understanding and cognition.

It is worth noting that many scholars have pointed out the negative effect of the explosive growth of information in the Internet era, i.e., information overload (Fuertes et al., 2020; Gong et al., 2022). The sheer volume of information overwhelms researchers. Researchers may subconsciously or even actively ignore other information that is not relevant to the current research but is valuable. If researchers focus only on their familiar research areas for a long time and ignore other valuable information intentionally or unintentionally, it may eventually lead to the information cocoon effect. In recent years, some scholars have also paid attention to this problem, such as Yuan, who used the Grounded Theory research method to conduct a qualitative study on the factors influencing the formation of researchers' information cocoon in the network environment through interviews, data coding, and model construction (Yuan, 2018). Although his study explains to a certain extent how the information cocoons of researchers are generated, the research form of interviewing and coding has an intense subjectivity, which makes different coders may get different conclusions. Therefore, quantitative research can remedy this deficiency to a certain extent.

In summary, it is clear that researchers are at the forefront of the development of the times, and the process of their information input has an important impact on the output of scientific research results and therefore has received wide attention from the academic community. In the era of data overload, it is clear that the information cocoon effect has had an impact on the lives of the general public and also on the information behavior of researchers. In order to avoid the cognitive pressure brought by information overload, researchers often choose to activate their filtering mechanism to reject information that does not seem relevant to their research, which may lead to excessive homogenization of the acquired information and gradually wrap themselves in the information cocoon. The research on the formation mechanism of the information cocoon effect of researchers is urgent. Few scholars have paid attention to the information cocoon of researchers. Only a small number of studies have used qualitative methods to explore the causes of the information cocoon of researchers. However, the results are subjective, and there is an urgent need to use a more scientific and objective method to There is an urgent need to use a more scientific and objective method to explore further the issue of the information cocoon effect of researchers.

2.2 Information cocoon effect

Keith Sunstein, a professor at Harvard University, first proposed the concept of the information cocoon in 2006, arguing that because the public only focuses on information that interests them, in the long run, they will shackle themselves in the cocoon-like a silkworm chrysalis, i.e., the information cocoon (Sunstein et al., 2008). Faced with a considerable amount of information, human attention is limited. When unable to handle the overload of information, they often engage selectively based on their interests and filter and select information based on their personal preferences to keep their attention focused and psychologically comfortable (Zhao, 2021). The development of algorithmic recommendation technology has provided the public with more personalized information services. However, because the public's own information needs are not comprehensive, they often choose to pay attention to their favorite things or information areas that can make them happy and are not willing to actively focus on other information, which will limit the breadth and depth of their access to information in the long run (Ren et al., 2021). Users tend to isolate themselves in environments of homogenous and like-minded communication and are more eager to become friends with those who have similar opinions, which might increase internal group identification and devalue external groups (Cargnino and Neubaum, 2020).

The information cocoon has become a hotspot in informatics-related fields in recent years. Scholars mainly research the causes, influencing factors, and dissipation strategies of information cocoon from the perspectives of algorithmic technology, social interaction, and human factors characteristics. For example, in terms of algorithmic techniques, Liu et al. combined multi-label classification algorithms with building a multidimensional feature labeling system to cope with the information cocooning problem (Liu et al., 2022). In terms of social interaction and human factors features, Baumann et al. qualitatively reproduced the observation relationship between user participation and opinions, as well as the opinion isolation in the interactive network by building a dynamic model, revealing the core mechanism of echo chamber and polarization in social media (Baumann et al., 2020); Zhang combined S-O-R theory to explore the factors influencing users' information echo behavior in the big data environment and found that users' affective and cognitive factors have a more significant influence on users' information echo behavior. Their internal motivation and external stimuli indirectly influence information echo behavior through changes in cognition (Zhang H., 2020). Zhang et al. looked at information overload, selective contact psychology and adverse effects of technology, etc., explored the causes and their effects of the college student group caught in the information cocoon, and proposed a path for information literacy education in colleges and universities to dissipate the information cocoon (Zhang et al., 2021).

Whether the information cocoon effect is more beneficial than detrimental or more detrimental than beneficial is not a consistent view in academia. Zhou pointed out that the

information cocoon has two sides: on the one hand, the information cocoon makes the audience information-bound; on the other hand, it is a conscious choice of the audience in the case of information overload, and although the information cocoon can be a potential threat to the cohesion of social consensus, it has a specific positive role in the process of reaching social consensus (Zhou, 2019). However, most scholars believe that the adverse effects of the information cocoon effect are severe and difficult to control. For example, Chen et al. analyzed the Lianyungang anti-nuclear incident. They found that the information cocoon induces the formation and fusion of group identity and in-group polarization, leading to the generation of neighborhood avoidance cluster behavior (Chen et al., 2021). A considerable number of scholars analyzed the possible adverse effects of information cocoons. It proposed corresponding countermeasures to dissipate them, such as Shen, who argued that information cocoons could cause cognitive differences among audiences and groups, which may cause the problem of social tearing in the long run, and gave countermeasures to dissipate information cocoons and promote information fairness from different perspectives, such as information platforms and governments (Shen, 2020). Zhang pointed out that once the information cocoon becomes a normalized condition in cyberspace, the space for the Party's voice to spread through the Internet will be suppressed, harming social stability and national ideological security (Zhang L. L., 2021). Social media networks are becoming more and more important in shaping political views and allowing people to access information. The social relevance of the information cocoon theory will only grow. Contact with different views is essential for cultivating well-informed citizens. In contrast, contact with like-minded voices may lead to the extreme polarization of ideology (Bright, 2016).

In summary, most scholars believe that the information cocoon effect does more harm than good. Many adverse effects are difficult to control, so it is essential to understand their mechanism and control their adverse effects. Most existing studies focus on the information cocoon effect of social network users and university students. However, there is a lack of research on the information cocoon effect of researchers. As an important talent resource for the development of national science and technology, scientific researchers' innovation ability plays an important role in the development of the times. The information behavior of scientific researchers affects the output of their innovative achievements. Homogeneous scientific research information may be conducive to the researchers' in-depth understanding of a problem in the short term, but if they get similar information for a long time to avoid information overload, they may fall into the information cocoon. Therefore, this study will investigate the formation mechanism of the information cocoon effect on researchers and the main reasons that influence the formation of an information cocoon. In addition, we want to know what types of researchers are more likely to be affected by the information cocoon.

3. Theoretical basis and research hypothesis

Information ecology theory was first proposed by F. W. Horton, a famous scholar in the field of information management, in 1978, which explains the process of information dissemination and diffusion from the perspective of the ecosystem (Yang et al., 2017). The theory has good explanatory power and applicability in information resource management and user information behavior. Lippitt et al. pointed out that individual characteristics and environmental characteristics are important factors affecting human behavior (Lippitt, 1939; Wang et al., 2022).Wang et al. pointed out that information, information person, information technology, and information environment are essential factors that make up the information ecosystem (Wang et al., 2018), in which the information person is the subject and dominates the whole process of information activities. Information is the object and does not depend on human will; information technology is the carrier of information dissemination. The information environment is where the information person as the subject and information as the object interact (Jiang et al., 2020). The information behavior of information people and the interaction between them and other elements are the critical issues studied by this theory, its own filtering mechanism may have a considerable impact on its information preference (Bruns, 2017).

Information ecology theory has been widely used in many disciplines, such as management, library, and intelligence science. Based on information ecology theory, Duan Aloe et al. explored the formation mechanism of the information cocoon of Internet users and the operation mechanism. They found that the cognition of value users, information environment, and information technology factors are important influencing factors that affect the formation of the information cocoon of Internet users (Duan et al., 2020). Zhang conducted a qualitative study on the formation mechanism of network users' information cocoons using rooting theory. Moreover, the results showed that the human information factor, information factor, information technology factor, and information environment factor are essential factors in forming network users' information cocoons (Zhang H., 2021). This shows that it is applicable and feasible to apply the information ecology theory to explain the formation mechanism of the information cocoon of researchers. Based on the information ecology theory and the characteristics of researchers' information behavior, this study constructs a research model of the formation mechanism of researchers' information cocoons, as shown in Figure 1.

Information people are the core elements in the information ecology, in which the producers, processors, transmitters, and users of information all belong to information people, and the object of this study is university researchers, i.e., users of research information. Many scholars believe (Jiang et al., 2020; Zhang H., 2020) that users' information behavior has an essential connection with their interests and value recognition. Researcher's interest reflects the degree of enthusiasm and enjoyment in pursuing the needs of the research field. But value recognition of researcher

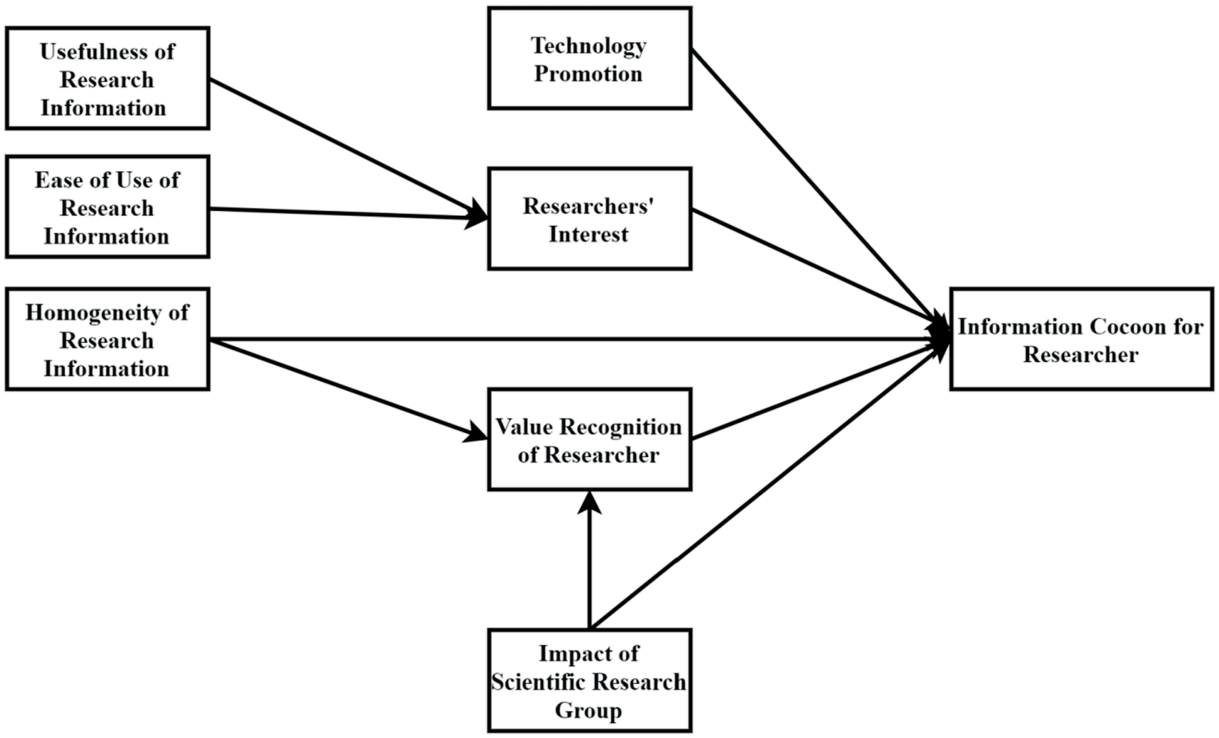


FIGURE 1
Research model.

reflects the values formed by the researcher's recognition of certain types of values. Specifically, when researchers read information related to their research field, they will be highly interested in reading and have pleasant emotions. The emotional pleasure will motivate them to continue to pay attention to the academic information they are interested in. From the perspective of rational cognition, the values conveyed by the information researchers receive are often expected to be highly compatible with the values they have accumulated in the past. Moreover, receiving academic information with highly similar values for a long time will often lead to the formation of value recognition, which will motivate researchers to continue to pay attention to homogeneous scientific information and may even resist academic information that contradicts their views but is meaningful.

> *H1:* Researcher's interest and value recognition significantly influence the formation of information cocoons of researchers.

The information factor is the central system in the information ecology, which is the critical link to other factors in the information ecology. In forming information cocoons, researchers' exposure to academic information tends to exhibit characteristics such as usefulness, ease of use, and homogeneity. In this study, usefulness of research information refers to the extent to which research-related information improves the performance of researchers and enhances the quality of their research. Researchers tend to show great interest in the information they receive when it is relevant to their research field and beneficial to improving the quality of their research and learning about the details of the information promptly. Ease of use of research information refers to the ease of access to academic information. Information that is easy to access and use is more likely to be downloaded and read by researchers. Homogeneity of research information refers to the degree of homogeneity of research information obtained by researchers, precisely the convergence of research-related information content, access, and the value of the information conveyed. When researchers read academic information related to their research fields or similar to their views, it can often stimulate their interest in reading and effectively improve their research efficiency. However, suppose researchers read information with similar content and viewpoints through fixed information access channels for a long time. In that case, their values are likely to be highly convergent with the transmitted information and form value identities, thus limiting the emergence of other heterogeneous information. In the long run, researchers will be enclosed in such highly similar information, which will be detrimental to their research innovation and may eventually lead to the emergence of the information cocoon effect, based on which the following hypothesis is proposed.

> *H2:* The usefulness of research information and ease of use significantly positively affect researchers' interest.

> *H3:* Homogeneity of research information has a significant positive impact on the value recognition of researcher and the formation of an information cocoon.

Information technology is a guaranteed factor for the proper functioning of information ecology, which mainly includes information retrieval, processing, dissemination, and security technologies. This study considers technology promotion as the information technology factor, i.e., the subjective feelings of researchers about each service function, each service module, and each application technology of the research service platform. Compared with the past, modern information technology has made it possible for researchers to access relevant academic information and use the academic platform more conveniently. The convenience brought by information technology should promote access to diversified research information. However, at the same time, the complicated and overloaded information also makes it more difficult for researchers to obtain and identify useful information. In order to avoid this situation, researchers often focus only on specific research topics, research teams, and keywords or choose a fixed and usual platform to obtain relevant academic information. The following hypothesis is proposed based on the fact that the information content and access will be solidified and thus become dependent on the information, thus intensifying the formation of the information cocoon effect of researchers.

> *H4:* Technology promotion has a significant positive impact on the formation of an information cocoon for researchers.

The information environment is an essential condition for the normal functioning of the information ecology, including the internal and external environments, including the social environment, impact of scientific research group, and opinion leaders. For researchers, the academic fields they can cover are mainly influenced by their research teams. Generally speaking, researchers in the same research team have a high degree of similarity in their research contents and fields, which are shared through internal teamwork and academic group meetings. Similar academic information is disseminated for a long time, which may lead to narrowing information, group polarization, and even the information cocoon effect among researchers.

> *H5:* Impact of scientific research group has a significant positive impact on the value recognition of researcher and the formation of information cocoons.

4. Research design

4.1 Questionnaire

The questionnaire consists of three parts: the first part introduces the basic information of the questionnaire, including the purpose and content of the survey; the second part investigates the basic information of the respondents, including demographically important information such as gender, age, highest education, discipline, and the number of research teams. The third part is the investigation of the factors influencing the formation mechanism of the information cocoon of researchers, including researcher's interest, value recognition of researcher, usefulness of research information, ease of use of research information, homogeneity of research information, technology promotion, and impact of scientific research group. Moreover, the information cocoon of researchers' eight variables and variable items are from the existing literature of mature scales, with appropriate adaptations in the study context and appropriate amendments based on the pre-research part. The items were measured on a 5-point Likert scale.

4.2 Questionnaire distribution and data collection

The research subjects of this study were university researchers, and the questionnaires were distributed by a combination of online and offline methods. Three hundred and thirty-four questionnaires were collected, and 320 valid questionnaires were obtained after excluding those that did not answer the screening questions correctly, those that took less time to fill in, and those with too high a repetition rate.

5. Data analysis

5.1 Descriptive analysis

In the formal research, the number of males was 156, accounting for 51%. The number of females was 164, accounting for 49%, with a relatively balanced gender distribution. in terms of age distribution, researchers aged 21–30 accounted for the most significant proportion, about 50%, followed by researchers aged 31–40, about 39%. Furthermore, this indicates that young and middle-aged researchers are the leading group in this research. Regarding the distribution of research disciplines, science and engineering accounted for the most significant proportion, about 20%, followed by management and education, about 14%. In terms of education, most of the researchers in this study had the highest degree of master's degree, about 76%, and doctoral degrees only accounted for 24%; in terms of the status of researchers, the proportion of students and teachers was the same. This indicates that this research sample meets this study's needs.

5.2 Reliability testing

As shown in Table 1, Cronbach's α coefficients of all the variables in the questionnaire are more significant than 0.7. Cronbach's α coefficient does not increase again after excluding any measure, and the scale's reliability is good. The tests of

TABLE 1 Reliability testing.

Variables	Measure	Cronbach's alpha coefficient	Cronbach's alpha coefficient after removal of the measure	Factor loadings	CR	AVE
Researcher's interest	PI1	0.707	0.572	0.821	0.837	0.632
	PI2		0.647	0.776		
	PI3		0.630	0.787		
Value recognition of researcher	PV1	0.774	0.716	0.821	0.871	0.692
	PV2		0.752	0.796		
	PV3		0.615	0.876		
Usefulness of research information	IU1	0.751	0.700	0.746	0.836	0.505
	IU2		0.727	0.642		
	IU3		0.712	0.716		
	IU4		0.699	0.731		
	IU5		0.699	0.714		
Ease of use of research information	IE1	0.777	0.712	0.827	0.872	0.694
	IE2		0.736	0.811		
	IE3		0.650	0.861		
Homogeneity of research information	IS1	0.878	0.823	0.902	0.926	0.806
	IS2		0.875	0.866		
	IS3		0.781	0.924		
Technology promotion	TE1	0.729	0.639	0.801	0.834	0.557
	TE2		0.714	0.661		
	TE3		0.666	0.763		
	TE4		0.655	0.754		
Impact of scientific research group	EV1	0.853	0.725	0.920	0.912	0.776
	EV2		0.820	0.867		
	EV3		0.837	0.854		
Information cocoon for researcher	CO1	0.891	0.839	0.909	0.932	0.821
	CO2		0.854	0.900		
	CO3		0.840	0.909		

structural validity include convergent validity and discriminant validity. The factor loadings, combined reliability (CR), and average extracted variance (AVE) can verify the convergent validity. The factor loadings of each item are higher than 0.7, the CR is higher than 0.8, and the average extracted variance (AVE) is higher than 0.5. The discriminant validity can be verified by the square root of the observed variable AVE value more significant than the correlation coefficient with other variables. As shown in Table 2, the square root of all variable AVE values is more significant than the correlation coefficients with other variables, which shows that the questionnaire has good discriminant validity.

5.3 Individual variation analysis

From the results of the independent sample t-test in Table 3, it can be seen that the differences between genders in usefulness of research information, homogeneity of research information, technology promotion, impact of scientific research group, and information cocoon of researcher are significant. The mean values of usefulness of research information and technology promotion for female researchers were significantly higher than those for male researchers. The mean values of homogeneity of research information, impact of scientific research group, and researcher information cocoon for male researchers were significantly higher than those for female researchers.

The independent sample *t*-test in Table 4 shows significant differences in value recognition of researcher, ease of use of research information, impact of scientific research group, and the information cocoon of researcher. The mean values of value recognition of researcher, ease of use of research information, impact of scientific research group, and information cocooning of researchers were significantly higher

TABLE 2 Distinct validity test.

	RI	VR	UI	EI	HI	TP	RG	CO
RI	**0.795**							
VR	0.379**	**0.832**						
UI	0.419**	0.248**	**0.712**					
EI	0.178**	0.316**	0.388**	**0.833**				
HI	0.162**	0.331**	0.124*	0.212**	**0.898**			
TP	0.403**	0.331**	0.524**	0.071	0.106	**0.746**		
RG	0.198**	0.347**	0.226**	0.230**	0.209**	0.284**	**0.881**	
CO	0.097	0.409**	0.010	0.332**	0.437**	0.014	0.411**	**0.906**

RI = researcher's interest, RV = value recognition of researcher, UI = usefulness of research information, EI = ease of use of research information, HI = homogeneity of research information, TP = technology promotion, RG = impact of scientific research group, CO = information cocoon for researchers.**At the 0.01 level (two-tailed), the correlation is significant. *At the 0.05 level (two-tailed), the correlation is significant. The bold values are the square root of each variable AVE.

TABLE 3 Differences in the dimensions among gender-specific researchers.

Dimension	P	T	Standard deviation	Average	Gender
Researcher's Interest	0.592	0.536	0.463	4.376	Female
			0.533	4.346	Male
Value recognition of researcher	0.126	−1.535	0.716	4.246	Female
			0.387	4.344	Male
Usefulness of research information	0.006	2.777	0.293	4.373	Female
			0.508	4.244	Male
Ease of use of research information	0.830	−0.214	0.669	4.000	Female
			0.753	4.017	Male
Homogeneity of research information	0.006	−2.763	0.941	3.644	Female
			0.716	3.902	Male
Technology promotion	0.037	2.095	0.392	4.372	Female
			0.527	4.263	Male
Impact of scientific research group	0.000	−4.240	0.815	3.839	Female
			0.437	4.148	Male
Information cocoon for researcher	0.004	−2.879	0.849	3.848	Female
			0.601	4.083	Male

for researchers with the highest degree of PhD than for those with the highest degree of master's. This indicates that higher-education researchers are more likely to be affected by the information cocoon effect.

From the results of the independent sample *t*-test in Table 5, it is clear that the differences in value recognition of researcher, homogeneity of research information, and information cocoon of researchers between researchers as teachers and students are significant. Among the researchers, the mean value recognition of researcher of teachers is significantly higher than that of students. In contrast, the mean value of students is significantly higher than that of teachers in terms of homogeneity of research information and the information cocoon of researchers.

As shown in Table 6, there are significant differences in the perceptions of information usefulness, information ease, homogeneity of research information, technology promotion, impact of scientific research group, and researcher information cocoon among researchers of different ages. The comparison shows that researchers aged 51 and above have the highest mean values in information usefulness, information ease of use, homogeneity of research information, and researchers' information cocoon. Moreover, the mean values of researchers' information cocoon show a wave-like increase with age; researchers aged 31–40 have the highest mean values in technology promotion and impact of scientific research group.

Table 7 shows significant differences in the perceptions of value recognition of researcher, information ease, homogeneity

TABLE 4 Differences in dimensions among researchers with different degrees.

Dimension	P	T	Standard deviation	Average	Academic qualifications
Researcher's interest	0.200	−1.285	0.503	4.342	Master
			0.476	4.425	PhD
Value recognition of researcher	0.015	−2.434	0.592	4.250	Master
			0.519	4.434	PhD
Usefulness of research information	0.763	0.302	0.402	4.314	Master
			0.461	4.297	PhD
Ease of use of research information	0.000	−5.933	0.767	3.918	Master
			0.359	4.298	PhD
Homogeneity of research information	0.699	−0.387	0.850	3.760	Master
			0.844	3.802	PhD
Technology promotion	0.612	0.508	0.407	4.328	Master
			0.618	4.290	PhD
Impact of scientific research group	0.034	−2.136	0.702	3.949	Master
			0.568	4.118	PhD
Information cocoon for researcher	0.002	−3.124	0.780	3.900	Master
			0.588	4.162	PhD

TABLE 5 Differences in dimensions among researchers with different roles.

Dimension	P	T	Standard deviation	Average	Roles
Researcher's interest	0.206	−1.269	0.624	4.325	Student
			0.333	4.340	Teacher
Value recognition of researcher	0.031	−2.162	0.626	4.222	Student
			0.527	4.361	Teacher
Usefulness of research information	0.189	−1.317	0.515	4.278	Student
			0.292	4.340	Teacher
Ease of use of research information	0.140	1.478	0.707	4.068	Student
			0.710	3.951	Teacher
Homogeneity of research information	0.001	3.416	0.674	3.932	Student
			0.961	3.616	Teacher
Technology promotion	0.111	−1.598	0.587	4.276	Student
			0.304	4.360	Teacher
Impact of scientific research group	0.170	1.375	0.629	4.043	Student
			0.715	3.939	Teacher
Information cocoon for researcher	0.092	1.690	0.651	4.034	Student
			0.824	3.894	Teacher

of research information, technology promotion, impact of scientific research group, and researcher information cocoon among researchers of different team sizes. The mean values of value recognition of researcher, ease of use, homogeneity of research information, technology promotion, impact of scientific research group, and information cocoon of research teams of 20 or more people are greater than those of research teams of other sizes.

5.4 Model hypothesis testing

The model path coefficients were tested against the hypotheses, and the results are shown in Table 8. From the test results, it can be seen that value recognition of researcher ($\beta = 0.277$, $p < 0.001$), homogeneity of research information ($\beta = 0.307$, $p < 0.001$), and impact of scientific research group ($\beta = 0.311$, $p < 0.001$) have a more significant positive effect on

TABLE 6 Differences in the dimensions among researchers of different ages.

Dimension		Researcher's interest	Value recognition of researcher	Usefulness of research information	Ease of use of research information	Homogeneity of research information	Technology promotion	Impact of scientific research group	Information cocoon for researcher
P		0.075	0.427	0.004	0.000	0.000	0.001	0.000	0.000
F		2.320	0.929	4.611	8.611	8.317	6.049	10.979	9.639
Under 30	SD	0.563	0.667	0.349	0.594	0.810	0.577	0.677	0.789
	AVE	4.317	4.250	4.341	4.067	3.867	4.275	3.917	3.927
31–40	SD	0.434	0.466	0.475	0.688	0.843	0.211	0.582	0.541
	AVE	4.449	4.358	4.329	4.065	3.755	4.436	4.210	4.132
41–50	SD	0.325	0.576	0.422	1.125	0.846	0.485	0.626	0.983
	AVE	4.238	4.298	4.036	3.381	3.107	4.071	3.583	3.345
Over 51	SD	0.356	0.178	0.396	0.178	0.415	0.267	0.975	0.502
	AVE	4.333	4.167	4.350	4.167	4.375	4.250	3.458	4.208

the formation of researchers' information cocoons. The positive effect of impact of scientific research group was the most pronounced, but the role of technology promotion and interest in forming researchers' information cocoons was not verified. Information usefulness ($\beta = 0.412$, $p < 0.001$) significantly positively affected researchers' interest, and its role in influencing interest was not verified. Both homogeneity of research information ($\beta = 0.270$, $p < 0.001$) and impact of scientific research group ($\beta = 0.291$, $p < 0.001$) had a significant positive effect on value recognition of researcher. Moreover, impact of scientific research group has a slightly higher effect than homogeneity of research information.

In academic research, researchers tend to collect and obtain academic information on research topics and methods similar to their field. This type of information is more likely to stimulate their interest in reading. Although the ease of use of information brings convenience to researchers' research, it is not enough to stimulate researchers' interest in reading. The influence of interest on the information cocoon of researchers is not significant, probably because interest only reflects the shallow emotional state of researchers, and interest in a specific field of research may influence other information retrieval behavior. However, its influence does not yet lead to the formation of the information cocoon of researchers. Value recognition of researcher reflects the deeper cognitive state of researchers. Homogeneity of research information and value recognition of researcher play a positive role in forming researchers' information cocoon. Long-term input of homogeneous information may cause researchers to develop a strong value recognition of researcher for a particular viewpoint. In the short term, access to a large amount of academic information in the same field and on the same topic can help researchers gain a deeper understanding of that particular field. However, in the long term, solidifying information sources and content may narrow information for researchers. Homogenized information will change the value perception of researchers and lead to the solidification of thinking, which may eventually lead to the formation of information cocoons for researchers, which not only affects their academic careers but also is not conducive to the prosperity of the academic community. For researchers, the most frequent social group they come into contact with is their research group. The convergence of academic topics within the group, the fixed academic communication groups, and a large amount of homogeneous academic information increase the possibility of polarization of the research community and the degree of scientific involution. At the information technology level, the correlation between technology promotion and the information cocoon of researchers is insignificant, indicating that technology's development does not impact researchers' formation. To circumvent researchers' information cocoon effect, we should consider the influence of information homogenization, researchers themselves, and environmental factors.

TABLE 7 Differences in dimensions among researchers of different sizes of research teams.

Dimension		Researcher's interest	Value recognition of researcher	Usefulness of research information	Ease of use of research information	Homogeneity of research information	Technology promotion	Impact of scientific research group	Information cocoon for researcher
P		0.197	0.000	0.092	0.022	0.002	0.017	0.014	0.004
F		1.517	5.997	2.015	2.892	4.255	3.046	3.157	3.925
5 and below	SD	0.622	0.656	0.274	0.529	0.423	0.211	0.403	0.158
	AVE	4.167	4.000	4.250	3.917	3.823	4.188	3.781	4.010
6–10	SD	0.510	0.711	0.287	0.751	0.906	0.412	0.624	0.901
	AVE	4.405	4.212	4.369	3.924	3.748	4.343	4.048	3.786
11–15	SD	0.572	0.395	0.671	0.863	0.889	0.663	0.796	0.846
	AVE	4.370	4.375	4.217	4.019	3.787	4.236	3.907	4.106
16–20	SD	0.351	0.291	0.430	0.590	0.926	0.471	0.884	0.304
	AVE	4.364	4.424	4.277	4.061	3.439	4.318	3.879	4.076
20 or more	SD	0.158	0.224	0.090	0.112	0.392	0.152	0.269	0.164
	AVE	4.344	4.583	4.369	4.375	4.229	4.531	4.281	4.208

6. Discussion

6.1 Comparison with previous research

In the past, researchers' information behavior has been deeply discussed. However, with the development of Internet technology, the amount of information available to people has shown an explosive growth trend. Researchers have encountered a new problem: how to extricate themselves from complex information. Some researchers have paid attention to the possible information avoidance behavior of researchers. Researchers may intentionally or unintentionally start their information filtering mechanism, selectively focus on information related to their research, and ignore other seemingly unrelated information, even if the ignored information is valuable. Avoiding information may reduce the pressure on researchers and temporarily remove them from the confusion and negative emotions existing in current research. Nevertheless, it may also cause researchers to ignore important information and miss innovative ideas and opportunities to eliminate uncertainty (Keren, 2018). Selective information input may lead to information showing a high degree of homogeneity, bringing risks to the information cocoon.

In order to deal with the problem of researchers' information cocoon, this study used quantitative methods to build a theoretical model of the formation mechanism of scientific researchers' information cocoon and made a detailed analysis of the differences between different scientific researchers' formation of a research information cocoon.

When discussing the effect of information cocoons, previous scholars chose social network users as their research objects. In today's era, researchers are also affected by information overload. This study found that the influence of scientific research groups, homogeneity of research information, and value recognition of researcher are important factors affecting the formation of an information cocoon for scientific researchers. Yang et al. analyzed the causes and consequences of the information cocoon, pointing out that different environments will affect personal information contact behavior and adjust the impact of personal characteristics on the information cocoon (Yang and Yuan, 2022). Their research conclusion is consistent with that of this study.

In terms of information homogeneity, Zhang et al. analyzed the influencing factors of network users' information cocoon detention willingness based on PPM theory. They found that information homogeneity and information overload negatively affect network users' information cocoon detention willingness (Zhang and Li, 2022). However, this study found that information homogeneity positively impacts the generation of an information cocoon. The different research objects may be an important reason for this difference. Social network users are eager to obtain more extensive information through social network platforms. A large amount of homogenized information for a long time will put users in a state of overload, which is easy to generate negative emotions such as fatigue and boredom, thus generating the desire to leave the original information cocoon. However, for researchers, a deep

TABLE 8 Path coefficients and hypothesis testing results.

NUM	Independent variable→dependent variable	Standardized path coefficient	Standard error	T	P	Validation results
1	RI → CO	−0.047	0.077	−0.921	0.358	Not supported
2	VR → CO	0.277	0.068	5.200	0.000	Supported
3	UI → RI	0.412	0.066	7.441	0.000	Supported
4	EI → RI	0.018	0.039	0.329	0.743	Not supported
5	HI → VR	0.270	0.035	5.217	0.000	Supported
6	HI → CO	0.307	0.042	6.409	0.000	Supported
7	TP → CO	−0.179	0.082	−3.519	0.000	Not supported
8	RG → VR	0.291	0.044	5.623	0.000	Supported
9	RG → CO	0.311	0.054	6.339	0.000	Supported

understanding of their fields can not be separated from reading a large number of relevant literature. Therefore, compared with network users, scientific researchers' information cocoon effect is more difficult to control.

In value recognition, Yu et al. pointed out that the information cocoon presents the coexistence of tool rationality and value rationality. That is, improving the subjective initiative of the audience and high-dimension media literacy has positive value for overcoming the information cocoon (Yu and Wang, 2022). Their conclusion suggests that although the value recognition of scientific researchers may further promote the formation of the information cocoon, it is not absolute. Researchers should give play to their subjective initiative, take the initiative to overcome their absolute identification with a single point of view or specific areas, and be more inclusive of multiple views.

We initially believe that the information cocoon of scientific researchers will also be positively affected by research interest, technology, and other factors. However, the relationship between interest and information cocoon has not been confirmed. Much research on network users emphasizes the critical influence of users' interests on the information cocoon. For example, Ren et al. pointed out that individual selective psychology determines the evolution of their information behavior, constraining users to narrow information cocoons guided by their existing ideas and interests, and this phenomenon is objective (Ren et al., 2021). However, some scholars pointed out that users only have the information cocoon effect when the values of users are deeply affected or even changed in the reading process. The value cognition of users, rather than the emotional cognition represented by interest, is the critical factor in the formation of the information cocoon effect (Duan et al., 2020). Researchers should improve their own information literacy, actively focus on information in different fields, and embrace different values. In this study, the relationship between technology promotion and information cocoon is another untested hypothesis. The research results show that technology promotion does not accelerate the generation of information cocoon for scientific researchers but harms this process. Some scholars pointed out that the influence of information technology on the information cocoon effect is weaker than that of the human information element (Yan and Li, 2022). Technology is a double-edged sword. Although many scholars pointed out that the development of information technology may produce a series of adverse effects, including information overload, we cannot deny that technology provides us with more information access channels. We should pay more attention to the role of people themselves.

As the characteristics and status of the information behavior subject, the human information factor is a primary essential category in forming the user information cocoon. It is necessary to analyze the individual differences in forming an information cocoon. Previous studies focused on the information cocoon's causes, hazards, and elimination strategies. Compared with previous studies, this study further explored the differences between different types of individuals based on path analysis. The research found that the different gender, educational backgrounds, identities, ages, and team sizes of researchers will lead to different dimensions in producing the information cocoon.

6.2 Differences among different types of researchers

The mean values of female researchers were significantly higher than those of male researchers in terms of perceived information usefulness and technology promotion. In comparison, the mean values of male researchers were significantly higher than those of female researchers in terms of information homogeneity, impact of scientific research group, and researcher information cocoon. The subsequent path analysis showed that information homogeneity and impact of scientific research group significantly positively affected forming of a researcher information cocoon. The results suggest, to some extent, that male researchers are more likely to be trapped in information cocoons. Alrashidi notes that while society is working toward professional equality between men and women, fewer women are actively engaged in research (Alrashidi, 2017), and even for those who are, a significant

proportion of them need to allocate a significant amount of time to family activities. As a result, the depth of research, participation, and even academic status of current female researchers is less likely to be on par with that of male researchers. It should be noted that the premise of the information cocoon effect for researchers is the long-term input of a large amount of homogenized information, so female researchers are currently at less potential risk of being threatened by the information cocoon compared to men. However, with the development of society, the gender gap in the research field will continue to narrow, and female researchers should not ignore the adverse effects of information cocooning.

Researchers with the highest degree of PhD have significantly higher mean values of value recognition, information ease, impact of scientific research group, and researcher information cocoon than those with the highest degree of M.S. Higher education also brings a higher risk of an information cocoon. Previously, it was believed that the longer an individual spends on conscious information acquisition, the wider the boundaries of his or her personal information world and the more information-rich the individual is (Zhou and Bao, 2021). However, this study reveals the opposite conclusion, which may be since, compared to master's degrees, PhDs have developed a more fixed pattern of research work. There is a clear bias in the content and channels of acquiring research information (Spezi, 2016). While having rich research experience, PhDs are also more influenced by the research community than master's degrees. The content of the information exchanged within the group tends to be the same. The long-term and repeated exchanges within the group will consolidate the researchers' identification with their views, leading to an increased possibility of information cocooning.

The mean value of mentors was significantly higher than that of students in terms of value recognition of researcher. However, the mean value of students was significantly higher than that of mentors in terms of information homogeneity and information cocooning of researchers. The fact that mentors have richer research experience and have developed more fixed research protocols in continuous exploration may be an important reason why researchers with mentorship status have higher value recognition of researcher than student research groups. However, it is also found that the degree of access to homogeneous information and the risk of information cocooning are higher for student researchers than for mentors. This may be because mentors involved in research have a broader experience and communication platform than students. Students are still immature in research thinking, self-control and drive, and their tendency to avoid information in the exchange of research knowledge is more significant (Gong et al., 2022). Therefore, in research work, mentors should pay more attention to cultivating students and guide them in various forms to face diversified and cross-disciplinary research information with a more open and inclusive attitude to avoid getting caught in the information cocoon.

In addition, this study also found significant differences in the information cocoon formation process among researchers in different-sized research teams. When setting up a team, it is not better to have a larger team size but to have a team of appropriate size according to the nature of the team's research area to avoid the information cocoon effect. The question of how to allocate team members in different research fields to avoid the research information cocoon effectively is worthy of more in-depth exploration in the future.

6.3 Analysis of the formation path of researchers' information cocoons

It was found that researchers' interest in reading would be influenced only by the usefulness of the information and not by the ease of use of the information. However, the effect of interest on researchers' information cocoon was insignificant. This is easy to understand because once a researcher identifies a research direction, his or her subsequent work will inevitably revolve around this precise topic, and helpful information related to the research content is more likely to stimulate the researcher's interest in reading, regardless of its accessibility. However, it should be clear that the interest of researchers only has a subtle influence on their information acquisition behavior at a superficial emotional level and does not lead to the formation of an information cocoon effect for they. Researchers gradually form their research logic and style in their scientific work, and the concepts and methods conveyed by the information they acquire overlap highly with their previous perceptions. Once researchers are surrounded by similar information, they tend to form a valued identity. This value recognition of researcher will motivate researchers to focus on homogeneous information and may even resist other different but meaningful information (Chen and Wang, 2019).

Both information homogeneity and value recognition of researcher play a positive role in forming researchers' information cocoons. Homogenized information and solidified values may lead researchers into an information cocoon, where they cannot be thoughtful because their preconceptions will become ingrained, gradually blocking them from outside voices. In Sunstein's view, people are trapped in information cocoons because they select and filter information (Sunstein et al., 2008). Previously, scholars have focused on the information cocoon effect of Internet users. They believe that the "filtering bubble" of Internet users is generated by information filtering and information pushing based on the information traces of users. However, for researchers， their "filter bubble" is more based on personal choice. In the field of education, there is a remarkable phenomenon: students' knowledge gradually takes on a pyramidal shape as their education level increases, i.e., the higher the education level, the narrower the field and the more specialized the content they learn. This may seem a paradox because, in the past perception, the highly educated group had a broader knowledge. Higher education approximates to equal broader knowledge in terms of learning and understanding of common sense knowledge. However, in scientific problems, researchers need to conduct an in-depth analysis of specific and concrete problems, which requires them

to collect a large amount of relevant research literature actively. It is worth mentioning that these kinds of literature often have strong similarities regarding research content, research methods, and even the expression of opinions. In this process, researchers' values are constantly crystallized, which is likely to intensify the information narrowing of researchers and eventually lead to the development of the information cocoon to a deeper level.

Communities have a significant positive impact on both the academic value recognition of researcher of researchers and the formation of their information cocoons. Information technology provides a more self-contained space for ideas and vast knowledge in any field. However, while communication within research communities is more efficient, scholarly communication is not necessarily smoother and more effective than in times of information scarcity. Research communities are classed by differentiation and may tend to be homogeneous within groups and heterogeneous between groups. Members within research groups may be limited to their research areas, drastically reducing their communication with other research groups in different fields. Once generated, the information cocoon of scientific researchers may have unpredictable effects on scientific work. Members within a group have similar views and perspectives. Over time, they accumulate their unique styles and characteristics, eventually leading to more significant characteristics of intra-group homogeneity and inter-group heterogeneity. The "spiral of silence theory" proposed by German scholar Neumann suggests that the more silent people are, the more others will consider a particular view representative (Noelle-Neumann, 1974). This theory is often applied to explain the process of spreading online opinions. When people see that more people agree with a specific view, they will participate more actively, reinforcing the view and spreading it to a broader area, and getting more people's support, which contributes to the homogeneity within the group. This theory can also be used to explain the influence of community on researchers' academic value recognition and the formation of information cocoons. For example, researchers in the same research group or even in the same research field often communicate with researchers with similar views and research topics and rarely with researchers who hold opposite views or whose research fields are not significantly related. The community brings together researchers with similar research perspectives and fields, strengthening internal value recognition of researcher and reinforcing group members' research perspectives.

6.4 Coping strategies of researchers' information cocoon

Based on the above analysis, the following strategies and solutions to solve the information cocoon problem of researchers are given.

Researchers of different genders, education, status, age, and team size have different characteristics in the information cocoon effect formation process. Male, highly educated students, and older research groups are more likely to be influenced by crucial variables in information cocoon formation than other researchers. So in scientific research, this person should pay more attention to diversified research contents and methods, promptly follow up on the latest research hot issues, continuously diversify research fields and channels, and avoid homogeneous effects from becoming the dominant sustainable research.

In forming an information cocoon for researchers, impact of scientific research group, information homogeneity, and value recognition of researcher play a significant favorable influence and are inseparable from each other. Information homogeneity and impact of scientific research group positively influence value recognition of researcher, contributing to the formation of researchers' information cocoons. This suggests that we should pay attention to the input of diversified information in the research process, not limited to the communication within the subject group, but actively promote the positive interaction between subject groups in different fields and cross-disciplines. Moreover, student research groups are easily limited by their thinking in the research process, and the constant input of homogeneous information tends to solidify their thinking. Supervisors should actively guide them to participate in cross-field and multidisciplinary academic conferences to avoid the information cocoon effect effectively.

7. Limitations of research

The study may have had problems related to the sample. In the sample for this study, the number of researchers with the highest degree PhD was much smaller than that of researchers with the highest degree or master's degree. This is to be expected because, in reality, there are far fewer people with PhDs than people with only master's degrees. It is more difficult to obtain data for this segment. Although those researchers with PhDs are more focused on research, in reality, there are more researchers with master's degrees, so this data set is still representative to some extent.

Another potential limitation may be that the article only measured subjects quantitatively using a questionnaire. The concept of information cocooning has not been around for a long time. Using only quantitative measures may overlook subjects' potential information about the information cocoon during the study. However, this study uses a quantitative approach to measure the information cocoon of the researcher, which can clarify more about the ambiguous concept of the information cocoon and has implications for subsequent studies.

8. Conclusion and recommendations for future work

This paper analyzes researchers' information cocoon formation mechanism and their differences based on the information ecology theory and draws the following conclusions. Firstly, the analysis of individual differences reveals that differences in gender, education,

status, age, and team size lead to differences in the perception of information cocoons among researchers in the information ecology theory. In addition, in the path analysis, it was found that information homogeneity, value recognition of researcher, and impact of scientific research group are the key factors that lead to the information cocooning of researchers, and the research impact of scientific research group value recognition of researcher.

Future studies could consider selecting a more scientific sample. In addition, more diverse classifications can be considered in terms of individual variability of researchers, e.g., future studies can examine the variability of researchers with different cognitive styles and personality traits in forming information cocoons.

In addition, future research will use more objective and scientific methods to detect the information cocoon effect of researchers in more depth. Some current studies use qualitative methods such as rooting theory to detect the information cocoon effect, which can avoid the constraints brought about by the fixed topic of quantitative methods but are more subjective. The quantitative method in this study can avoid the influence of analysts' subjective judgment, but there are still certain shortcomings. Future studies can try to combine data mining techniques to obtain the actual information behavior data of researchers to make the conclusions more objective.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by College of Management in Xi'an University of Science and Technology. The patients/participants provided their written informed consent to participate in this study.

Author contributions

YX contributed to the conception and design of the study and performed the statistical analysis. WC wrote the first draft of the manuscript and wrote sections of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Key competencies of students with autism spectrum disorders: Perspectives of Chinese teachers and parents

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Well-defined key competencies for students with autism spectrum disorders (ASD) help develop curriculum and pedagogies that emphasize what students with ASD are expected to learn, to know and to do. Most of the current research on the key competencies of ASD is theoretical and based on the social and cultural backgrounds of western countries. The key competencies defined by most of the research lack of the support of empirical evidence. This study sought to identify the key competencies of school-age students with ASD from the perspectives of teachers and parents. Based on the review of existing key competencies frameworks, a key competencies instrument that consisted of 76 learning outcome items in eight domain areas was developed. An online survey to explore the teachers' and parents' views of the key competencies was conducted with 1,618 teachers and 2,430 parents of students with ASD across China. The results showed that teachers believed that the key competencies should consist of eight domain areas including social-communication, learning skills, healthy living, play, motor, emotion, sensory processing, and cognition, while the cognition related competencies were not recognized by parents. The competencies in social-communication, learning skills, healthy living had higher variance contribution. From the perspective of teachers, the variance contribution of social communication was the highest, while from the perspective of parents, the variance contribution of learning skills was the largest. Taken together, the key competencies framework for students with ASD should include eight dimensions and 75 learning outcome items. The similarities and differences between the perspectives of the two group were discussed. The findings could provide empirical data to assist in developing educational guidelines and guide the development of models of support for students with ASD.

KEYWORDS

autism spectrum disorders, key competencies, learning outcomes, teachers, parents

1. Introduction

With the increasing prevalence of autism, education for students with autism spectrum disorders (ASD) has become a major focus of the education policy and research worldwide. The Autism CARES Act of 2019 enacted by the Department of Health & Human Services in the United States (U.S. Department of Health & Human Services Interagency Autism Coordinating Committee, 2019) incorporates autism education into the law. The National Strategy for Autistic Children, Young People and Adults: 2021 to 2026 promulgated by the British government elevates autism education to a national strategic position (Department of Health and Social Care and Department for Education, 2021). The 14th Five-Year Plan of Action for the Development and Enhancement of Special Education issued by the Chinese Ministry of Education (2022) also specifically puts forward requirements for autism education. These polices indicate the consensus that students with ASD should have access to high quality education.

To ensure high quality education, many countries and international organizations including the U.S., the U.K., Singapore, and the Organization for Economic Co-operation and Development (OECD), have proposed preparing students to develop key competencies as an important educational goal in the 21st century (Liu, 2017). Key competencies represent a set of desired learning outcomes integrating the knowledge, skills, attitudes and values, which are necessary for personal fulfillment, development throughout life, social inclusion and employment (Rychen and Salganik, 2007). While there are well-documented key competencies (e.g., learning skills, critical thinking, communication, creativity and collaboration) to prepare students for the 21st century, the key competencies for students with special education needs, such as the students with ASD have been ignored at a large extent. And it is urgent to clarify the key competencies for students with ASD to provide high quality education.

Some existing research shared what competencies students with ASD should learn. The Autism Education Trust in the U.K. developed a progression framework for students with ASD [Autism Education Trust (AET), 2019]. The framework comprises eight main learning areas, including social understanding and relationships, learning and engagement, communication and interaction, emotional understanding and self-awareness, sensory processing, healthy living, interests, routines and processing, and independence and community participation. Each of the eight learning areas is structed with multiple sub-learning areas, learning outcomes and example of learning outcomes. For example, under the area of communication and interaction, it has a sub-learning area as engaging in interaction. A learning outcome in interaction is to "share attention with adult"; and an example of the learning outcome is to "accept adult sharing an activity." Therefore, the framework was suggested to provide the support to guide practitioners to develop learning outcomes, implement intervention and monitor learning progress.

Using content analysis, Cao et al. (2019) analyzed and compared 10 clinical guidelines for ASD in developed countries and regions, for example, New Zealand Autism Spectrum Disorder Guideline. They found that the learning goals for the students with ASD were mainly distributed in three major competency domains: self-improvement, social skills, and tool use. Specifically, the social skills domain focused on skills in social language, socialization, and challenging behaviors. The self-improvement domain focused more on learning goals related to attention, cognition, motor development, and sensory response, followed by physical development, self-management, and imitation. There were fewer goals in the tool use domain such as academic skills. Some guidelines focused on the remediation to improve their competencies in social communication and stereotypic behaviors. And others focused on holistic education that improved students' overall growth and develop the potential. Most of the guidelines shared competencies domain areas without clarifying the specific outcomes.

Hume et al. (2021) systematically reviewed 972 evidence-based practices (EBPs) studies on children and youth with ASD from 1990 to 2017. It was found that 13 competency areas (i.e., academic/pre-academic performance, adaptive/self-help, challenging/interfering behavior, cognition, communication, joint attention, mental health, motor, play, self-determination, school readiness, social and vocational skills) were addressed in these EBPs studies. While the communication, social, and challenging/interfering behavior related areas were studied most often, there was increasing attention given to academic skills, vocational skills, and mental health.

However, these findings only revealed the expectations on students with ASD in the western cultural context, while the situation may be different in Chinese cultural context. For example, in one transnational online training program for parents of children with ASD in China, when American trainers thought that some repetitive behaviors were normalized, the parents had opposing ideas and hoped their children look like other kids and "fit in society" (McDevitt, 2021). In addition, there is a culture of "collectivism" in Chinese education system. Although the individuality of students is acknowledged, students are firstly as one part of the collective group and must obey the required classroom principles, orders and conditions (Zhu and Li, 2020).

The only documented framework of key competencies for Chinese students with ASD was conducted by Jin et al. (2022). Jin and her colleagues were commissioned by the Ministry of Education of China in 2016 to develop the framework of key competencies and values for Chinese school-age students with ASD. Taking Chinese social-cultural backgrounds and educational system into consideration, and based on the analysis of international guidelines for ASD (e.g., North Dakota Guidelines for Serving Students with Autism Spectrum Disorder in Educational Settings), the framework covered eight key competencies areas, including health, personal independence, earning skills, cognition, interpersonal relationships, communication, play, and community participation. In addition, the framework offers numerous learning outcomes to clarify what

to teach and assess. The learning outcomes were created as measurable statements by using action verbs that articulated what the knowledge and skills that student should learn. For example, "Choose and participate in leisure activities such as shopping, recreation, sports, and vacation" in health. But it still lacks empirical evidence with incorporating perspectives from the primary educators of students with ASD.

Teachers and parents are the key stakeholders in the education, and their attitudes, choices and needs are crucial to frame the key competencies for students with ASD. But the main educational place for parents is in the family environment, and the content is mainly focused on living. The teachers' educational place is mainly in the collective school environment, which needs to face the students' academic and interpersonal communication situations. Different identities and educational settings may lead to different educational expectations for the development of students with ASD. Research has also shown that parents and professionals have different perspectives on the education for ASD (Nissenbaum et al., 2002; Gabovitch and Curtin, 2009). Although parents and teachers share common concerns in many areas, teachers tend to focus more on the restricted, repetitive, and stereotyped behaviors of students with ASD, while parents place more importance on academics (Azad and Mandell, 2016). Similarly, Dillenburger et al. (2010) found that professionals were concerned about externalizing behaviors, while parents were more worried about behaviors commonly associated with ASD, such as deficits in interaction, play, social skills and communication. The value judgment and educational behaviors of teachers and parents on the development of students with ASD are the basis for their perceptions of student development (Yao, 2014). Since the significance of this study is to shape the key competencies framework for students with ASD, it is essential to clarify teachers' and parents' expectations.

Therefore, this study aims to identify the perspectives of Chinese teachers and parents regarding key competencies for Chinese school-age students with ASD. Two research questions were addressed in this study:

> *Q1*: What are the key competencies identified by Chinese parents and teachers of students with ASD?
>
> *Q2*: What are the similarities and differences between the parents and teachers regarding the identified key competencies?

2. Materials and methods

2.1. Participants

Using a stratified random sampling method, teachers and parents who met the participant criteria were recruited from different regions (i.e., Eastern, Central, Western, and Northeast) to participate in the study. The participant criteria included: (1) teachers or parents of students diagnosed with ASD by clinical experts according to Autism Diagnostic Observation Schedule (ADOS), 11th revision of the International Classification of Diseases (ICD-11) or Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM5), and (2) students were between 6 and 18 years old. The samples were stratified proportionately based on the number of special schools in each region. The online survey was tested including, clarifying introduction, checking the format, and reviewing questionnaires. The online survey was first distributed to the special education guidance centers or relevant administrative departments in all regions including 30 provinces, autonomous regions, and municipalities. The centers and departments then administered the online survey to potential participants. 4,446 responses were return with the valid as 91.05%. The 4,048 valid responses included 1,618 from teachers and 2,430 from parents. All participants provided informed consent before taking part in the study. The demographic information is shown in Tables 1, 2.

TABLE 1 Teacher demographics (n=1,618).

Variables		Frequency	%
School type	Special education school	1,438	88.88%
	General school	180	11.12%
Region	Eastern	706	43.63%
	Central	487	30.10%
	Western	323	19.96%
	Northeast	102	6.30%
Gender	Male	299	18.48%
	Female	1,319	81.52%
Grade	Grade 1–3	750	46.35%
	Grade 4–6	472	29.17%
	Grade 7–9	344	21.26%
	High school	52	3.21%
Age	20–25 years	249	15.39%
	26–30 years	324	20.02%
	31–35 years	311	19.22%
	36–40 years	227	14.03%
	41–45 years	209	12.92%
	45–50 years	177	10.94%
	Above 50 years	121	7.48%
Years of teaching	1–5 years	535	33.07%
	6–10 years	311	19.22%
	11–15 years	168	10.38%
	16–20 years	153	9.46%
	21–25 years	185	11.43%
	26–30 years	145	8.96%
	Above 30 years	121	7.48%

TABLE 2 Parent demographics (n=2,430).

Variables		Frequency	%
Region	Eastern	1,029	42.35%
	Central	589	24.24%
	Western	676	27.82%
	Northeast	136	5.60%
Education level	Elementary school and below	227	9.34%
	Junior high school	974	40.08%
	High school or secondary school	581	23.91%
	University	606	24.94%
	Master and above	42	1.73%
	Others	310	12.76%
School placement of child	Special education school	1,461	60.12%
	General school	969	39.88%
Gender of child	Male	1,631	67.12%
	Female	799	32.88%
Age of child	6–9 years	951	39.14%
	10–12 years	873	35.93%
	13–15 years	408	16.79%
	16–18 years	198	8.15%
Grade of child	Grade 1–3	1,238	50.95%
	Grade 4–6	889	36.58%
	Grade 7–9	271	11.15%
	High school	32	1.32%
IQ level of child	IQ > 90	350	14.40%
	IQ > 70	695	28.60%
	IQ:70–55	298	12.26%
	IQ:55–40	587	24.16%
	IQ:40–25	421	17.33%
	IQ < 25	79	3.25%

2.2. Instrument

The self-completion survey consisted of eight competency domains and 76 learning outcome items (see Supplementary material). The eight domains and 76 learning outcome items were generated based on careful reviews of several competencies frameworks [e.g., Autism Education Trust (AET), 2019]. The Key Competencies and Values constructed by Jin et al. (2022) was the most suitable resource for the survey development. The learning outcomes in the framework were not only concrete, but also provided socially relevant competencies. For example, "Get along with others in familiar or public settings."

Two round of focus groups was used to shape the content and form of the survey. Eight professionals (1 associate professor, 7 teachers of students with ASD, and 8 graduate students) in the field of special education were consulted for the first round of evaluation. Fifteen professionals (12 researchers, 3 special education teachers, and 15 graduate students) in the field of special education were sought for the second round of evaluation.

Each of the eight domains (i.e., healthy living, personal independence, learning skills, cognition, interpersonal relationships, communication, play, and community participation) had multiple learning outcome items ranged from 5 to 15. For example, the healthy living domain presented in the first section of the survey had 15 items, and the community participation domain in the last section of the survey had 5 items. Using a five-point scale, teachers and parents rated the importance of each learning outcome for students with ASD from 1 (not important at all) to 5 (extremely important).

2.3. Statistical analysis

Using SPSS 23, item analysis, exploratory factor analysis, and internal consistency reliability analysis were performed on the data of teachers (n = 1,618) and parents (n = 2,430), respectively. Item analysis was first based on independent samples t-tests between the high and low groups (top 27% and bottom 27% of the total score for all items), followed by the correlation between items and the total score. Exploratory factor analysis (EFA) was conducted to explore the underlying structure of key competencies of students with ASD. In this study, principal component analysis and promax oblimin rotation method were used to explore teachers' and parents' understanding of the key competencies for students with ASD, respectively. We excluded the items with factor loading less than 0.45 or with high loadings of several common factors at the same time (cross loading between factors >0.2). Internal consistency reliability was measured using the Cronbach's alpha coefficient.

3. Results

3.1. Item analysis

The independent samples t-test results showed that the difference between the high and low groups of each item was statistically significant (all p values <0.001, see Supplementary material), indicating that the items were well differentiated. Each item scores of the teacher and parent responses were significantly correlated with the total score (see Supplementary material). The correlation coefficients were all above 0.4.

3.2. Construct validity

3.2.1. The perspectives of teachers

EFA was performed on 76 learning outcome items. The Kaiser-Meyer-Olkin (KMO) value was 0.987, the Bartlett's sphericity test value was 137162.630, df = 2,850, $p < 0.$ 001, indicating a structure of data suitable for factor analysis. A total of nine factors of competency domains with eigenroots >1 were obtained, and the cumulative variance contribution rate was 75.178%. Thirteen items needed to be excluded according to the exclusion principle. The second factor analysis was conducted on the remaining 63 items. The KMO value was 0.985, the Bartlett's sphericity test value was 11066.038, df = 1953, $p < 0.001$, indicating that the factor analysis was suitable. The analysis yielded eight factors of competency domains with eigenroots >1, and the cumulative variance accounts for 75.108%. The eight factors named according to their contents were social-communication, learning skills, healthy living, play, motor, emotion, sensory processing, and cognition (see Table 3). The three factors with the highest variance contribution were social-communication (54.057%), learning skills (6.332%) and healthy living (3.893%). The correlation coefficients between the scores of each factor and the total score across all items ranged from 0.600 to 0.941, and the correlation coefficients between the factor scores ranged from 0.343 to 0.835, all p values <0.001.

3.2.2. The perspectives of parents

EFA was also performed on 76 learning outcome items. The KMO value was 0.989, the Bartlett's sphericity test value was 210464.156, df = 2,850, $p < 0.$ 001, supporting factorability of the items in the surveys. A total of seven factors with eigenroots >1 were obtained, and the cumulative variance contribution rate was 73.227%, of which 14 items needed to be excluded. The second factor analysis was conducted on the remaining 62 items. The KMO coefficient (0.986) and Bartlett's Test of Sphericity [χ^2 [1891] = 167954.267, $p < 0.001$] indicated that exploratory factor analysis could be applied to the data. The analysis yielded seven factors of competency domains with eigenroots >1, and the cumulative variance contribution rate was 74.775%. The seven factors were named according to their contents (see Table 3). Among them, leaning skills (variance contribution of 54.523%), social-communication (variance contribution of 6.862%) and healthy living (variance contribution of 4.641%) had the highest explanatory power. The correlation coefficients between the average score of each factor and the total score across all items ranged from 0.504 to 0.940, and the correlation coefficients between the factors scores ranged from 0.279 to 0.940, all p values <0.001.

Summarizing the factors and item indicators of the above two structures, we found that the key competencies of students with ASD should cover 75 learning outcomes items and eight factors of competency domains, namely social-communication, learning skills, healthy living, play, motor, emotion, sensory processing, cognition. Although cognition was not viewed significantly important by parents, other seven domains were recognized by both teachers and parents. Fifty of the initial 76 item indicators appeared in the final structure of both teachers and parents, and were equally distributed in each factor. The primary variations being in factors such as healthy living, learning skills, and social-communication.

3.3. Internal consistency reliability

The Cronbach's alpha coefficient of the 63 items identified by teachers was 0.986, and the Cronbach's alpha coefficients of each factor of key competencies domains were greater than 0.855. The Cronbach's alpha coefficient of the 62 items identified by parents was 0.986, and the Cronbach's alpha coefficients of each factor were greater than 0.805.

4. Discussion

This study examined and constructed an inventory of key competencies for Chinese students with ASD from the perspectives of teachers and parents, respectively. The item analysis and internal consistency analysis results met the quality

TABLE 3 The comparison of competency domains between teachers and parents.

Factors	Teachers		Parents	
	% Variance explained	Items	% Variance explained	Items
Social-communication	54.057	59–76	6.862	59–73
Learning skills	6.332	42–49	54.523	37–49
Healthy living	3.893	18–26	4.641	15–25, 27–29
Play	2.849	50–57	2.617	50–58
Cognition	2.156	30–36		
Motor	2.101	5–8	2.547	5–7
Emotion	2.055	10–14	1.934	10–14
Sensory processing	1.665	1–4	1.650	1–3

of psychometrics. The EFA results found that teachers and parents share common understanding about the key competencies of students with ASD, but there are also certain differences.

4.1. Consensus on the key competencies of students with ASD

Both teachers and parents believed that the key competencies of students with ASD should consist of social-communication, learning skills, healthy living, play, motor, emotion, and sensory processing, with the first three factors having higher explanatory power. Fifty of the initial 76 item indicators appeared in the final structure of both teachers and parents, and were equally distributed in each factor, indicating a high degree of consistency between the items and their corresponding factors.

First, both parents and teachers identified social-communication as one of the key competencies to be developed for students with ASD, with a strong emphasis on compensating for social deficits. And the social-communication factor was clustered with the ability to communicate, socialize, and be in groups. Social-communication is the most important area in which parents focus their attention (Lin et al., 2007), and parents believe that having good social relationships is the most important priority for their children's adult lives. In the same way, teachers give social area the same attention and importance (Azad and Mandell, 2016). Kurth and Mastergeorge (2009) specifically analyzed goals in Individual Education Plan (IEP) text of students with ASD, and found that most IEP goals were for core symptoms such as communication and social interaction, see also Wilczynski et al. (2007).

Second, parents and teachers have certain expectations and requirements for the learning skills of students with ASD. Education guidelines for ASD from North Dakota, Virginia, Kansas, the United Kingdom, and Taiwan, China also consider the academic competencies as important goals (Cao et al., 2022). In addition, some studies also suggest that acquiring key academic skills, such as the abilities to read and write, are important good outcomes for some adults with ASD (Wittemeyer et al., 2011).

Further, the key competencies for survival are also highly valued by parents and teachers. Healthy living relates to being able to live independently (e.g., engage in appropriate leisure activities at home, manage household goods and finances, choose and participate in leisure activities, and manage health-care). Several researches also suggested developing the living abilities of students with ASD first (Bilgin and Kucuk, 2010; Liu and Breslin, 2013; Sosnowy et al., 2018), for healthy living is essential for independent living, further education, and participation in employment in adulthood.

In addition, teachers and parents have paid similar attention to other related deficit areas, considering that the key competencies of students with ASD should also cover motor, emotion, sensory processing and play.

In this study, the motor factor involved gross, fine, balance and coordination, and physical resilience. Research suggests that children with ASD have difficulties with delayed motor skills and movement compared to typically developing children (Liu and Breslin, 2013), which needs attention.

The emotion factor involves emotional understanding, expression, regulation, regulatory control, and problem behavior management. For students with ASD, the presence of emotional problem behaviors is not only detrimental to their own development, but also interferes with teachers' teaching and peers' learning, and should be a priority area of improvement.

The sensory processing factor involves the competencies to respond to, tolerate, express, and manage sensations. The DSM5 includes abnormalities in sensory abilities as one of the diagnostic indicators, and six of the 10 international autism guidelines available in the United Kingdom and the United States involve sensory process (Cao et al., 2022).

The play factor involves imitation, individual play (e.g., explore toys or materials, play combination games, play cause and effect games, and play functional games), and social play (play parallel games, play joint games, etc.). The ability to play can be used as a grip for the enhancement of students with ASD. In the process of play, children have the natural and yet powerful opportunity to integrate the capacities of regulation, symbolic capacity, emotional development, and readiness for learning. In children with ASD, learning through play is seen to be more powerful than learning through adult-directed activities (Gerber, 2017).

Overall, the seven competencies areas shared by teachers and parents in this study not only responded to core deficits such as social interaction among students with ASD, but also focused on related deficit areas such as healthy living and sensory processing. Research has also shown that ASD-related stakeholder groups believe that social-communication, learning skills, healthy living are important for a better life with ASD in adulthood (Wittemeyer et al., 2011).

4.2. Complementary perspectives between teachers and parents

According to the results, teachers and parents still have different views on the key competencies that students with ASD should possess. Overall, the results of teachers' data showed that social-communication had the highest variance contribution followed by learning skills and healthy living, while parents' data analysis suggested that learning skills had the largest explanatory power followed by social-communication and healthy living. In addition, teachers pay more attention to cognition.

This discrepancy reflects the different perceptions and expectations of the two groups for students with ASD. In schools, teachers are more likely to identify students' social deficits and thus place more emphasis on social skills. Whereas a parent may be interacting with a child, the parent is more forgiving of the

child's social issues and thus more likely to help the child improve his or her learning skills. It has also been shown that parents and teachers do not always have the same views on ASD (Barnhill et al., 2000; Azad and Mandell, 2016).

Chinese parents of children with ASD were concerned about learning quality such as motivation, self-regulation and reflection. They have higher expectations on their children's academic related competencies. Chinese culture places a particular emphasis on academic achievement (Chao, 1994), and children's academic attainment is considered a key factor reflecting good future or respectability (Leung and Shek, 2011). And the one-child policy has led to high expectations for individual children's academic and career achievements (Zhang et al., 2015). In addition, some Chinese parents may view their children's learning difficulties as a reflection of inadequate effort and self-discipline or unsuccessful training attempts (Tews and Merali, 2008).

However, the teacher's work conditions "filtered" the effect of cultural traditions. The teacher's work situations can influence or even limit teacher's instructional choices (Cuban, 1987). In China, school-age children with ASD are mostly placed in special education schools and regular classrooms in general schools for children with high-functioning (Hu and Fan, 2016). The majority of teachers in this study (88.88%) worked in special education schools and had to interact with children who had both ASD and intellectual disabilities, which may have resulted in lower learning quality expectations. In addition, these teachers all worked in a typically age-graded classroom structure. It implies that one teacher has to deal with 12 students with special education needs (including intellectual disability and ASD) simultaneously, and the teacher also need to complete the corresponding teaching tasks within the limited time. Due to ASD characteristics, students with ASD are prone to challenging behaviors in group classrooms, which can interrupt the class. Therefore, it is more crucial for teachers to ensure an orderly operation of the classroom rather than developing students' higher-order learning qualities.

This may also explain why teachers emphasize the cognition competencies of students with ASD, while parents do not focus on them. The cognition factor includes cognitive flexibility (e.g., flexibly switch attention between people, objects, situations, and activities; transfer between sessions; adapt to new changes in the environment) and thinking skills (e.g., solve problems). These competencies are extremely important for participation in the group classroom. But parents may not pay attention to these because they may be accustomed to students' stereotyped interests and behaviors at home that are disruptive to the classroom (Azad and Mandell, 2016). Moreover, cognition may be relatively abstract to parents.

In terms of healthy living, parents focused on daily life related skills such as self-care (items 15–17) and adolescent problem handling (items 27–29) for students with ASD, while teachers paid less attention to those aspects. This is consistent with previous studies. Parents acknowledged that achievement of independence and happiness depends on the completion of a certain level of education and the acquisition of numerous other skills such as self-help skills (Starr and Foy, 2012). Additionally, adolescents with ASD are greatly at a disadvantage due to their lack of sexual knowledge, which also poses extra social and health issues (Lehan Mackin et al., 2016). For parents of autistic teenagers, the subject of sexuality can be especially troublesome since they believe it to be an additional burden for their child (Travers and Tincani, 2010).

Interestingly, in terms of social-communication, teachers believe that students with ASD should have social responsibility, social belonging and career readiness skills, while parents believe that these areas are less important as relative items were deleted in parents' structure. It is clear that the two groups have different values regarding the development and education of students with ASD. Teachers expect students from a collective perspective, emphasizing their participation and role in the classroom, school, and even society, and attaching importance to the socialization of students with ASD. However, parents make more demands from the standpoint of individuality, placing greater emphasis on their children's adaptation and quality of life. This is also in line with the Chinese cultural context of "collective individualism," which values collective responsibility in the classroom environment while also focusing on individual development.

Differences do exist between teacher and parent groups, but an important prerequisite for effective home-school partnership is that parents and teachers share their concerns and agree on the priority areas that need to be addressed (Jivanjee et al., 2007; Esquivel et al., 2008). Good collaboration is not about eliminating differences, but about understanding the needs of each group to find coexistence and synergy. Since one of the most distinctive features of ASD is heterogeneity, the framework proposed in this study is not a closed, fixed system of key competencies, but rather a maximized menu of key competencies. As a result, different perspectives must be included to make it more complete and comprehensive. Teachers and parents have different educational contexts and perspectives, but bringing them together and complementing one another result in a more cohesive, functional, and comprehensive understanding of key competencies. Combining the two perspectives, it can be concluded that the key competencies for students with ASD include social-communication, learning skills, healthy living, play, motor, emotion, sensory processing and cognition, a total of eight dimensions. This verifies the theoretically constructed framework of key competencies for students with ASD by Jin et al. (2022) and provides a specific indicator system for reference. It generally covers the basic demands of educational practice for the current development of students with ASD and the emphasis of parents and teachers, indicating that the key competencies for students with ASD are holistic in nature. It also shows that education for ASD should balance the defect remediation and potential development, balance basic survival and long-term well-being, and balance personal development and social integration.

4.3. The practical meaning of the key competencies framework

To date, there are few studies systematically exploring a reasonable framework of learning outcomes for students with ASD from an empirical perspective. This study adopts a "convergence" approach to develop a consensus based on the contrasting perceptions of teachers and parents in the Chinese cultural context. Results of the study will certainly have multiple implications to the field of practice.

Firstly, the key competencies framework provides a broader perspective of educational attainment for student with ASD. The framework with competency items can be used to identify appropriate educational goals and then adapt the curriculum and instruction accordingly, which will improve the learning outcomes of students with ASD in China. The framework can also enable holistic education for students with ASD by facilitating social and cultural perspectives on disability.

Secondly, the key competencies framework can help educators design and implement more targeted and effective IEPs for students with ASD, especially for those students in inclusive settings. Obviously, Chinese parents and educators have called for effective inclusive education for student with ASD. However, students with ASD in inclusive settings struggle immensely due to a lack of special education support. And Chinese educators are seeking more ready-to-use resources for educating students with ASD. The eight competencies dimensions and 75 learning outcome items provide specific samples that can be adopted for IEP goals. For example, there are 18 items under social-communication area, then teachers can locate social-communication area and choose a learning outcome item (e.g., express needs, options, events, ideas and comments) for IEP goal development.

Finally, the interrelationship of Chinese teachers' and parents' perspectives regarding the priority needs of students with ASD will enhance the collaboration between these two groups. The deep collaboration between educators and parents has been increasingly emphasized worldwide. For example, guidelines from the AET, North Dakota, Kansas, Washington State, and New Zealand all emphasize the necessity of parent-teacher collaboration. However, collaboration is built on shared values. This study shows that parents and teachers have their own "lens" and hold differentiated expectations for students with ASD. The key competencies framework incorporates both parents' and teachers' concerns, thus providing a common tool for dialogue between parents and teachers. It can facilitate shared values and shared decision-making. Since parents and teachers may have different understandings on specific indicators of the framework, training for parents and teachers may be needed to avoid mutual misunderstandings.

4.4. Research limitations

This study does have certain limitations. Firstly, the authenticity of the questionnaire may be compromised by filling it out online, and the lack of relevant qualitative interview data will not allow us to see deeper perceptions. Secondly, the insufficient number of teachers in the regular classroom of general schools may affect the selection of key competencies indicators. Thirdly, since teachers and parents only have diagnosis certificates of students with ASD, and do not determine the specific diagnostic criteria, this study did not distinguish the impact of different diagnostic bases.

In addition, the currently proposed key competencies framework only considers the horizontal content areas and describes only a single form of competencies, making it difficult to measure and evaluate competencies development. In order to enhance the precision, operability, and implementability of the framework, it may be necessary to draw on the relevant results of the taxonomy of educational goals to further improve the framework to clarify what students with ASD should learn, understand, and how to do.

4.5. Conclusion

Based on a survey of teachers and parents in China, this study systematically quantified the key competencies structure of students with ASD. A key competencies framework with 75 learning outcome items in eight domains was derived through factor analysis. Corresponding competencies items should be constructed around the areas of social-communication, learning skills, healthy living, play, motor, emotion, sensory processing, and cognition. It provides a starting point for future research on teaching curriculum and assessment based on this framework, as well as a reference for curriculum policy and educational practice.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Human Experiment Ethics Committee of Zhejiang Normal University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

SC, YW, DX, QJ, and YH-M designed the research and wrote the manuscript. SC and XY collected and analyzed the data. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1054249/full#supplementary-material

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The fellow effect on college students' academic performance

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This paper uses data from the 2018 College Graduates Employment Survey in a province in central China to investigate whether there is a fellow effect (a special kind of peer effect) among groups of college students in colleges and universities. It was found that a group of fellows with higher academic achievement would have a significant positive effect on individual students' achievement; conversely, it would have a significant negative effect on individual student's achievement. To avoid endogeneity problems, this paper conducted a two-stage regression analysis using the average education level of the parents of the fellow as an instrumental variable; to ensure the robustness of the findings, this paper used the fellow sample at the municipal level for the regression. The analysis of heterogeneity found that the effect of good grades in the fellow had a greater impact on the individual academic performance of girls compared to boys; in terms of geography, the effect of fellow showed a decreasing trend from eastern to central and western China; in terms of major categories, the effect of fellow also showed a greater difference between humanities majors and social science majors.

KEYWORDS

peer effect, fellow effect, academic achievement, university students, university education, gender differences

Introduction

School is the most important place for adolescents to be socialized outside of the home, and the peer group in school is closely related to adolescent development. Coleman (1966) argues that the peer group in school has as much influence on adolescent development as important factors such as parental involvement, quality of education, and class size (Sacerdote, 2011). Numerous empirical studies have shown that the better the peer group at school or in the classroom, the better the academic performance of the individual (Wu and Zhang, 2020; Xuesong, 2020; Yang and Huang, 2020). The "one who stays nearer vermilion gets stained red" effect. According to sociological reference group theory, peer groups may have a "social contract "function (Kelley, 1952), i.e., peers may compare themselves with each other due to the "social contract" function (Kelley, 1952). The "discouraging" effect is caused by the comparison of peers with each other, which leads to a decrease in self-conception or self-esteem of the individual who is in a group of superior peers. The above research supports the notion that those who are close to the vermilion are red and those who are close to the ink are black.

The special group of peers, the fellow, is defined in the Dictionary as people who come from the same region or the same province. Zhong and Qian (2017) believe that due to "carrying" common perceptions, cultural characters, and regional psychology, the fellow effect is mediated by the perception of fellow, which in turn leads to specific fellow behavior. Zhang and Jiang (2013) through their research, they argue that migrant workers in different places will form mutual help fellow associations; (Shigen, 2019; Liu and Ma, 2022) on the other hand, found that fellow relationships have a significant impact on the internal control and financial risk of companies. College students in higher education come from all over the world, and when individual students enter a brand new environment, they tend to look for people or organizations that come from the same place and have the same language symbols as they do to communicate. So, do fellow relationships among students in higher education have an effect on students' academic performance? Exploring the study of the fellow effect in higher education can further enrich the depth of peer effect research and provide a theoretical basis for understanding the academic achievement choices of higher education students.

Review of the literature

Research on peer effects in education began in the 1960s when Coleman (1966) conducted a study on the effects of peers on student achievement. Since then many scholars have conducted research, for example, Bruce (2001) used random assignment data from freshman dorm rooms at Dartmouth College to examine peer effects among college roommates and showed that peers had a significant effect on average academic performance and membership in clubs. Eisenberg et al. (2014) argue that the gender composition of university peers may have peer effects on risky behavior, which in turn may affect academic performance. Isabel Pessoa de Arruda Raposo (2018) and Raposo and Gonalves (2018) found that the more peers in the classroom, the better the students' average performance; in terms of the assessment of math and Portuguese performance, a one standard deviation increase in peer performance would increase individual student performance by 30% of the standard deviation in a diffusion study of students' academic performance in Brazilian public schools. Diemer (2022) research findings on endogenous peer effects in friendship networks suggest that the interactive friendship networks between children of foreign origin and immigrant children show greater peer effects and will widen the gap in academic achievement between native and immigrant children.

Related studies in China started late, mostly based on classes and dormitories to develop the analysis of peer effects on academic performance. For example, Xiaojuan (2015) found that the peer effect on academic achievement at the class level was greater than the peer effect at the dormitory level, and that the peer effect not only had gender differences, but also differences in learning ability were affected differently by the peer effect. Yaoming and Qinying (2017) also reached similar conclusions in their study of undergraduate dormitory-level peer effects, concluding that dormitory peer effects have a significant positive impact on individual achievement, with large differences in the impact of peer effects on individuals with different learning abilities. Zhimei (2020) used questionnaire data from several different levels of universities to classify students' academic performance into positive learning benefits and negative learning behaviors, and to classify roommate relationships into "joint progress," "negative interference" and "subtle influence." The results showed that the peer effects at the dormitory and class levels had significant positive and negative effects on academic performance, and there were heterogeneous differences by gender. Ma and Huang (2021) used two undergraduate students from a "double first-class" university as the subjects, the study was conducted to overcome the selection bias in the study of peer effects by randomly assigning them to dormitories, and to investigate peer effects in four aspects: the average peer effect of roommates and the trend of change, the heterogeneity of peer effects, the structural differences of peer effects, and the competitiveness of peer effects. and the competitive nature of the peer effect. The study found that college roommate performance had a positive peer effect on peers and that the heterogeneity of the peer effect existed between roommate academic grades and between genders.

Further, Manski (1993) argues that self-selection problems, reflexive problems (imaging problems), and co-occurrence problems can lead to inaccurate estimates of the peer effect. Self-selection problems, where individuals selectively engage or interact with certain types of people based on their own interests or unobservable hidden factors, are likely to result in peer effects due to "self-selection problems." Reflexivity refers to the fact that peer groups can have an impact on individual students, while individuals can also have an impact on peer groups, leading to a two-way causal problem in the empirical process. The problem of co-occurrence refers to the fact that students in a class learning and living in the same environment will result in highly correlated learning behavior outcomes, which may be due to the influence of the level of teaching by the teacher in the class. To address the problem of self-selection, some scholars have used randomized and naturalistic experiments to address the problem of self-selection. For example, Bruce (2001) conducted a natural experiment of random assignment of dormitory arrangements for freshmen at Dartmouth in the United States to study peer effects at the dormitory level at that school. To address the reflexive problem, most scholars use instrumental variable methods to address the two-way causality problem in benchmark regressions, such as Qiang (2019) and Zhouhang et al. (2018).

The fellow effect is a special case of the peer effect, which refers to the positive tendency of an individual in a foreign place, when faced with an unfamiliar environment, to have a positive feeling toward people from the same area (city) because they "hold" the same language, culture, emotions, lifestyle, values, religious practices, etc. as he or she does (Jiang et al., 2012). This is a positive emotional involvement and tendency to converge (Jiang et al., 2012). This is a positive emotional involvement and tendency to converge in one's mind Jiang et al. (2012), which will

eventually influence one's behavior. According to regional psychology, the division of administrative and geographical regions creates different geographical and cultural perceptions, which in turn form the cultural character of a particular region, and the cultural character of different regions ultimately determines regional psychological differences (Zhang and Jiang, 2010). Guo and Zhang (2022) from a cultural psychology perspective, suggest that culture is a potential factor that affects individual behavior all the time. When a group lives in the same place for a long time, the group will be potentially influenced by the local social environment and cultural traditions, and only when they interact with people who are influenced by different cultures can they discover the influence of their own culture. Similarly, Zhang and Jiang (2010), in a preliminary construction of the psychological mechanisms of the fellow perception, argue that individuals will only emotionally construct the fellow perception and thus the fellow psychological perception when they are in a different place, and that cultural and environmental differences will cause behavioral differences. Bramoullé et al. (2020) compares the literature on peer effects in networks and the identification of peer effects and argues that The key to studying peer effects lies in the analysis of theoretical models of network interaction. Therefore, this paper analyses the fellow effect (a special kind of peer effect) among university students based on the new research perspective of social networks of fellow groups.

In summary, there are many studies on peer effects in higher education, but there are still several shortcomings: (1) Most of the literature focuses on peer effects at the classroom and dormitory levels, but few scholars have conducted in-depth studies on peer effects at the level of fellow students in the same school and in the same major. (2) Some of the studies only examine the impact of average peer behavior and output on individual students, and fail to distinguish whether and how the heterogeneity of peer behavior or output affects individual students differently. (3) Due to the differences in the selected research subjects and sample data, there is no consensus on the mechanism of peer effects and the mechanism of action.

Therefore, this paper analyzes the fellow effect of college student's academic performance based on the employment survey data of college graduates in a central province in 2018. As the research object of this paper is the peer effect (fellows effect) of the fellows group of the same school and the same major, the fellow group is formed through the random assignment mechanism of the college entrance examination. Therefore, the self-selection problem causes very little impact on the peer effect (fellows effect) estimates in this paper. To mitigate the reflexive problem, this paper draws on Yuan Zhouhang's practice of selecting the average education level of the parents of the fellows as an instrumental variable for the proportion of fellows in each achievement level; in addition, this paper draws on (Xuesong, 2020)'s approach, the co-temporality problem is mitigated by controlling for variables such as the province, school, and major from which individuals come.

Study design

Model setting

Drawing on Qiang (2019), the following model is used in this paper to estimate the fellow effect on the academic performance of college and university students.

$$Y_{\mathrm{ijk}} = \beta_0 + \beta_1 Z_{ijp} + \beta_2 V\mathrm{ar}_{\mathrm{ijp}} + \lambda X_{ijk} + \varepsilon_i \quad (1)$$

Dependent variable Y_{ijk}: The overall academic performance rank of student k in major j at school i in that major, divided into five ranks in total, where 1–5 denote overall performance ranking in the bottom 20%, bottom 21–40%, 40–60%, top 21–40% and top 20% of the major, respectively.

Core explanatory variables Z_{ijp}: Drawing on Diemer (2022), the percentage of all fellow (provincial) with achievement levels 1, 2, 3, 4 and 5 were used as explanatory variables, respectively: $Z_{\mathrm{ijp}} = \frac{m_i}{n}$ (i = 1,2,3,4,5), where n denotes the number of all provincial old villagers for an individual student, and m_i denotes the number of fellow with academic achievement level i. β_1 measure the effect of each academic performance level of fellow on the individual student's performance level.

Control variablesX_{ijk}: include individual student's province of birth, school, type of major, gender, whether they are poor, whether they were born in an urban area, political affiliation, type of second-degree minor, type of club participation, type of parent's establishment, parent's education level, help from parent's family background.

Var_{ijp}: denotes the variance of all fellow grades for individual students. That is,$Var_{ijp} = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2$, β_2 measures the effect of the variance of fellow grades on individual student performance.

Description of data

This paper uses data from the 2018 Employment Survey of College Graduates in a central province of China. The survey was organized and implemented by the Employment Office of the Provincial Education Department and covered all higher education institutions in the province. As some of the majors in some colleges and universities have only one student enrolled in a particular province, resulting in no fellow for that individual student in that school or major. Therefore, data on individual students without fellows were excluded from the sample, and the valid sample size was 179,588 entries. In this data, 128 items of personal information of the individual student are included, such as: ID number, place of birth, school attended, major attended, education level of the student's parents, etc. The following data (variables) are used in this paper: student's ID number, overall grade ranking located in this major, provincial code, municipal code, school code, major code attended, gender, category of poor student, whether born in an urban area,

political appearance, category of second degree minor subject, type of association attended, type of parent's unit, parent's education level, help from parents and family background, whether a teacher-training student, core explanatory variables Z_{ijp} (number of old folks with achievement levels 1–5, respectively, as a percentage of the total number of old folks (provincial or municipal)), variance of fellow's achievement, and education level of fellow's parents. In particular, in terms of the identification of the fellows and the number of fellows. Firstly, using the four variables of the provincial code (municipal code), the code of the school attended, the code of the major attended, and the overall grade rank located in the major of all students; then writing python scripts to determine whether students other than student i were born in the same province (city) as a student i and whether they attended the same school and a major; finally, identify the fellow, calculate the core explanatory variables Z_{ijp} and the variance of fellow grades. The main variables are described in detail in Table 1 below.

Descriptive statistics

Table 2 shows the descriptive statistics of the variables. It can be seen that the overall grade ranking is located in the major with a maximum value of 5, a minimum value of 1 and a mean value of 3.682. The number of individual student peers varies considerably with a minimum value of 1, a maximum value of 2,308, and a standard deviation of 339.9 due to the wide variation in admissions policies across the provinces. For the core explanatory variables, the means of each grade of individual student provincial peer scores as a proportion of all peers were 0.045, 0.115, 0.271, 0.251 and 0.381, respectively, with standard deviations of 0.077, 0.115, 0.159, 0.150 and 0.177; the mean value of the variance of provincial fellow scores was 1.153. In terms of individual student characteristics, the numbers of male, the number of females were about the same, the number of poor students, the number of those born in urban areas, and the number of teacher-training students were relatively small, and the mean value of political affiliation was 0.984, with most students' political affiliation being that of a member of the Communist Youth League. The mean value of parents' education level was 1.421, with a standard deviation of 0.848, indicating that the majority of students' parents have a low level of education, mainly at the junior to senior secondary level. The parents and family backgrounds are low in helping students in various areas, with a mean value of 1.951.

Empirical analysis

Regression results of the old country effect

Table 3 reports the OLS regression results for the effect of the fellow effect on individual student academic performance in colleges and universities. Columns (1)–(5) denote the number of

TABLE 1 Description of variables.

Dependent variable	Academic Performance Level	Overall ranking in the major: 1 = bottom 20%, 2 = bottom 21–40%, 3 = top 40–60%, 4 = top 21–40%, 5 = top 20%
Core explanatory variables	Z_{ijp}	$Z_{ijp} = \frac{m_i}{n}$(i = 1,2,3,4,5), where n denotes the number of all provincial fellows for an individual student, and m_i denotes the number of fellows with academic achievement level i.
Control variables	The variance of the Old Country results	$Var_{ijp} = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ to measure the degree of volatility in the achievements of the Old Country Group
	Province	The sample contains a total of 31 provinces
	City	The sample contains a total of 360 cities
	School	The sample covers all higher education institutions in the province
	Type of profession	The sample contains a total of 687 sub-disciplines
	Gender	0 = Female, 1 = Male
	Needy Student Category	0 = non-disadvantaged students, 1 = disadvantaged students
	Born in an urban area or not	0 = born in a rural area, 1 = born in an urban area
	Political affiliation	0 = mass, 1 = Communist Youth League member, 2 = preparatory member, 3 = party member
	Second Degree Minor Subject Categories	0 = No; 1 = Yes, Philosophy, 2 = Yes, Economics, 3 = Yes, Law, 4 = Yes, Education, 5 = Yes, Literature, 6 = Yes, History, 7 = Yes, Science, 8 = Yes, Engineering, 9 = Yes, Agriculture, 10 = Yes, Medicine, 11 = Yes, Military, 12 = Yes, Management, 13 = Yes, Art
	Type of association attended	0 = never attended, 1 = faith-based, 2 = academic, 3 = literary, 4 = sports, 5 = technology, 6 = service, 7 = practice, 8 = association, 9 = career, 10 = entrepreneurial, 11 = other
	Parental literacy	0 = never attended school, 1 = junior high school and below, 2 = high school, 3 = college, 4 = bachelor's degree, 5 = graduate
	Help from parents and family background	1 = largely unhelpful, 2 = yes, but not very helpful, 3 = yes, moderately helpful, 4 = yes, more helpful, 5 = yes, very helpful
	Whether you are a teacher trainee	0 = non-teaching students, 1 = teaching students

TABLE 2 Descriptive statistics (provincial).

Main variables		Sample size	Average	Minimum value	Maximum value	Standard deviation
Overall ranking in the program		179,588	3.682	1	5	1.164
Number of individual student provincial fellows		179,588	166.5	1	2,308	339.9
Individual student provincial fellow score rating of i as a proportion of all fellows	i = 1	179,588	0.045	0	1	0.077
	i = 2	179,588	0.115	0	1	0.115
	i = 3	179,588	0.271	0	1	0.159
	i = 4	179,588	0.251	0	1	0.150
	i = 5	179,588	0.318	0	1	0.177
The variance of provincial fellows 'results		179,588	1.153	0	4	0.502
Gender		179,588	0.5	0	1	0.50
Whether you are a needy student		179,588	0.135	0	1	0.342
Born in an urban area or not		179,588	0.266	0	1	0.442
Political affiliation		179,588	0.984	0	3	0.413
Second Degree Minor Subject Categories		179,588	0.686	0	13	2.353
Type of association attended		179,588	4.284	0	11	3.242
Parental literacy		179,588	1.421	0	5	0.848
Help from parents and family background		179,588	1.951	1	5	1.138
Whether a student majoring in normal education		179,588	0.107	0	1	0.309

TABLE 3 Regression results for the effect of the fellow effect on academic performance.

		Individual overall student performance ranking in the major				
		(1)	(2)	(3)	(4)	(5)
Number of individual students with a provincial fellow score rating of i as a percentage of all fellows	i = 1	−0.181*** (0.040)				
	i = 2		−0.153*** (0.025)			
	i = 3			−0.106*** (0.018)		
	i = 4				0.037** (0.019)	
	i = 5					0.163*** (0.016)
The variance of the fellow's results		0.021*** (0.007)	0.016** (0.006)	0.004 (0.006)	0.012* (0.007)	0.007 (0.006)
Gender		−0.455*** (0.007)	−0.455*** (0.007)	−0.455*** (0.007)	−0.455*** (0.007)	−0.455*** (0.007)
Political affiliation		0.381*** (0.006)	0.381*** (0.006)	0.381*** (0.006)	0.381*** (0.006)	0.381*** (0.006)
Whether you are a needy student		0.241*** (0.008)	0.241*** (0.008)	0.240*** (0.008)	0.241*** (0.008)	0.241*** (0.008)
Born in an urban area or not		0.017*** (0.006)	0.017*** (0.006)	0.017*** (0.006)	0.017*** (0.006)	0.017*** (0.006)
Whether a student majoring in normal education		−0.114*** (0.029)	−0.113*** (0.029)	−0.113*** (0.029)	−0.115*** (0.029)	−0.109*** (0.029)
Parental literacy		0.001 (0.00a3)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)
Help from parents and family background		−0.001 (0.002)	−0.001 (0.002)	−0.001 (0.002)	−0.001 (0.002)	−0.001 (0.002)
Province		Control	Control	Control	Control	Control
School		Control	Control	Control	Control	Control
Specialities		Control	Control	Control	Control	Control
Type of association attended		Control	Control	Control	Control	Control
Second Degree Minor Subject Categories		Control	Control	Control	Control	Control
_cons		2.552*** (0.275)	2.566*** (0.275)	2.588*** (0.289)	2.519*** (0.280)	2.580*** (0.275)
R2		0.099	0.099	0.099	0.098	0.099
N		179588.00	179588.00	179588.00	179588.00	179588.00

(1) Figures in brackets are standard errors; (2) ***, ** and * represent 1, 5 and 10% significance levels respectively; (3) The above regression results are all ROBUST regressions.

individual students with a provincial fellow score rating of 1–5 as a percentage of all fellows as the core explanatory variable, i.e., the fellow effect studied in this paper, respectively, to examine its effect on the overall grade ranking of individual students. All of the above regressions control for individual students' province of birth, school of study, and major, as well as individual student's

type of club participation and type of second-degree minor discipline.

The results show that (1) when the individual student's provincial fellow grades were 1, 2 and 3 (lower than the mean of the total sample grade of 3.682), the effect on the individual student's overall grade rank was significantly negative, and when the core explanatory variableZ_{ijp} (the number of provincial fellow grades of 1, 2 and 3 as a percentage of the total number of fellow grades) increased by 1%, the individual student's overall grade rank in the major decreased by 0.181, 0.153 and 0.106, respectively. (2) The effect on the student's overall ranking was significantly positive when the individual student's provincial fellow achievement level was 4 and 5, respectively, and the student's overall ranking improved by 0.037 and 0.163 for each 1% increase in the proportion of fellow students in the two achievement levels.

In terms of control variables, there was a significant positive effect of the variance of fellow achievement on individual student achievement, meaning that the greater the dispersion of fellow achievement, the higher the individual student achievement ranking. There was a significant negative effect of the fellow effect on the gender variable, which is consistent with the results of scholars such as Xiaojuan (2015) and Yang and Huang (2020) in their studies of peer effects. Political affiliation, being a poor student or not, and being born in an urban area all had significant positive effects on individual student academic achievement, and being a teacher-training student or not had a significant negative effect on individual student academic achievement. Parental literacy, parental and parental and family background assistance did not have a significant effect on individual student academic achievement.

Heterogeneity analysis

Gender differences in the fellow effect

Table 4 shows that for both males and females, there is a significant negative effect on individual student achievement when the fellow composite ranking rank is at 1, 2 and 3, respectively. When the ranking level of the fellow is 4, there is no significant effect of the male fellow on the individual male student's performance, while there is a significant positive effect of the female fellow on the individual female student's performance. There is a significant positive effect on the individual student's overall grade when the overall grade ranking of the fellow is at 5.

In terms of the coefficient of the fellow effect, the coefficient of the fellow effect for male students tends to gradually increase, or the negative effect on male student's individual grades decreases when the fellow grade is 1, 2, and 3 respectively, and the positive effect on male student's individual grades increases when the fellow grade is 4 and 5, respectively. The coefficient of the fellow effect for female students tends to decrease and then increase, showing a U-shaped characteristic, or the negative effect on female students' grades increases and then decreases when the fellow grade is 1, 2 and 3 respectively, and the positive effect on female students' grades gradually increases when the fellow grade is 4 and 5, respectively. This means that male students are more likely to be negatively influenced by the lower academic performance of their peers, while female students are more likely to be positively influenced by the higher academic performance of their peers.

In terms of control variables, there was a significant positive effect of variance in fellow achievement on individual student achievement. Parental literacy had a significant positive effect on the academic achievement of individual male students, while it had a significant negative effect on the academic achievement of individual female students. The level of assistance from parents and family background did not have a significant effect on the academic performance of individual male students, while it had a significant negative effect on the academic performance of individual female students.

Regional differences in the fellow effect

This paper classifies the birthplaces of individual students into eastern, central, and western regions according to the China Statistical Yearbook. Table 5 shows the regression results of the fellow effect in the eastern, central and western regions, respectively. When the fellow ranking level is 1, 2 and 3 respectively, the fellow effect in the eastern and central regions has a significant negative effect on individual student's performance, while the fellow effect in the western region is not significant; when the fellow ranking level is 5, it has a significant positive effect on individual students' performance, and the fellow effect in each region The effect of fellow shows a decreasing trend from the eastern region to the central and western regions, i.e., east > central > west.

In terms of the control variables, the variance of fellow achievement all had a significant positive effect on student achievement, and this effect declined from the west to the center and east. Gender had a significant negative effect on individual student achievement. Political affiliation, being a poor student, and being a teacher training student all had a positive effect on individual student achievement. Parental literacy and parental and family background assistance did not have a significant effect on individual student achievement. In the central and western regions, the effect of being born in an urban area was significantly positive, while in the eastern region, the effect of being born in an urban area was significantly negative.

Professional differences in the fellow effect

Table 6 shows the regression results of the fellow effect for humanities and social science majors, science and engineering majors. The effect of the fellow effect on individual student achievement is significantly negative when the overall fellow ranking rank is 1, 2 and 3 respectively, and the negative effect of the fellow effect is greater for humanities and social science majors than for science and technology majors. The effect of

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TABLE 4 Regression results of the ranking of individual students' overall performance by gender fellow.

	Male					Women				
	Overall ranking in the program					Overall ranking in the program				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
z1	−0.228***					−0.140***				
	(0.058)					(0.053)				
z2		−0.113***					−0.186***			
		(0.035)					(0.034)			
z3			−0.077***					−0.126***		
			(0.026)					(0.025)		
z4				0.029 (0.027)					0.043*	
									(0.025)	
z5					0.135***					0.182***
					(0.024)					(0.023)
Var	0.031***	0.019**	0.011 (0.010)	0.017*	0.013 (0.009)	0.018*	0.017*	0.003 (0.009)	0.012 (0.009)	0.006 (0.009)
	(0.010)	(0.010)		(0.010)		(0.009)	(0.009)			
x1	0.399***	0.399***	0.399***	0.399***	0.399***	0.360***	0.361***	0.360***	0.360***	0.360***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
x2	0.293***	0.293***	0.293***	0.293***	0.293***	0.186***	0.186***	0.186***	0.186***	0.186***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
x3	0.031***	0.031***	0.031***	0.031***	0.031***	0.002 (0.008)	0.002 (0.008)	0.002 (0.008)	0.002 (0.008)	0.002 (0.008)
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)					
x4	−0.138**	−0.134**	−0.135**	−0.137**	−0.129**	−0.100***	−0.099***	−0.100***	−0.101***	−0.096***
	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
x5	0.011**	0.011**	0.011**	0.011**	0.011**	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
x6	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	−0.007**	−0.007*	−0.007*	−0.007**	−0.006*
						(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
x7	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
x8	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
x9	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
x10	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
x11	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
_cons	1.972***	1.987***	1.993***	1.944***	1.998***	2.247***	2.251***	2.301***	2.230***	2.207***
	(0.296)	(0.297)	(0.306)	(0.301)	(0.297)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)
R2	0.096	0.096	0.096	0.096	0.096	0.076	0.076	0.076	0.076	0.077
N	90179.00	90179.00	90179.00	90179.00	90179.00	89409.00	89409.00	89409.00	89409.00	89409.00

(1) z1, z2, z3, z4 and z5 denote the number of individual students with a provincial fellow score rating of 1, 2, 3, 4 and 5 as a percentage of all fellows, respectively; Var denotes the variance of fellow scores. (2) x1, x2, x3, x4, x5, x6, x7, x8, x9, x10 and x11 indicate political affiliation, whether the student is poor, whether the student was born in an urban area, whether the student is a teacher-training student, parental education, help from parents and family background, province, school, major, type of club participation, and type of second degree minor subject. (3) Figures in parentheses are standard errors; (4) ***, ** and * represent 1, 5 and 10% significance levels respectively; (5) The above regression results are all ROBUST regressions.

the fellow on individual student achievement is significantly positive for both humanities and social science majors when the ranking rank of fellow is 5, but the effect of fellow in humanities and social science majors is greater than that in science and engineering majors.

In terms of control variables, the coefficients of influence for the variables of gender and whether or not they are teacher trainees are all significantly negative, while the coefficients of influence for political appearance and whether or not they are poor students are significantly positive. This is generally consistent with the above regression results.

Robustness tests

To ensure the reliability of the findings, this paper uses municipal-level sample data to narrow the study of provincial-level fellow effects to municipal-level fellow effects. Consistent with the above, municipal-level fellows are located on a scale of 1–5 for this professional composite.

Table 7 shows the descriptive statistics for the municipal fellow data. After excluding the data of individual students without municipal fellows, the valid sample size was 149,206 entries. The maximum value of the overall grade ranking in

TABLE 5 Fellow effect in east, central and west regions.

The eastern region fellow effect						
Number of individual students with a provincial fellow score rating of i as a percentage of all peers		(1)	(2)	(3)	(4)	(5)
		Individual overall student performance ranking in the major				
	i = 1	−0.055 (0.071)				
	i = 2		−0.0871** (0.0433)			
	i = 3			−0.118*** (0.033)		
	i = 4				−0.019 (0.034)	
	i = 5					0.164*** (0.030)
The variance of provincial fellows' results		0.027* (0.014)	0.026** (0.013)	0.017 (0.013)	0.022* (0.013)	0.020 (0.013)
_cons		2.851*** (0.130)	2.860*** (0.130)	2.882*** (0.130)	2.855*** (0.130)	2.783*** (0.130)
R2		0.128	0.128	0.129	0.128	0.130
N		20484.000	20484.000	20484.000	20484.000	20484.000
The central region fellow effect						
Number of individual students with a provincial fellow score rating of i as a percentage of all peers		(1)	(2)	(3)	(4)	(5)
		Individual overall student performance ranking in the major				
	i = 1	−0.207*** (0.066)				
	i = 2		−0.127*** (0.041)			
	i = 3			−0.074*** (0.028)		
	i = 4				0.080*** (0.029)	
	i = 5					0.085*** (0.025)
The variance of provincial fellows' results		0.038*** (0.009)	0.032*** (0.009)	0.023*** (0.008)	0.032*** (0.009)	0.026*** (0.008)
_cons		3.058*** (0.257)	3.061*** (0.258)	3.083*** (0.268)	3.003*** (0.269)	3.062*** (0.258)
R2		0.092	0.092	0.092	0.092	0.092
N		142772.000	142772.000	142772.000	142772.000	142772.000
The fellow effect in the west						
Number of individual students with a provincial fellow score rating of i as a percentage of all peers		(1)	(2)	(3)	(4)	(5)
		Individual overall student performance ranking in the major				
	i = 1	−0.021 (0.079)				
	i = 2		−0.075 (0.049)			
	i = 3			−0.039 (0.036)		
	i = 4				0.018 (0.037)	
	i = 5					0.067* (0.035)
Variance of provincial fellows' results		0.050*** (0.016)	0.051*** (0.015)	0.046*** (0.015)	0.050*** (0.015)	0.046*** (0.015)
_cons		2.784*** (0.193)	2.793*** (0.193)	2.796*** (0.194)	2.779*** (0.193)	2.764*** (0.193)
R2		0.110	0.110	0.110	0.110	0.110
N		16332.000	16332.000	16332.000	16332.000	16332.000

Control variables are consistent with Table 3.

the major is 5, the minimum value is 1 and the mean value is 3.675. The minimum value of the number of students with municipal fellow is 1, the maximum value is 802 and the standard deviation is 97.73. The core explanatory variables: the number of municipal fellows in different achievement levels as a percentage of all fellows, with means of 0.0044, 0.115, 0.275, 0.253 and 0.313 and standard deviations of 0.104, 0.160, 0.225, 0.217 and 0.244, respectively. in terms of individual student characteristics, the number of males and females was almost equal, the number of poor students, The number of students born in urban areas, and the number of teacher trainees were relatively small. The mean parental education level was 1.389, with a standard deviation of 0.816, indicating that the majority of students' parents had a low level of education, mainly at the junior to senior secondary level. The level of parental and family background assistance to students in all areas is low, with a mean value of 1.945.

The results of the robustness tests in Table 8 show that there is a significant negative effect of the proportion of municipal fellow on individual students' overall grades when the municipal fellow achievement level is 2 and 3 respectively; when the municipal fellow achievement level is 5, there is a significant positive effect of the proportion of municipal fellow on individual student's overall grade, which is consistent with the regression results of the effect of the provincial fellow effect on individual student's overall

TABLE 6 fellow effect in humanities and social sciences, science and technology.

The fellow effect in humanities and social sciences

		(1)	(2)	(3)	(4)	(5)
Number of individual students with a provincial fellow score rating of i as a percentage of all peers		Individual overall student performance ranking in the major				
	i = 1	−0.330*** (0.058)				
	i = 2		−0.359*** (0.038)			
	i = 3			−0.192*** (0.027)		
	i = 4				−0.019 (0.027)	
	i = 5					0.372*** (0.023)
Variance of provincial fellows' results		0.008 (0.010)	0.003 (0.009)	−0.021** (0.009)	−0.014 (0.009)	−0.015* (0.009)
_cons		2.677*** (0.156)	2.721*** (0.155)	2.732*** (0.156)	2.675*** (0.155)	2.603*** (0.155)
R2		0.080	0.080	0.080	0.079	0.082
N		84142.000	84142.000	84142.000	84142.000	84142.000

The fellow's effect in science and engineering

		(1)	(2)	(3)	(4)	(5)
Number of individual students with a provincial fellow score rating of i as a percentage of all peers		Individual overall student performance ranking in the major				
	i = 1	−0.131** (0.055)				
	i = 2		−0.192*** (0.032)			
	i = 3			−0.185*** (0.024)		
	i = 4				0.018 (0.025)	
	i = 5					0.254*** (0.022)
Variance of provincial fellows' results		−0.017* (0.009)	−0.018** (0.009)	−0.03 5*** (0.008)	−0.025*** (0.009)	−0.028*** (0.008)
_cons		2.642*** (0.127)	2.684*** (0.128)	2.715*** (0.127)	2.638*** (0.127)	2.599*** (0.127)
R2		0.097	0.097	0.097	0.097	0.098
N		95385.000	95385.000	95385.000	95385.000	95385.000

Control variables are consistent with Table 3.

grade in Table 3 above This is consistent with the results of the regression of the effect of a provincial level fellow on individual students' overall grades in Table 3 above, further confirming the existence of the fellow effect.

Compared to the results in Table 3, the coefficient on the proportion of municipal fellows on individual student achievement levels is not significant at a municipal fellow achievement level of 1, and the coefficients on all five core explanatory variables are reduced for two possible reasons: first, the number of individual students with municipal fellows is much smaller than the number of fellows at the provincial level, so the effect of municipal fellows is smaller than the effect of provincial fellows. Secondly, the differences in language, culture, lifestyle, values, religious practices, economic policies, and educational policies between cities in a province are small, whereas these factors vary considerably between provinces, which may also lead to a smaller effect on fellow at the municipal level than at the provincial level.

Endogeneity test

To address the imaging problem in the impact of the fellow effect on individual student academic performance, the average literacy of provincial old-town parents was selected as an instrumental variable in this paper. We used two-stage least squares with instrumental variables to develop the following model.

$$\text{Phase I}: Z_{ijp} = fellow_parent_edu_{ijp} + X_{control} + u_i \quad (2)$$

$$\text{Phase II}: Y_{ijk} = Z_{ijp} + X_{control} + \varepsilon_i \quad (3)$$

Y_{ijk}, Z_{ijp} and $X_{control}$ have the same meaning as in eq. (1), and $fellow_parent_edu_{ijp}$ denotes the average educational attainment of the parents of provincial fellows. Since the average educational attainment of the parents of provincial fellows affects the performance of the fellows in terms of academic achievement, it does not have an impact on the academic achievement of individual students. Therefore, the $COV\left(Z_{ijp}, fellow_parent_edu_{ijp}\right) \neq 0$, the $COV\left(Y_{jik}, fellow_parent_edu_{ijp}\right) = 0$, the instrumental variables satisfy both correlation and exogeneity. In the first stage, the core explanatory variables were first used $\left(Z_{ijp}\right)$ for the average educational attainment of the parents of the fellows ($fellow_parent_edu_{ijp}$) was estimated by regression. In the second stage, the fitted core explanatory variables were estimated using the individual student's overall performance ranking $\left(Z_{ijp}\right)$ regression estimation was conducted.

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TABLE 7 Descriptive statistics (municipal).

Main variables	Sample size	Average	Minimum value	Maximum value	Standard deviation
Overall ranking in the program	149,206	3.675	1	5	1.158
Number of individual students' municipal fellows	149,206	41.70	1	802	97.73
Individual student's municipal fellow score rating of 1 as a percentage of all fellows	149,206	0.0440	0	1	0.104
Individual student's municipal fellow score rating of 2 as a percentage of all fellows	149,206	0.115	0	1	0.160
Individual student's municipal fellow score rating of 3 as a percentage of all fellows	149,206	0.275	0	1	0.225
Individual student's municipal fellow score rating of 4 as a percentage of all fellows	149,206	0.253	0	1	0.217
Individual student's municipal fellow score rating of 5 as a percentage of all fellows	149,206	0.313	0	1	0.244
Variance of municipal fellows' results	149,206	0.972	0	4	0.644
Gender	149,206	0.501	0	1	0.500
Whether you are a needy student	149,206	0.138	0	1	0.344
Born in an urban area or not	149,206	0.254	0	1	0.435
Political affiliation	149,206	0.968	0	3	0.398
Second Degree Minor Subject Categories	149,206	0.685	0	13	2.349
Type of association attended	149,206	4.287	0	11	3.278
Parental literacy	149,206	1.389	0	5	0.816
Help from parents and family background	149,206	1.945	1	5	1.130
Whether a student majoring in normal education	149,206	0.113	0	1	0.316

Table 9 reports the results of the regressions using instrumental variables and the results of the tests for the validity of the instrumental variables. The results show that: (1) the first stage regression results for the number of fellows as a percentage of all fellows are significant when the individual student's provincial fellow grades are 1, 2, and 3, respectively, and pass the under-identification test and the weak instrumental variable test; the second stage regression results show that the fellow effect has a significant negative impact on the individual student's academic performance. (2) The first-stage regression results were significant when the individual students' provincial fellow grades were 4 and 5 respectively, and passed the under-identification test and the weak instrumental variable test; the second-stage regression results showed that the fellow effect had a significant positive impact on the individual student's academic performance.

Further discussion

In some of the regression results in Tables 4, 5, as well as in Table 6 for the effect of fellow in humanities and social sciences and science and technology, and in Table 8 for the robustness test, when the core explanatory variable is the number of fellow students with a provincial fellow achievement grade of 4 as a percentage of all fellow students, the effect of this variable on individual student academic achievement is not significant, possibly because the mean of the overall achievement rank of individual students in the sample is located in the major of 3.682, could this indicate that fellow with an achievement grade of 4 would not have an impact on individual students with an achievement grade close to that mean.

According to the regression results in Table 10, the effect of the number of students with a provincial fellow grade of 4 as a

TABLE 8 Robustness tests.

		(1)	(2)	(3)	(4)	(5)
		Individual overall student performance ranking in the major				
Number of individual students with a municipal fellow score rating of i as a percentage of all fellows	i = 1	−0.005				
		(0.031)				
	i = 2		−0.079***			
			(0.019)			
	i = 3			−0.075***		
				(0.013)		
	i = 4				0.010 (0.014)	
	i = 5					0.091***
						(0.012)
Variance of municipal fellows' results		−0.010*	−0.007	−0.015***	−0.010*	−0.012**
		(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Gender		−0.458***	−0.458***	−0.458***	−0.458***	−0.458***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Political affiliation		0.375***	0.375***	0.374***	0.375***	0.374***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Whether you are a needy student		0.231***	0.231***	0.231***	0.231***	0.231***
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Born in an urban area or not		0.005 (0.007)	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)	0.005 (0.007)
Whether a student majoring in normal education		−0.091***	−0.088***	−0.089***	−0.090***	−0.088***
		(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Parental literacy		−0.001	−0.000	−0.000	−0.001	−0.000 (0.004)
		(0.004)	(0.004)	(0.004)	(0.004)	
Help from parents and family background		−0.000	−0.000	−0.000	−0.000	0.000 (0.003)
		(0.003)	(0.003)	(0.003)	(0.003)	
Province		Control	Control	Control	Control	Control
School		Control	Control	Control	Control	Control
Specialties		Control	Control	Control	Control	Control
Type of association attended		Control	Control	Control	Control	Control
Second degree minor subject categories		Control	Control	Control	Control	Control
_cons		2.120***	2.138***	2.162***	2.116***	2.143***
		(0.342)	(0.343)	(0.365)	(0.346)	(0.342)
R2		0.095	0.095	0.096	0.095	0.096
N		149206.000	149206.000	149206.000	149206.000	149206.000

(1) Figures in brackets are standard errors; (2) ***, ** and * represent 1, 5, and 10% significance levels respectively; (3) The above regression results are all ROBUST regressions.

percentage of all fellows on individual students' academic performance changed from a non-significant to a significant positive effect, while the effect of the number of students with a provincial fellow grade of 3 as a percentage of all fellows on individual students' academic performance changed from a significant negative to a non-significant effect. The effect of the number of students with a provincial fellow score of 3 as a percentage of all fellows on individual students' academic performance changed from a negative to a non-significant effect. Therefore, this paper concludes that the effect of fellows on students' academic performance is not significant when the gap between students' academic performance and that of their fellows is small, and that the effect of fellows on students' academic performance is significant only when the gap between students' academic performance and that of their fellow is large.

Conclusion and discussion

While peer groups in schools have significant effects on adolescent development, the influence of fellow groups, which "carry" common perceptions, cultural dispositions, and regional psychology, on adolescents in schools has not been well studied. This paper examines the effect of fellows on the academic performance of college students based on an OLS model using data from the 2018 college graduate employment survey in a central province. The study found that:

1 There is a significant fellow effect on the academic achievement of college students. The fellow with grade ranking in the middle and lower reaches of their major

TABLE 9 Two-stage regression results for instrumental variables.

			Explained variables				
Second-stage regression results	Explanatory variables		Individual overall student performance ranking in the major				
	Number of individual students with a provincial fellow score rating of i as a percentage of all peers	i = 1	−10.887 (7.001)				
		i = 2		−2.274* (1.389)			
		i = 3			−2.160* (1.196)		
		i = 4				2.338* (1.304)	
		i = 5					1.764* (0.968)
First-stage regression results			Explained variables				
	Explanatory variables		Number of individual students with a provincial fellow score rating of i as a percentage of all fellows				
			i = 1	i = 2	i = 3	i = 4	i = 5
	The average literacy level of parents in the provincial fellow		0.001*** (0.00049)	0.006*** (0.00079)	0.007*** (0 0.00105)	−0.0063*** (0.00102)	−0.008*** (0.00115)
Under-identification test	LM statistic		7.559	69.122	42.845	38.564	53.127
	value of p		0.006	0.000	0.000	0.000	0.000
Weak instrumental variables test	Cragg-Donald Wald F statistic		7.526	68.838	42.663	38.398	52.904
	Stock-Yogo bias critical values (15%)		8.96	8.96	8.96	8.96	8.96

Control variables are consistent with OLS regression results.

TABLE 10 Regression results after adjusting for mean values.

		(1)	(2)	(3)	(4)	(5)
		Individual overall student performance ranking in the major				
Number of individual students with a provincial fellow score rating of i as a percentage of all peers	i = 1	−0.056* (0.032)				
	i = 2		−0.086*** (0.022)			
	i = 3			−0.022 (0.017)		
	i = 4				0.039* (0.022)	
	i = 5					0.097*** (0.021)
Gender		−0.392*** (0.009)	−0.393*** (0.009)	−0.392*** (0.009)	−0.392*** (0.009)	−0.392*** (0.009)
Political affiliation		0.323*** (0.010)	0.323*** (0.010)	0.324*** (0.010)	0.323*** (0.010)	0.323*** (0.010)
Whether you are a needy student		0.167*** (0.011)	0.167*** (0.011)	0.167*** (0.011)	0.167*** (0.011)	0.166*** (0.011)
Born in an urban area or not		0.047*** (0.008)	0.047*** (0.008)	0.047*** (0.008)	0.047*** (0.008)	0.047*** (0.008)
Whether a student majoring in normal education		−0.084** (0.037)	−0.082** (0.037)	−0.085** (0.037)	−0.084** (0.037)	−0.081** (0.037)
Parental literacy		0.002 (0.004)	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)
Help from parents and family background		0.000 (0.003)	0.000 (0.003)	0.001 (0.003)	0.000 (0.003)	0.001 (0.003)
Province		Control	Control	Control	Control	Control
School		Control	Control	Control	Control	Control
Specialties		Control	Control	Control	Control	Control
Type of association attended		Control	Control	Control	Control	Control
Second degree minor subject categories		Control	Control	Control	Control	Control
_cons		2.598*** (0.114)	2.603*** (0.114)	2.593*** (0.114)	2.556*** (0.114)	2.592*** (0.114)
R2		0.087	0.088	0.087	0.087	0.088
N		95,757	95,757	95,757	95,757	95,757

(1) Figures in brackets are standard errors; (2) ***, ** and * represent 1, 5, and 10% significance levels respectively; (3) the above regression results are all ROBUST regressions.

have a significant negative effect on the academic performance of individual students, while fellows with grade ranking in the upper reaches of their major have a significant positive effect on the academic performance of individual students.

2 There are gender differences in the effect of fellow. The coefficient of the effect of different academic grades of a fellow on male students' academic performance tends to gradually increase, while the coefficient of the effect of different academic grades of a fellow on female students' academic

performance shows a U-shaped characteristic of first decreasing and then increasing. Male students are more likely to be negatively influenced by fellows with poorer academic performance; while females are more significantly influenced by fellows with better academic performance. This may be due to the fact that female students have a stronger sense of learning and study harder and more solidly, while male students are more active and more susceptible to peer interference, resulting in gender differences in the fellow effect.

3 The fellow effect not only has gender differences but also regional differences, with the positive effect of fellow achievement on individual students' performance gradually decreasing from the eastern to the central and western regions. One of the reasons for the regional differences in the fellow effect may be that the level of education in each region gradually decreases from the eastern to the central and western regions, resulting in significant differences in students' perceptions and attitudes toward learning in each region.

4 Regarding the fellow effect between different professional categories, the negative effect of fellow performance on students' individual performance is greater in humanities and social science majors than in science and engineering majors; in terms of the positive effect of fellow performance on students' individual performance, the fellow effect is greater in humanities and social science majors than in science and engineering majors. This may be due to the fact that science and engineering majors focus on rational analysis and logical deduction, while humanities and social science majors focus more on comprehension and memorization, and summarization, which leads to the difference in the fellow effect among different major categories.

There may be several shortcomings in this paper: Firstly, in the regressions grouped by gender, this paper only examines the effect of all male (female) fellows on the academic performance of individual male (female) students and does not consider the effect of heterosexual fellows on the academic performance of individual students. Secondly, this paper uses cross-sectional data, which does not allow for dynamic analysis of the effect of fellow on individual students across grades. Third, few scholars have studied the fellow effect, so this paper lacks appropriate theoretical support.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

GZ: conception, data collection, analysis, revision. MZ: writing and literature review, empirical analysis, revision. WW: revision, fund support. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Adult education needs inventory: Construction and application

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Background: The article presents the psychometric parameters and implementation of the adult education needs inventory (AENI) questionnaire, which is designed to measure the key competences of adult educators. It was constructed on the concept of key competences as proposed by the Council of the European Union. This model of competences is inscribed in the concept of lifelong learning and does not concentrate on the compensatory functions of the competences but merely promotes the insight of educators into their self-development. This article presents the construction process and psychometrical properties of AENI.

Materials and methods: The reliability of the test is confirmed by the inter-correlated results. The accuracy of the questionnaire was confirmed through principal component analysis (PCA). Apart from this, the accuracy of the theory was verified by a correlation between AENI and the Social Skills Profile (PROKOS), which measures the level of such social skills as assertiveness, cooperativeness, sociability, social resourcefulness, and social activeness. To check the accuracy of the theory, hypotheses were formulated which were related to both the correlated overall results (AENI and PROKOS) and the chosen scales.

Results: Six areas of need in development were distinguished: communication skills, multilingual and multicultural skills, digital skills, entrepreneurial skills, openness to science and culture, and social and civic skills. A low result on the scale indicates a need to develop a given skill because the respondent's skills are weak. Such information is vital for employers and educators who wish to diagnose the areas that need improvement. The measures of reliability and accuracy allow us to state that the questionnaire possesses acceptable psychometrical factors. This study contains propositions for further improvement of the questionnaire and a key to interpreting the research results.

Conclusion: Adult education needs inventory questionnaire is a reliable research tool that can be used to assess the competences of adult educators. Also, it can be considered a voice of discussion regarding the necessity of raising the quality of education and raising the awareness of the education needs of individual adult educators and organizations that benefit from their services.

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KEYWORDS

educational needs, key competences, development of adults, lifelong learning, andragogy

1. Introduction

Lifelong education is typically a comprehensive system, with the entirety and pertinence as the main features, and is composed of multiple elements (Wang et al., 2020). On the one hand, there are still people at risk of exclusion due to deficiencies in primary education. On the other hand, there is a great need to find one's way in an ever-changing reality characterized by technological advances and globalization (Yamashita et al., 2019). As the modern reality is characterized by the growth of cognitive and informational resources in learning, researchers and theorists of adult education note that there is a global trend away from the concepts of "knowledge" and "skill" to the concept of "competence" (Sin et al., 2020).

An example of the concept of researching educational needs in its broadest sense would be the work of Stufflebeam et al. (2012), which, in turn, is not suitable for analyzing key competence deficiencies among adult students. The problem of classifying key competences for adults who are learning is being resolved by the Council of the European Union. Its latest classification of key competences could become a notional base for testing how far we could make use of a standard, universally accessible tool. A text published in 2018 in the Official Journal of the European Union, with recommendations as to key competences in the process of lifelong learning, presented a classification and definition of key competences which could become the basis for constructing a universal, multidimensional and cohesive concept for research. The proposed model could be used for self-evaluation of adults' educational needs in the area of key competences, and also extended by the opinions of colleagues and seniors using the technique of 360-degree feedback (or multi-source feedback) in both individual diagnoses and those of the whole workforce (Telling and Serapioni, 2019).

The general concept of educational needs (understood as the presence of disability) has often presented academics with the problem of an appropriate definition due to haziness, ambiguity, and the possibility of a multidimensional approach to the problem (Griffith, 1978). In the literature on the subject, we often come across the term "special educational needs," which refers to creating specific conditions for atypical students with learning disabilities (Morris, 2001). Other approaches propose the concept of "educational needs assessment," which generally concentrates on defining educational objectives in specific professions and institutions. However, this term is also used in relation to strictly defined groups of adult students; in other words, it defines the fairly generalized effects of education within a given company environment. In this case, it would be difficult to define some kind of general set of needs, because deficiencies in this area cannot be defined until after a thorough analysis of skill deficiencies among the personnel and the training needs of a particular institution which results from this (Padzik, 2016).

Thus, educational needs can be understood as the necessity of teaching specific skills resulting from an analysis of deficiencies, the replenishment of which will be the objective of a planned education program (Darling-Hammond et al., 2020). However, in the case of adults who already function relatively well in the work environment, understanding their educational needs as being connected with special educational needs would lead to adult education being understood as having a compensatory function (Lodge et al., 2018). In addition, projects are being developed to support adults at risk of exclusion (Pinto et al., 2016). Nevertheless, to a large extent, adult education is not about educational deficiencies; it is about what goals they set for themselves and how they want to use and develop their resources (Panacci, 2015).

In the rapidly developing modern world, a proper function is much more important, which aims to equip people with the skills to understand and change that world and not merely follow it and adapt to it (Joynes et al., 2019).

There are many projects outlining the key competences of adult educators, but there need to be more tools with which to find out whether such competences are present and to what extent. Therefore, the study aimed, in addition to identifying the key competences of adult educators, primarily to develop a way to measure them. The authors wanted the AENI questionnaire developed by them to be widely used by andragogists for the diagnosis and self-diagnosis of key competences helpful in their work.

2. Materials and methods

The model proposed by the Council of the European Union regarding lifelong learning was employed as the notional basis for highlighting various content areas. In the 21st century, this model covers the following set of key competences: (1) skills in understanding and composing information; (2) multilingual skills; (3) mathematical skills, and competences in the natural sciences, technology, and engineering; (4) digital skills; (5) personal and social competences concerning learning skills; (6) civic skills; (7) entrepreneurial skills; and 8) competences in cultural awareness and expression (Council of the European Union, 2018).

The statements ($N = 56$) responding to individual areas were developed by considering the following areas of expression: skills,

attitudes, and behavior. Next, the list of items was consulted by a panel of experts. These experts were academics with the title of doctor ($N = 8$) working in the field of andragogy, particularly adult education. On a scale of 1–5, the experts assessed the usefulness of individual items in delineating the educational needs of adults. Finally, the assessments of these experts were compared with each other, considering the assessment's level and integrity. The Cronbach's alpha test ($\alpha = 0.97$) showed that the internal integrity of the experts' assessments was very high.

At this stage, none of the items were rejected but edited instead (according to the experts' guidelines) to increase the statements' comprehensibility and unambiguity. At this stage, the AENI questionnaire was made up of eight areas, containing 56 items altogether, and had the following structure:

1. Skills in understanding and composing information (8 items),
2. Multilingual skills (8 items),
3. Mathematical skills and competences in the natural sciences, technology and
4. Engineering (8 items).
5. Digital skills (5 items),
6. Personal and social competences concerning learning skills (7 items),
7. Civic skills (6 items),
8. Entrepreneurial skills (9 items),
9. Competences in cultural awareness and expression (5 items).

The 5-point Likert Scale was used to assess individual statements, where 1 = 'decidedly do not agree' and 5 = 'decidedly agree'. The respondents' personal attributes were established by verifying the following socio-demographic variables: sex (male/female); age; type of organization (state, private or non-governmental organization); and position held within the organization (owner/director, manager, worker, or volunteer).

3. Results

3.1. Analysis of the scale structure

3.1.1. Description of the research sample

The random sample consisted of 210 participants (28 male and 182 female). The sample size was calculated (Sapra, 2022) based on the GUS survey (2020) that there are 150,000 non-government full-time job positions in Poland. Assuming fraction size on 0.9 and 95% confidence interval, the minimal probe was calculated on 138 observations. Due to the large NGO market in Wrocław, we wanted to increase the probe size when suitable circumstances occur; thus, the final probe has been noted on 210 observations and proved highly representative. Participants were selected based on their engagement in the third sector's professional, semi-professional, or amateur activities.

3.1.2. Explorational factorial analysis

The results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy verified after Varimax rotation (MSA = 0.709) and Bartlett's sphericity test ($X2 = 4{,}130$, $p < 0.001$) allow for the implementation of a principal component analysis (PCA). Seven factors were highlighted based on the configuration of a component scree plot (Figure 1).

Loadings higher than 0.4 were accepted for analysis. Since factor 7 contained only two items in the structure, the team decided to exclude this factor from further analysis. At this stage, the questionnaire contained 41 items.

3.1.3. The discriminatory power of the items (Cronbach's alpha coefficient)

As a result of the analysis, two items were removed from the 'multilingual and multicultural skills' section. However, no further items were removed because all the test items correlated to the overall result on a level higher than 0.2. Ultimately, the structure of the diagnostic tool (39 items) appeared in the following form (Table 1): CS: Communication skills (12 items: $\alpha = 0.823$); MMS: Multilingual and multicultural skills (5 items: $\alpha = 0.799$); DS: Digital skills (4 items: $\alpha = 0.780$); ES: Entrepreneurial skills (7 items: $\alpha = 0.659$); CCAE: Competences in cultural awareness and expression (7 items: $\alpha = 0.594$); and SCS: Social and Civic skills (4 items: $\alpha = 0.616$).

Each of the singled out-areas proved to had a satisfactory level of diagnostic accuracy. What is significant is that the complete tool also features a high coefficient of accuracy. In this case, Cronbach's alpha was 0.803.

3.2. Internal and theoretical accuracy

3.2.1. Description of the research sample

The sample consisted of 98 random participants (16 male and 83 female). Participants were selected for the second measurement based on their professional (…). Similar to the first measurement, the second test was conducted in an auditory survey of small groups of workers. The authors informed participants about the aim and potential outcome of the study and signaled refusal of participation in the study by handing back empty test questionnaires. During the survey, 98 questionnaires were distributed, and 98 were collected back; thus, the response rate was 100%. They were engaged in professional, semi-professional, or amateur activities in the third sector. Previously calculated minimal sample size of 138 observations, when compared with the collected 98 observations, gave a possibility to calculate maximum bias, which was not higher than 5%; thus, a 95% confidence interval was possible to sustain.

3.2.2. Internal accuracy

The Confirmatory Factor Analysis (CFA) has been conducted to check internal consistency. The created model proved significant ($X2 = 1{,}200$, $p < 0.001$). Fit measures were inconclusive (CFI = 0.580, TLI = 0.547, SRMR = 0.108, and

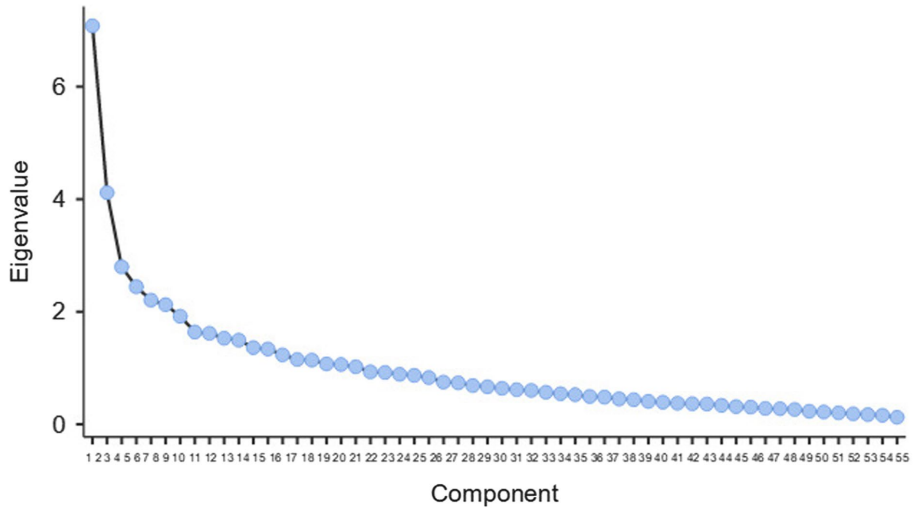


FIGURE 1
Principal component analysis of the AENI questionnaire. AENI, adult education needs inventory. Component screen plot.

TABLE 1 Accuracy coefficient of the AENI questionnaire measurements (*N*=210).

	Number of items	*M*	*SD*	Cronbach's alpha
CS	12	3.83	0.60	0.823
MMS	5	3.46	0.98	0.799
DS	4	3.94	0.79	0.780
ES	7	3.40	0.66	0.659
CCAE	7	3.85	0.57	0.594
SCS	4	3.74	0.70	0.616
AENI	39	3.65	0.36	0.846

AENI, adult education needs inventory; CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; *M*, mean; *SD*, standard deviation.
Cronbach's alpha coefficient.

RMSEA = 0.087) and suggested that the model had significant measuring value, although there is room for improvement in the future (Xia and Yang, 2019). Factor loadings (Table 2) proved in the majority of indicators significant. Internal factor covariances were noted (Table 3), although those were assumed to occur due to the close relationship between individual factors. An inter-correlation between sets of variables for the AENI questionnaire was performed to check its internal accuracy (Table 4).

The highest correlations occur between individual measurements and the overall AENI result. Most measurements do not correlate with one another, except the CS and SCE measurements. However, in this case, it is justifiable because social and civic skills require communication skills, even though they are not the same. To sum up, analysis of the inter-correlation proves an acceptable homogeneity of the measurements.

3.2.3. Theoretical accuracy

Each of the research subjects completed two questionnaires: Adult Education Needs Inventory (AENI) and Social Skills Profile (PROKOS) [original polish title of PROKOS test: Profil Kompetencji Społecznych]. PROKOS is a test which measures the level of such social skills as assertiveness, cooperativeness, sociability, social resourcefulness, and social activeness. This tool is used to assess and recruit staff (Martowska and Matczak, 2013).

Three hypotheses were formulated, which concerned the overall results (AENI and PROKOS questionnaires) and the selected ranges to check the theoretic accuracy.

> *Hypothesis 1*: The overall score for educational needs in the AENI questionnaire correlates to the overall score for social skills in the PROKOS questionnaire.
>
> *Hypothesis 2*: Both the overall score and individual skills in the PROKOS questionnaire correlate to the measurement of 'communication skills' in the AENI questionnaire.
>
> *Hypothesis 3*: Both the overall score and individual skills in the PROKOS questionnaire correlate to the measurement of 'social and civil skills'.

Burns (1985) and Paterson (2000) have, among others, pointed to the connection between social and communication skills. Generally, communication skills are treated as a part of social skills (Kobylarek, 2009) or as a basis for formulating other interpersonal skills (Warzocha, 2016).

TABLE 2 Confirmatory factor analysis factor loadings summary.

				95% Confidence interval			
Factor	Indicator	Estimate	SE	Lower	Upper	*Z*	*p*
CS	1	0.6487	0.1083	0.43641	0.861	5.9894	<0.001
	2	0.3136	0.0916	0.13408	0.493	3.4236	<0.001
	4R	0.6361	0.1144	0.41191	0.860	5.5614	<0.001
	5	0.3223	0.0921	0.14174	0.503	3.4985	<0.001
	6	0.6183	0.0966	0.42892	0.808	6.3993	<0.001
	7	0.7438	0.0867	0.57395	0.914	8.5836	<0.001
	8	0.4825	0.1070	0.27283	0.692	4.5104	<0.001
	24	0.3679	0.0897	0.19214	0.544	4.1030	<0.001
	25R	0.6407	0.1070	0.43104	0.850	5.9901	<0.001
	30	0.5204	0.0684	0.38623	0.654	7.6040	<0.001
	31	0.5029	0.1018	0.30335	0.702	4.9395	<0.001
	36R	0.1621	0.1086	−0.05071	0.375	1.4929	0.135
MMS	9	0.7551	0.1368	0.48700	1.023	5.5203	<0.001
	11	0.8830	0.1122	0.66312	1.103	7.8715	<0.001
	12	0.9343	0.1113	0.71611	1.153	8.3914	<0.001
	13	0.7329	0.1137	0.51009	0.956	6.4477	<0.001
	37	0.2231	0.1153	−0.00279	0.449	1.9357	0.053
DS	20	0.5743	0.0668	0.44347	0.705	8.6020	<0.001
	21	0.7638	0.0784	0.61010	0.918	9.7390	<0.001
	22	0.7032	0.0940	0.51889	0.887	7.4787	<0.001
	23	0.3415	0.0493	0.24500	0.438	6.9341	<0.001
ES	16	0.4068	0.0904	0.22963	0.584	4.5005	<0.001
	17R	0.3691	0.1234	0.12720	0.611	2.9905	0.003
	19	0.8997	0.1172	0.66997	1.129	7.6763	<0.001
	26R	0.1488	0.1289	−0.10375	0.401	1.1549	0.248
	33R	0.8050	0.1189	0.57192	1.038	6.7686	<0.001
	34R	0.3963	0.1029	0.19472	0.598	3.8530	<0.001
	35R	0.6202	0.1275	0.37034	0.870	4.8653	<0.001
CCAE	10R	0.1790	0.1171	−0.05043	0.409	1.5292	0.126
	14R	0.0781	0.1851	−0.28463	0.441	0.4222	0.673
	15R	0.0142	0.1933	−0.36457	0.393	0.0736	0.941
	27R	0.3899	0.1715	0.05372	0.726	2.2732	0.023
	32R	0.4978	0.1758	0.15324	0.842	2.8315	0.005
	38R	0.3334	0.1523	0.03486	0.632	2.1888	0.029
	39R	0.5297	0.1680	0.20042	0.859	3.1528	0.002
SCS	3	0.2788	0.1022	0.07849	0.479	2.7278	0.006
	18	0.4223	0.1024	0.22164	0.623	4.1249	<0.001
	28	0.6955	0.1444	0.41243	0.979	4.8157	<0.001
	29	0.6985	0.1341	0.43573	0.961	5.2097	<0.001

AENI, adult education needs inventory; CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; *M*, mean; *SD*, standard deviation.
R-reversed scale.

TABLE 3 Confirmatory factor analysis factor covariances summary.

				95% Confidence interval			
		Estimate	SE	Lower	Upper	*Z*	*p*
CS	MMS	0.259	0.1164	0.0312	0.487	2.22758	0.026
	DS	0.179	0.1163	−0.0488	0.407	1.54053	0.123
	ES	0.191	0.1254	−0.0550	0.436	1.52115	0.128
	CCAE	0.279	0.1565	−0.0278	0.586	1.78261	0.075
	SCS	0.759	0.0961	0.5702	0.947	7.89493	<0.001
MMS	DS	0.162	0.1197	−0.0723	0.397	1.35604	0.175
	ES	0.000	0.1301	−0.2548	0.255	0.00198	0.998
	CCAE	0.238	0.1682	−0.0920	0.567	1.41294	0.158
	SCS	0.326	0.1356	0.0603	0.592	2.40493	0.016
DC	ES	0.131	0.1239	−0.1123	0.373	1.05358	0.292
	CCAE	0.337	0.1421	0.0584	0.615	2.37084	0.018
	SCS	0.159	0.1566	−0.1482	0.466	1.01379	0.311
EC	CCAE	0.124	0.1700	−0.2092	0.457	0.72947	0.466
	SCS	0.350	0.1393	0.0766	0.623	2.50982	0.012
CCAE	SCS	0.220	0.2168	−0.2044	0.645	1.01689	0.309

AENI, adult education needs inventory; CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; *M*, mean; *SD*, standard deviation.

TABLE 4 Inter-correlations for AENI (*N*=98) measurement and overall result.

		1.	2.	3.	4.	5.	6.	7.
1.	CS	–						
2.	MMS	0.267**	–					
3.	DS	0.168	0.194	–				
4.	ES	0.264**	0.070	0.061	–			
5.	CCAE	0.149	0.087	0.076	−0.021	–		
6.	SCS	0.527***	0.299**	0.154	0.220*	0.114	–	
7.	AENI	0.902***	0.427***	0.286**	0.463***	0.325**	0.606***	–

AENI, adult education needs inventory; CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; *M*, mean; *SD*, standard deviation; *p*, level of statistical significance.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

3.2.4. Descriptive statistics

Before calculating the correlations, the normality of the distribution of both tests was checked. In the AENI questionnaire, MMS, DS, and SCS did not meet the requirements of a normal distribution, and in the PROKOS questionnaire, the scores for co-operative skills did not meet the requirements of a normal distribution (Tables 5 and 6).

In order to provide a more detailed description of the scales, descriptive statistics are also presented in Table 5. Each research subject gave their replies on a scale from 1 to 5. The higher the mark, the higher the measurement in each scale. It was possible to gain a maximum of 195 points in the questionnaire and a minimum of 39. The most points could be achieved in the area of Communication Skills, which forms one of the most important competences necessary in adult education. A proposal for calculating the scores is presented in Table 7.

TABLE 5 Normality of distribution of the AENI (*N*=98).

	CS	MMS	DS	ES	CCAE	SCS	AENI
M	46.9	18.4	16.7	24.3	27.2	15.4	29.3
SD	6.66	4.08	2.61	4.44	3.46	2.56	2.95
p	0.380	0.001	<0.001	0.205	0.133	0.005	0.847

AENI, adult education needs inventory; CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; *M*, mean; *SD*, standard deviation; *p*, level of statistical significance.
Shapiro–Wilk normality scores.

In view of the fact that the normality of distribution of three scales in AENI, as well as three scales in the PROKOS

TABLE 6 Normality of distribution of the PROKOS (N=98).

	Assertiveness skills	Co-operative skills	Friendship skills	Social resourcefulness	Social skills	PROKOS
M	40.31	54.5	33.7	41.8	17.2	187
SD	6.59	5.77	5.79	4.82	3.08	22.2
p	0.089	0.002	0.105	0.105	0.113	0.318

PROKOS, social skills profile (pol. Profil Kompetencji Społecznych); *M*, mean; *SD*, standard deviation; *p*, level of statistical significance. Shapiro–Wilk normality scores.

questionnaire, did not meet normality requirements (Table 8), the correlation between variables measured with these tools was tested with the nonparametric Spearman's correlation test.

The results confirm the hypotheses which predict a correlation between the overall scores in both questionnaires and the measurements relating to communication and social skills. Furthermore, the 'communication skills' in the AENI questionnaire correlate with all the social skills measured in the PROKOS questionnaire, and the same is true for the measurement of "Social and Civic Skills." Therefore, the AENI questionnaire has a satisfactory level of theoretical accuracy.

3.3. Application

The adult education sector needs more research tools, which is a significant barrier to developing andragogic research. At the same time, this situation is blocking the development of andragogic theory and, what goes with it, andragogy itself. If such tools are to be applied universally, they should be prepared by professionals and properly tested, and then published as open-source so that they could be used by adult education instructors, who are rarely authorized to use professional psychological tools. The tool proposed is an attempt to overcome such developmental barriers in andragogy. The development of this research tool enables a quick and relatively easy diagnosis of a basic set of key competences. It can also be used by every adult education instructor because it is universally available, together with an overview and set of instructions.

The AENI tool can be used by adult educators (self-testing and calculating the results) to identify areas worth developing. The tool can also be used by employers to diagnose the needs of their educators, in order to plan training to improve competences with lower scores.

The AENI questionnaire is a tool for researching key competences, which furthers the concept proposed by the Council of the European Union in 2018. It possesses satisfactory psychometric properties—high reliability and proven accuracy. The universality of the tool comes from the fact that it is intended to be used in researching educational needs by everybody working in the adult education sector in its broadest sense—both in private firms and in public institutions.

As a result of the analysis, 6 areas of need were highlighted. Low scores on the scale mean that a respondent needs training in that area because that skill is not well developed. Such information is vital for both the employer and educator who wants to discover the areas which need improvement.

3.4. Key competence areas

As a result of the analysis, the following key competence areas were defined:

3.4.1. Communication skills (CS)

Those who score high on this scale like to engage in a discussion and can carry on a conversation in any situation. They feel at ease during a conversation, send out clear and understandable communications, and have no problem understanding their interlocutor or expressing thoughts, which they are able to communicate unconventionally. Such people are able to work as part of a team, motivate others, share information, and be successful negotiators.

3.4.2. Multilingual and multicultural skills (MMS)

Those who score high on this scale know at least one foreign language, use it every day, and make use of several opportunities to learn a new language. They also manifest an interest in various cultures.

3.4.3. Digital skills (DS)

Those who score high on this scale willingly take advantage of technological innovations and make use of them to communicate effectively. They feel proficient with ICT and have no problem making use of various digital tools and software.

3.4.4. Entrepreneurial skills (ES)

Those who score high on this scale recognize the necessity for good planning and try to proceed according to a plan. They feel competent and efficient when carrying out their tasks. They are able to form an orderly relationship with the team, as well as implement and monitor the tasks delegated to them.

3.4.5. Competences in cultural awareness and expression (CCAE)

Those who score high in CCAE are open to continuous learning, including improving their foreign language skills. They also appreciate the European Union's integration policies, such as

TABLE 7 Descriptive statistics of AENI and PROKOS (N=98).

	Min	Max	*M*	*SD*	Slant	Kurtosis
CS	12	60	46.9	6.66	−0.04	−0.26
MMS	5	25	18.4	4.08	−0.24	−0.93
DS	4	20	16.7	2.61	−0.67	0.52
ES	7	35	24.3	4.44	−0.27	0.28
CCAE	7	35	27.2	3.46	−0.08	−0.28
SCS	4	20	15.4	2.56	−0.05	−0.08
AENI	39	195	149	13.9	0.102	0.313

AENI, adult education needs inventory; PROKOS, social skills profile (pol. Profil Kompetencji Społecznych); CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills; Min, minimum value, Max, maximum value; *M*, mean; *SD*, standard deviation.
Correlation between AENI and PROKOS scores.

recognizing cultural differences. They perceive the value of contemporary culture and can use the arts to express themselves.

They do not trust "conspiracy theories" but use science to reach the truth. They also see many possibilities conducive to realizing their ideas.

3.4.6. Social and civic skills SCS)

Those who score high on this scale use different sources when planning and looking for information. This is because they feel they have some influence over what is going on around them and engage in social affairs which are important to them.

4. Discussion

The AENI questionnaire presented in the article examines six competences that can create an attitude to educate an adult in a changing reality effectively. It is a tool that can be used in adult education to identify areas of improvement for educators. The proposed tool fits into the concept of lifelong education, which contemporary international organizations define very broadly as the field of policy, practice, research, and science, and how it is shaped by different philosophies of education and understandings of human nature and ethical principles (UNESCO, 2021). The American Association for Adult and Continuing Education (AAACE) emphasizes that lifelong learning contributes to human self-actualization and positive social change (Hunter-Johnson et al., 2021).

There are many challenges facing modern adult educators. In a world of changing knowledge, the person who teaches should be able to acquire this knowledge and make it interesting. In the literature, there are many classifications of key educators' competences. One of them, for example, presents such competences as IT competence, creative/cognitive competence, intercultural competence, ability to work in virtual, multicultural teams, emotional and social intelligence, and interdisciplinary competence (Przytuła, 2018). What most classifications have in common are the needs arising firstly from the development and increasing use of new technologies and secondly from globalization, migration, and, therefore, the ability to find oneself in multiculturalism. Trainers working with refugees sometimes do not feel sufficiently prepared for such work because they somehow did not imagine this is precisely the kind of educational demand they will have to respond to. Research on refugee education shows that most trainers want to educate themselves on basic principles of adult and vulnerable group education, diversity and interculturalism issues, and psychology (Kafritsa et al., 2021).

Another challenge for which adult educators were unprepared and demonstrated the importance of adapting to new situations is the work of educators during a pandemic. The pandemic caused many areas of education to go online. The authors note that "digital adult education" became one of the key competences of both educators and their students (Petrushenko et al., 2021). Nevertheless, it was more than just technical skills that were important here. In an article, researchers on this issue found that educators have developed a range of innovative and dynamic social solidarity-oriented pedagogies that can contribute to more equitable and inclusive socio-technological relationships in a post-pandemic future (Smythe et al., 2021). Motivating, interest, and sometimes social support for adults in general and during a pandemic is a major challenge. Research shows that adult educators need up-to-date, innovative, interesting, and engaging materials to help develop adult learners' creativity (Boghian et al., 2022). So, what resounds in both the context of interculturalism and new technologies is flexibility, innovation, and the ability to make adult learners curious.

It should be emphasized that the key competences of an adult are characterized by the fact that they refer to universal skills and knowledge (Põlda et al., 2021). Having them becomes the foundation for getting actual knowledge on an ongoing basis and dealing with the adult-educator relationship. Morelli (2022) points out that the relevant competences are the capacity to innovate, create, problem-solve and collaborate through horizontal leadership with teams and individuals across the organization.

In the digital society, the possession of knowledge is no longer enough as access to it becomes more and more egalitarian. Researchers point to a change in the professional competences of adults, which are characterized by a shift from the paradigm of knowledge to competences related to motivation and the ability to assess self-esteem (Sin et al., 2020).

Researchers consistently emphasize the need for lifelong learning, which results, inter alia, from the globalization of the market and the development of new technologies (Yamashita et al., 2019). It is predicted that some occupations will cease to be needed, whereas others will require the employee's ability to adapt to changes and skills related to fitting into international teams and efficient use of new technologies (Przytuła, 2018).

The concept of lifelong learning shines through many European education and research programs (Bohnenberger, 2022). It should be emphasized, however, that the vast majority are

TABLE 8 Coefficient values in the correlation of measurements between AENI and PROKOS (N=98).

	PROKOS–social skills					
	Assertiveness skills	Co-operative skills	Friendship skills	Social resourcefulness	Social skills	PROKOS
CS	0.507***	0.665***	0.673***	0.533***	0.593***	0.693***
MMS	0.234*	0.236*	0.158	0.203*	0.154	0.195
DS	0.282**	0.257*	0.147	0.189	0.240*	0.226*
ES	0.292*	0.341*	0.231*	0.132	0.355***	0.306*
CCAE	0.020	0.167	0.152	0.095	0.058	0.128
SCS	0.504***	0.385***	0.458***	0.391***	0.543***	0.501***
AENI	0.553***	0.702***	0.646***	0.527***	0.636***	0.703***

AENI, adult education needs inventory; PROKOS, social skills profile (pol. Profil Kompetencji Społecznych); CS, communication skills; MMS, multilingual and multicultural skills; DS, digital skills; ES, entrepreneurial skills; CCAE, competences in cultural awareness and expression; SCS, social and civic skills.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

directed at people from the risk group, who are subject to an exclusion (Pinto et al., 2016).

Meanwhile, the desire to satisfy specific learning needs is also reported by adult learners (Owusu-Agyeman et al., 2018) and by educators wanting to develop their academic skills and use the best educational practices (Czerniawski et al., 2017).

Research is ongoing in measuring educational needs and their identification and specification (Oberländer et al., 2020). This was also the aim of the authors of the AENI tool.

Considering the skills that emerged and the educational needs that are integral to them, the insofar research can be divided into 3 groups.

Researchers usually explore educational needs regarding the areas of skill that have little in common with the systematics being proposed. Some of the most important examples of such explorations are:

- classifications referring to old education reports and predictions regarding the course of social development. Radovan (2019) refers above all to the skills and competences of the future, further defined as "learning to learn" in a report by Faure (1979);
- specific skills useful in particular sectors, such as planning, and the skills needed to formulate a balanced development (Hakio and Mattelmäki, 2019).
- extra-European classifications of skills that relate to somewhat different educational realities, determined by diverse political, organizational, and cultural influences, such as creative thinking (Hipkins, 2018).

Much research, which does not consider the Council of the European Union model, distinguishes the same or similar areas, often defined in different ways. An example is a work of Głomb (2020), which emphasizes the role of digital skills but is defined in such a way that they can be identified partly with the areas of digital skills highlighted by the AENI questionnaire and partly with the area of communication skills.

Only a small portion of research refers directly to the same model, which constituted the starting point for the skill sets proposed here for researching educational needs (Petrėtienė et al., 2020). Deficiencies in this area should not be surprising because the model has only been functioning for a short time. Therefore, scientific discussion over its accuracy and substantiation may last some time. Work on the proposed tool revealed, for example, that some of the skill areas identified by the Council of the European Union should be redefined during the research because they have been aggregated differently.

We are aware that the competences indicated in the questionnaire: *Competences in cultural awareness and expression; Entrepreneurial skills; Digital skills; Multilingual and multicultural skills; Communication skills–may not cover all the necessary areas for the development of adult educators*. However, analyzing the literature and based on the statistical analysis with which we examined the content analysis areas selected from the theory, we believe that the competences identified in the questionnaire can be described as key. They take into account two important trends of catalysts of change in contemporary reality: the development of new technologies and interculturalism. Therefore, such competences, which are universal and at the same time take into account the dynamics of modernity, can be used to shape further competences and the acquisition of skills and knowledge corresponding to current educational needs.

5. Conclusion

Presented in this study AENI questionnaire supports the idea of key competences created by the Council of the European Union in 2018. AENI has good psychometric properties verified by high reliability and verified fitness. Low scores indicate that respondents are in high need of education due to low competences in a given area. Therefore, test results can be important for the employee and the educator because they indicate which areas require development.

Recent events have shown that we sometimes need more time to prepare for changes regarding both the form of education and the educational needs of adults. For example, the rapid growth and spread of online education forced by a pandemic, or the educational needs of refugees trying to find their way in a culturally different reality, are huge challenges for those working with adults. To deal with such challenges, the nature of the owned competence should be universal.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

LŚ: conceptualization, methodology, software, validation, formal analysis, resources, data curation, writing—original draft, writing—review and editing, supervision, project administration, and funding acquisition. KB and AK: conceptualization, methodology, software, validation, formal analysis, resources, data curation, writing—original draft, and writing—review and editing. MŠ: conceptualization, validation, resources, writing—review and editing, and visualization. All authors of this manuscript meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors (ICMJE). All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1035283/full#supplementary-material

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Meaning in life and adolescent self-control: Effect of perceived social support and its gender differences

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Purpose: The objective of this study is to investigate the relationship between meaning in life and adolescent self-control, as well as the role of perceived social support and gender in this pathway.

Methods: For this purpose, a total of 936 adolescents from two high schools were selected as subjects in this study. The Meaning in Life Scale, the Self-Control Scale, and the Perceived Social Support Scale were used for the research.

Results: The results obtained in this study have shown that meaning in life is a significant positive predictor of adolescent self-control and perceived social support. In addition, perceived social support partially mediates the relationship between meaning in life and self-control. Further, it has been found that gender moderates the second half of the pathway of the mediation model of meaning in life on self-control, specifically, perceived social support is a stronger predictor of self-control for females than for males.

Conclusion: The results of this study suggest that enhancing perceived social support promotes self-control in adolescents with lower meaning in life, and this process is more pronounced in females.

KEYWORDS

meaning in life, self-control, perceived social support, gender differences, adolescents

1. Introduction

Adolescence is an important period in the development of an individual's life. However, adolescents are prone to show greater paranoia, emotional excitement and impulsive behavior during this period due to the various pressures, conflicts and contradictions they are often faced with. Therefore, good self-control is a necessary condition and basic guarantee for the development of good personality and behavior in adolescents (Wang Hongjiao, 2004). Self-control is an individual's ability to control impulses to resist temptation and pursue worthy goals (Touré-Tillery and Fishbach, 2015). The lower level of self-control predisposes adolescents to suicidal tendencies, anxiety and depression, as well as increases the likelihood of problematic behaviors such as school bullying and cyber violence (Wenzel et al., 2021). Recent investigations have found that adolescents are frequently exposed to school bullying and cyber violence, which has led to an increase in

suicidal ideation and self-harming behaviors, and that those with low self-control are more likely to become repeat victims and perpetrators (Nofziger and Callanan, 2016; Oliva et al., 2019; Hu Qian et al., 2022). Therefore, exploring the formation mechanism of adolescent self-control is an important reference for improving adolescent self-control and promoting the perfection of adolescent personality and positive as well as healthy growth.

Providing a sense of control over life events is one function of the meaning in life (Zhang Shuyue and Haoqiang, 2010). Meaning in life refers to the degree to which an individual seeks, Perceived and appreciates the meaning of his or her life, as well as his or her awareness of the purpose, mission and value of life (Brassai et al., 2011). Research suggests that the powerful psychological restorative and constructive functions of meaning in life enable individuals with high meaning in life to experience higher levels of well-being, maintain higher degrees of self-control, and experience less health anxiety (Hedlund, 1977; Jong Jae Kim, 2012; Zhang Xiuge and Wenyu, 2019). Several studies have found that meaning in life motivates individuals to regulate their emotions and behavior patterns while positively predicting self-control (Nie Hanying, 2017; Schnell and Krampe, 2020). Hedlund noted that a strong meaning in life makes individuals aware of the value of their own existence and clarifies the direction of their lives, which drives intrinsic motivation to regulate external behaviors to align with life goals (Yek et al., 2017). This in turn enhances one's ability to control oneself. However, the lack of meaning in life leads to a low level of self-control and instinctive impulses to dominate one's behavior, which eventually leads to many problematic behaviors such as crime and addiction (Jia, 2016; Bernadette and Tatjana, 2019). Adolescents are in a period of important exploration of the meaning of life, and are in an important stage of developing self-control (Hamama and Hamama-Raz, 2021; Ting, 2021). Therefore, it may be more practical to examine the impact of adolescents' self-control ability from the perspective of meaning in life.

1.1. Perceived social support as a mediator

Perceived social support refers to the emotional experience and satisfaction of being respected, understood and supported by others in society, referring to individuals' subjective perceptions of their own social support level, their expectations and evaluations of social support, and their beliefs about their ability to receive social support (Barbara et al., 1991; Hanxiao, 2008; Ye Baojuan et al., 2014). It has been found that higher levels of perceived social support can help individuals reduce the effects of negative emotions, enhance their ability to deal with stressful events, and decrease feelings of depression (Qiu Yiwen and Yi, 2021; Sun et al., 2021). According to Stillman's hypothesis that meaning in life promotes interpersonal relationships," there is a mutually reinforcing symbiotic relationship between the sense of social belonging and meaning in life, which means that a positive sense of social belonging will promote an individual's meaning in life, and a higher meaning in life will also promote the establishment of better interpersonal relationships (Stillman et al., 2009). Empirical research has shown that the higher an individual's sense of meaning in life, the more social support they perceive (ZN, 2019). Additionally, perceived social support is closely related to the development of self-control among adolescents. The self-control resource depletion model suggests that social support helps individuals manage and replenish the resources needed for self-control and restore their self-control in a timely manner (Fitzsimons and Finkel, 2011). Several studies have found that social support positively predicts self-control and further increases well-being (HY Jung, 2008; Zhang et al., 2016). Based on this, this study hypothesized that perceived social support may play a mediating role between meaning in life and self-control.

1.2. Gender as a moderator

Social cognition and social role theory suggest that the socialization process leads to gender differences and that people tend to imitate same-gender individuals in order to conform to socially expected gender role norms and acquire certain more gender-specific behaviors (Zhang Shupeng and Caina, 2015; Ding Qian and Zongkui, 2020). Does gender play a role in the process of perceived social support mediating meaning in life and self-control? However, this needs to be explored further. Notably, numerous fields of research have demonstrated that self-control is significantly different by gender, but this result is also subject to controversy. Some researchers have explained why there are gender differences in the area of self-control in three ways: physiological, evolutionary, and sociocultural (Van den Akker et al., 2013). Physiologically, males exhibit higher levels of emotional arousal and activity due to androgen secretion, which induces more instinctive impulsivity and aggression, resulting in relatively weaker self-control. In terms of brain development, females have earlier brain development (especially in the left hemisphere of the brain) than males, and thus females have more mature emotional control and social interaction skills. In addition, sociocultural influences make females' level of self-control significantly higher than that of male. Meanwhile, Hamama found that females reported higher levels of self-control compared to males (Hamama and Hamama-Raz, 2021) and that the gap was more pronounced with age (Kochanska et al., 2001), which provides empirical evidence for the existence of gender differences in self-control. Nonetheless, Jo and Bouffard's study concluded that among Korean youth aged 10–14 years, boys and girls have largely similar levels of self-control (Youngoh Jo, 2014).

Therefore, it is necessary to continue to explore the gender differences in self-control in order to clarify the mechanisms of its occurrence and development. In addition, gender differences were found to be significant in adolescents' perceived social support and self-control, with females' ability to perceive social support significantly better than males (Zhang et al., 2016; Nakash et al.,

2022). In addition, the effect of females' perceived social support on self-control is more significant than that of males' perceived social support (Orkibi et al., 2018). This may indicate that the difference in self-control between males and females is closely related to their ability to perceive social support. Based on this, the present study hypothesized that gender plays a moderating role in the influence of meaning in life on adolescent self-control through perceived social support, and that perceived social support has a greater effect on self-control for females than for males.

1.3. The current study

In summary, this study aims to construct a pathway of "meaning in life → perceived social support → self-control" to systematically examine the influence of meaning in life on self-control of adolescents, and the mediating role of perceived social support between meaning in life and self-control also testing the moderating role of gender differences in the pathway. We propose the following hypotheses.

Hypothesis 1: meaning in life is positively related to adolescent self-control and perceived social support.

Hypothesis 2: perceived social support is a mediator in the relationship between meaning in life and adolescent self-control.

Hypothesis 3: gender differences play a moderating role in the second half of the pathway by which meaning in life affects adolescent self-control through perceived social support.

The proposed model is illustrated in Figure 1.

2. Materials and methods

2.1. Participants

A stratified whole-group sampling method was used to select 1,006 high school students from two middle schools in China. After obtaining informed consent from the school leaders, adolescents and their parents, the test was administered to the group in a classroom setting. Before the test, the test leader read out the instructions and promised that the contents of the questionnaire would be kept strictly confidential and used for scientific research only, emphasizing the need for subjects to answer truthfully and independently. Finally, 936 complete and valid questionnaires were returned (93.04% effective rate; mean age 15.61 ± 1.81 years). Of these, 462 were male, accounting for 49.4%, and 474 were female, accounting for 50.6%; 95 were only children, accounting for 10.1%, and 841 were non-only children, accounting for 89.9%; 174 were urban, accounting for 18.6%, and 762 were rural, accounting for 81.4%; 340 were freshman students, accounting for 36.3%, 352 were sophomores, accounting for 37.6%, and 244 in the senior year, accounting for 26.1%.

2.2. Materials

2.2.1. Meaning in life

The level of meaning in life was assessed using the Meaning in Life Scale (Xinqiang, 2013). The scale consists of 10 items that include two dimensions: sense of having meaning and sense of seeking meaning. Among them, the sense of having meaning focuses on the extent to which individuals perceive the meaning of life, while the sense of seeking meaning focuses on the individual's drive to actively pursue meaning. Participants answered each item on a seven-point Likert scale (1 = very unlikely to meet, 7 = very likely to meet). Higher scores indicate higher levels of meaning in an individual's life. In this study, Cronbach's α was 0.85, whereas those of the two

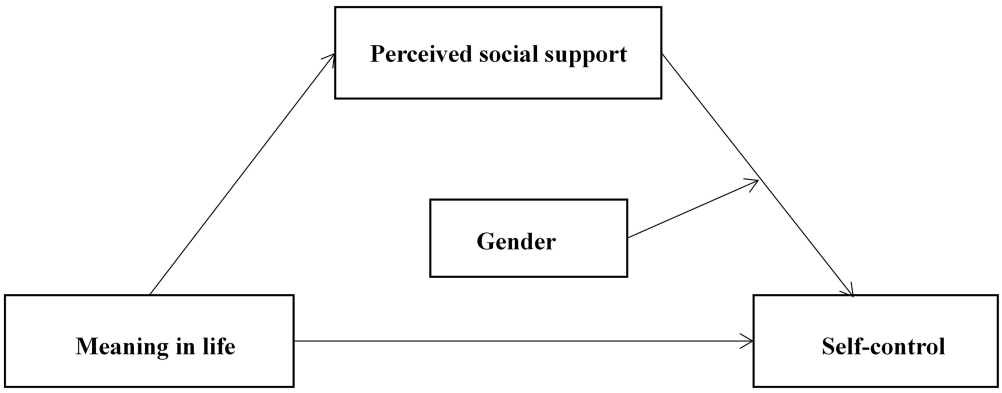


FIGURE 1
Concept framework.

TABLE 1 Descriptive statistics and correlation analysis of the predictor variables.

	M±SD	1	2	3	4
Gender	——	1			
Meaning in life	4.55 ± 0.91	0.05	1		
Perceived social support	4.81 ± 0.96	−0.04	0.36**	1	
Self-control	3.04 ± 0.50	0.09**	0.32**	0.25**	1

Gender is a virtual variable, male = 1, female = 2; **$P < 0.01$.

dimensions constituting the scale were 0.80 and 0.87, respectively.

2.2.2. Self-control

The Self-Control Scale was used to assess adolescent self-control (Wang Hongjiao, 2004). The questionnaire consists of three dimensions: emotional self-control, behavioral self-control, and thinking self-control, with a total of 36 items. Participants answered each item using a five-point Likert scale (1 = very inconsistent, 5 = very consistent) to calculate the total score. The higher the score on the questionnaire, the better the students' self-control. The Cronbach's α of the scale in this study was 0.88.

2.2.3. Perceived social support

The Perceived Social Support Scale was used to measure perceived social support (Wang et al., 1999). The questionnaire consists of three dimensions: perceived family support, perceived friend support, and perceived support from others. The questionnaire is composed of 12 items, with four items per dimension. Participants answered each item using a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). Higher scores on the questionnaire indicate a greater ability to perceive social support. In this study, Cronbach's α was 0.86, while those of the three dimensions constituting the scale were 0.80, 0.83, and 0.83, respectively.

2.3. Statistical processing and analysis plan

The questionnaire data were entered through EpiData 3.1, the data were collated and analyzed using SPSS 21.0, the mediating effect of navigating social support was analyzed using model 4 in the SPSS macro program PROCESS V3.5 developed by Hayes, and further analysis of whether gender plays a moderating role in the second half of the mediating effect of navigating social support was carried out using model 14.

3. Results

3.1. Common method bias test

Considering that the data in this study were collected from the subjects' independent reports, the possibility of common method bias cannot be ruled out, although the administration procedure was strictly controlled (Zhou, 2004). Therefore, the validity of procedural control was examined using Harman's one-way factorial analysis. All items of the predictor variables were put into an exploratory factor analysis, and the results yielded 14 factors with characteristic roots greater than 1, which explained 56.94% of the variance, and the explanation rate of the first factor was 16.42%, which was far below the threshold of 40%, indicating that the common method bias in this study was still within the acceptable range.

3.2. Descriptive statistics and correlation analysis

Descriptive statistical analysis showed that meaning in life was significantly and positively correlated with perceived social support ($r = 0.36$, $p < 0.01$) and self-control ($r = 0.32$, $p < 0.01$), but not with gender ($r = 0.05$, $p > 0.05$). Perceived social support was significantly and positively correlated with self-control ($r = 0.25$, $p < 0.01$) but not with gender ($r = -0.04$, $p > 0.05$). Self-control was significantly positively correlated with gender ($r = 0.09$, $p < 0.01$; see Table 1).

3.3. Testing for the mediating effect of perceived social support

Based on the theoretical hypotheses, a model of the mediating effect of perceived social support between meaning in life and self-control was constructed. The mediating effects were analyzed using model4 in the PROCESS macro program developed by Hayes, and the results are shown in Table 2. Controlling for gender, meaning in life significantly and positively predicted perceived social support ($\beta = 0.36$, $t = 11.63$, $p < 0.001$). After including the mediating variable perceived social support, meaning in life still significantly and positively predicted self-control ($\beta = 0.26$, $t = 7.92$, $p < 0.001$), and perceived social support significantly and positively predicted self-control ($\beta = 0.16$, $t = 4.99$, $p < 0.001$; see Table 2).

The bias-corrected Bootstrap method is considered to be an important method for testing the significance of the mediation effect, setting up to draw Bootstrap samples 5,000 times and observing the Bootstrap confidence intervals and standard errors of the parameter estimates, if they do not contain 0 in the 95% confidence interval, the results are said to be statistically significant and the mediation effect is significant. Therefore, this study first

TABLE 2 Analysis of the mediating role of perceived social support between meaning in life and self-control.

Regression equation		Fits the index			Significance of regression coefficient		
Outcome variable	Predictive variable	*R*	R^2	*F*	*β*	*SE*	*t*
Perceived social support	Meaning in life	0.36	0.13	69.80***	0.36	0.03	11.73***
	Gender				−0.12	0.06	−2.00*
Self-control	Meaning in life	0.36	0.13	47.41***	0.26	0.03	7.92***
	Perceived social support				0.16	0.03	4.99***
	Gender				0.17	0.06	2.82**

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

TABLE 3 Decomposition table of the mediating role of perceived social support.

Self-control	Normalized effect values	Bootstrap standard error	The 95% confidence interval		Relative effect value
			Superior limit	Lower limit	
Total effect	0.32	0.03	0.26	0.38	
Direct effect	0.26	0.03	0.20	0.32	81.25%
Mediating effect of perceived social support	0.06	0.01	0.03	0.08	18.75%

TABLE 4 Regression analysis of the moderating effect of gender.

Regression equation		The overall fit index			Significance of regression coefficient				
Outcome variable	Predictive variable	*R*	R^2	*F*	*β*	*SE*	CI lower limit	CI superior limit	t
Perceived social support	Meaning in life	0.36	0.13	135.17***	0.36	0.03	0.30	0.42	11.63***
Self-control	Meaning in life	0.37	0.14	36.81***	0.25	0.03	0.19	0.32	7.91***
	Perceived social support				−0.03	0.10	−0.22	0.16	−0.31
	Gender				0.17	0.06	0.05	0.29	2.82*
	Perceived social support * gender				0.13	0.06	0.01	0.25	2.12*

Each variable in the model adopts standardized variables, the same below. *$P < 0.05$, ***$P < 0.001$.

standardized each predictor variable, after which the significance of the mediation effect was tested using the bias correction Bootstrap method. The results are shown in Table 3, where none of the paths corresponded to a 95% confidence interval containing 0, and the total, direct, and indirect effects were statistically significant (all $p < 0$), indicating that perceived social support partially mediates the relationship between meaning in life and self-control. Further analysis revealed that the total effect of meaning in life on self-control was 0.32 (0.26 + 0.06) and the mediating effect of perceived social support was 18.75% (0.06/0.32*100%; see Table 3).

3.4. Testing for the moderating effect of gender

Model 14 in the SPSS macro program PROCESS, prepared by Hayes, was used to test the mediation model with moderation. It was explored whether gender plays a moderating role in the second half of the pathway mediated by perceived social support. The test results are listed in Table 4. Meaning in life was a significant predictor of self-control ($\beta = 0.36$, $t = 11.63$, $p < 0.001$). The predictive effect of perceived social support on self-control was not significant ($\beta = -0.03$, $t = -0.31$, $p > 0.05$). The effect of gender on self-control was significant ($\beta = 0.17$, $t = 2.82$, $p < 0.05$). The product term of perceived social support and gender had a significant positive predictive effect on self-control ($\beta = 0.13$, $t = 2.12$, $p < 0.05$). The 95% confidence interval did not include 0, indicating that the predictive effect of perceived social support on self-control was moderated by gender. The judgment indicator INDEX was 0.05, and the confidence interval was [0.002,0.091], and the confidence interval did not include 0, indicating that gender has a moderating effect on the predictive effect of meaning in life on self-control through the perceived social support. The effect of perceived social support on self-control was greater for females than for males (see Table 4).

TABLE 5 The mediation effects of social support.

Metavariable	Gender	Effect value	Boot standard error	BootCI superior limit	BootCI lower limit
Perceived social support	Male	0.04	0.02	0.003	0.073
	Female	0.08	0.02	0.050	0.118

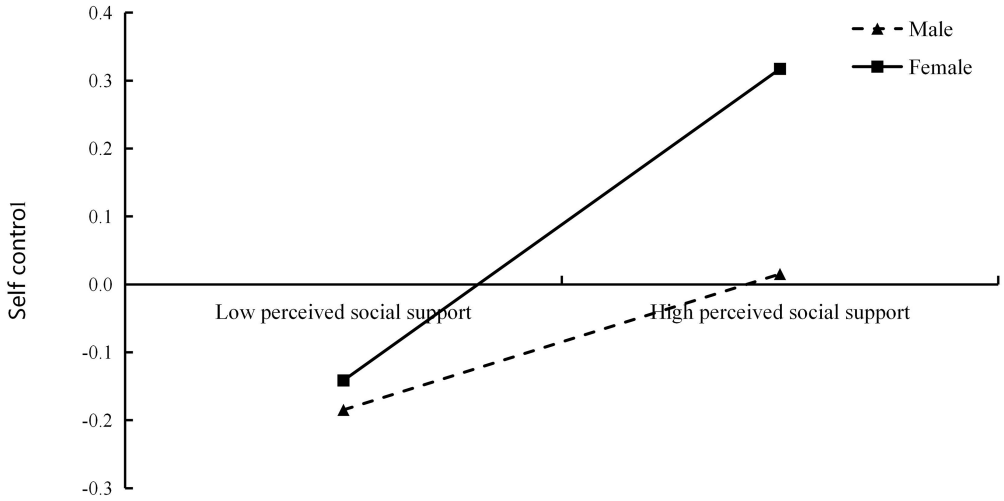


FIGURE 2
The moderating role of gender in perceived social support and self-control.

To understand the essence of the interaction effect between perceived social support and gender, male and female subjects were analyzed separately, and the mediated effect values and 95% Bootstrap confidence intervals of perceived social support between meaning in life and self-control for both groups are shown in Table 5. The moderating role of gender between perceived social support and self-control was further analyzed using the simple slope method (Fang et al., 2015). The results are shown in Figure 2. Perceived social support in females had a significant positive predictive effect on self-control (simple slope = 0.23, $t = 5.08$, $p < 0.001$). Perceived social support in males still had a significant positive predictive effect on self-control (simple slope = 0.10, $t = 2.26$, $p < 0.05$).

In summary, the moderated mediation model proposed in this study was empirically supported. Perceived social support mediated the relationship between meaning in life and self-control, and the second half of this mediating role was moderated by gender factors. The adjusted model relationships are shown in Figure 3.

4. Discussion

4.1. The relationship between meaning in life and self-control

The current findings support Hypothesis 1, which suggests meaning in life is positively related to adolescent self-control and perceived social support. The results of this study suggest that meaning in life significantly and positively predicts adolescent self-control, which is consistent with the existing research (Shao, 2021). Frankl's theory of meaning in life suggests that meaning in life plays a positive role by providing individuals with value, direction, and control over events in their lives (Frankl and He Zhongqiang, 2003). The stronger the meaning in life, the more individuals are able to perceived the value of their own existence and have greater self-control to regulate undesirable emotions and behaviors (Zhang and Zhang, 2021). Emotional attribution theory can also explain this finding. This theory suggests that for physiological arousal to be converted into an emotion, there must be not only feedback from the physiological response, but also a marker of the situation that leads to the physiological response (Schachter and Singer, 1962). Specifically, when individuals mark themselves as beings with a robust meaning in life, they can access extremely rich inner kinetic energy and subsequently invoke the inner purpose system to regulate their external behavior and performance, suppress instinctive impulsive desires, and strengthen inner self-control. At the same time, individuals who tend to seek meaning in life place more emphasis on achieving long-term goals and thus exhibit a more pronounced delayed gratification mentality. In this process, they shift their attention from external things to internal changes, social and situational aspects of the performance situation. At this time, individuals have stronger self-focused attention, more emphasis on self-care and self-evaluation, more motivation to adjust their behavior, and are more likely to achieve their life goals (Wicklund and Duval, 1971), and have greater self-control.

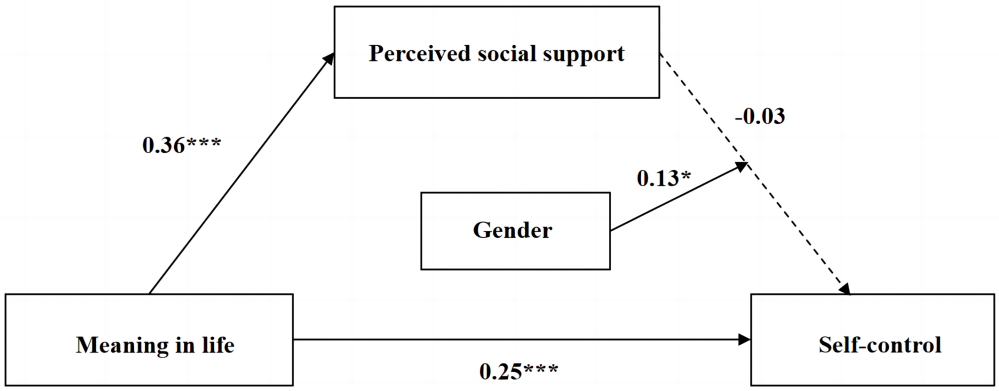


FIGURE 3
A moderated mediation model of the gender. *The correlation is significant at the 0.05 level. ***The correlation is significant at the 0.01 level.

4.2. Mediating role of perceived social support

Consistent with Hypothesis 2, we found that perceived social support is a mediator in the relationship between meaning in life and adolescent self-control. The present study also found that perceived social support could serve as a bridge to realize the impact of meaning in life on adolescent self-control. The main source of the mediating role of perceived social support may be that, on the one hand, experiencing more social support can enhance adolescents' self-control. It has been suggested that the imbalance between psychological and physical development makes adolescents irrational, impulsive, and emotionally vulnerable, and therefore adolescents are more sensitive to external social support. Simultaneously, more social support means being accepted and recognized by others, which can lead to a better self-image. The maintenance of the image, in turn, motivates adolescents to show higher self-control when dealing with problems and to be more willing to behave in accordance with social rules (Yang, 2021). In addition, in complex relationships with family and friends, individuals acquire the message of being loved and cared for by social support, which promotes the development of emotion management and executive functioning, thereby effectively improving self-control (Feng Kong and You, 2013). On the other hand, meaning in life influences adolescents' ability to perceive social support. It has been found that strong meaning in life predicts a more positive level of psychological well-being, and individuals with higher levels of psychological well-being have superior interpersonal skills, which motivates them to maintain close and friendly interactions with their peers (Kang et al., 2020), easily perceiving goodwill in interpersonal interactions, and thus are able to experience and receive more social support. At the same time, a strong meaning in life also indicates that individuals have more hope for the future, so individuals will maintain a positive mindset to interact with others, avoiding interpersonal conflicts and establishing stable relationships (Chen Yidi, 2018). This may reveal that the perception of social support and the meaning in life is extremely important for the development of adolescents' self-control. By strengthening life-meaning education and improving individuals' perceptions of social support can effectively stimulate adolescents' self-control ability.

4.3. Moderating role of gender

The results indicate that gender differences play a moderating role in the second half of the pathway through which meaning in life affects adolescents' self-control through perceived social support, which is consistent with Hypothesis 3. We found gender differences in the effect of perceived social support on adolescent self-control, with females' perceived social support having a more significant effect on their self-control than males'. The reason for this is, on the one hand, the difference in psychological development between the two groups. Specifically, during adolescence, females are more delicate and more likely to perceive support around them than males, and thus their psychological development is more mature, assertive, and capable of self-control (Jiandan, 2012; Jingmin, 2012). On the other hand, it lies in the different gender role expectations shaped by the culture of the society. It is noteworthy that such social expectations create differential social evaluations and have a more pronounced impact on female. Female's greater reliance on interpersonal relationships and the social environment makes them more willing to conform their behavior to social expectations, and for this reason they will continue to strengthen their self-control. Men, in contrast, are more focused on their own development, tend to rely on self-imposed norms, and are less influenced by social evaluations (Rose and Karen, 2006), thus leading to a reduced need for continuous improvement of self-control and a weakening of self-control.

Therefore, based on gender differences in the influence of perceived social support on adolescents' self-control, we need to follow the rules of psychological development of both genders, adopt scientific teaching methods, and provide targeted knowledge to promote the development of strengths and weaknesses of each gender group. At the same time, in education, we should pay more attention to females' emotional demands and focus on cultivating males' rational consciousness and awareness of rules, so as to improve the psychological quality of self-control and emotional regulation of adolescents and thus promoting the transformation of students from "other discipline" to "self-control."

4.4. Limitations and implications

This study reveals that perceived social support mediates the relationship between meaning in life and self-control along with gender differences, further revealing the mechanisms underlying the influence of meaning in life on adolescents' self-control. The results of this study provide an important empirical basis for nurturing adolescents' sense of self-control from the perspective of the meaning in life. In order to enhance adolescent self-control, we should not only strengthen adolescents' life-meaning education and reinforce their expectation of life meaning, but also elevate adolescents' ability to perceive social support so as to obtain rich social support around them. At the same time, gender differences should be taken into account when nurturing adolescents' self-control abilities. We need to tailor the developmental program to the gender-specific adolescents in order to fully utilize the cultivating effect.

In addition, the present findings also suggest some limitations and several directions for future research. Firstly, meaning in life, self-control, and perceived social support are all multidimensional variables, and the analysis based on the dominant variables in this study can hardly reveal the more complex relationships among them. Future studies can use these three as latent variables and construct more complex latent variable interaction effect models through standardized estimation of latent variables to explain the interaction effects between variables in more detail as well as to compare simple main effects. Secondly, the results of this study originated from cross-sectional studies, which are difficult to reveal the causal relationships between variables or the dynamic patterns of self-control development in adolescent groups. Future follow-up studies can be used to further analyze the effects of meaning in life and perceived social support on the development of adolescent self-control and to construct a dynamic model of growth and development. Finally, development is a continuous dynamic process, and environmental factors also play a role. As both meaning in life and perceived social support belong to personal factors, future investigations can combine personal and environmental factors to explore the mechanism of self-control in more depth and provide rich theoretical support for developing intervention programs to enhance adolescents' self-control.

5. Conclusion

The findings of this study are as follows. The present study found that meaning in life significantly and positively predicted self-control and perceived social support. Perceived social support partially mediated the relationship between meaning in life and self-control. Gender difference moderated the second half of the pathway of the mediation model of meaning in life on self-control, as evidenced by the fact that perceived social support was a stronger predictor of self-control for females than for males. The results of this study implied that enhancing perceived social support could help adolescents with lower meaning in life to enhance self-control, and this process was more significant in the group of girls.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the First Affiliated Hospital of Shihezi University, Shihezi University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

YL and SD designed the experiment, collected data, prepared the manuscript, and made data analysis. YS corrected the whole language of the manuscript and made final approval. CM gave technique supports and valuable suggestions in experiment designing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Factors influencing quality of transnational education: Evidence from a Sino-UK MA program

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With the internationalization of higher education, transnational education (TNE) has gradually become one of the main means to mobility of education resources in many countries. There have been many studies on service quality research, but not many of these studies attempt to directly explore the in-depth factors contributing to service quality. This study investigated the factors impacting the quality of TNE based on the interpretation of students' experiences on a Sino-UK MA program. Semi-structured interviews with seven participants revealed that high-quality educational resources and professional and sympathetic lecturers are the two major factors impacting the service quality. The results suggested that educational resources that meet the local social needs are considered desirable service offerings. Lecturers are key factors guaranteeing the service delivery. This study sheds light on service quality components of TNE that have not been given much attention in the literature of previous research, as well as informs host and export institutions on TNE programming.

KEYWORDS

service quality, student personal growth, internationalization of higher education, student satisfaction, sustainability of TNE

Introduction

With the trend of globalization, the international higher education sector has developed rapidly in the last four decades (Maringe et al., 2012), enabling educational resources to move around the world (Altbach and Knight, 2007; Rumbley and Wit, 2011). Studying abroad, as traditional internationalization activity, is gradually giving sway to a new landscape where diverse types of educational providers send their products to students' own countries and establish campuses across borders (Cai et al., 2013). This kind of educational activity is termed Transnational Education (TNE) to describe "any teaching or learning activity in which the students are in a different country (the host country) to that in which the institution providing the education is based (the home country)" (Global Alliance for Transnational Education, 1997, p. 1). Education services that are provided to another country in accordance with host country's regulations and

contexts become the main threat to the quality around the world. Trifiro (2018) highlights the vicious circle of quality in TNE, in which the diversity of approaches and regulatory frameworks for TNE across the participating regions leads to a general lack of information and knowledge for other countries, and then results in a "trust gap" between foreign and host institutions, and finally causes the low level of collaboration in service quality. Such a trust gap is understandable, since the quality assurance conducted by export institutions depends to a large extent on the experience of their successful domestic programs, ignoring the context and needs of the host countries. In addition, "rogue providers" might exploit regulatory loopholes in the host countries by capitalizing on the prestige of renowned universities in their home countries. In fact, "rogue providers" are widespread especially in fast-growing markets such as Southeast Asia where demand for high quality education services exceeds supply of local institutions (Cremonini et al., 2012).

According to Harvey and Green (1993), the purpose of quality assurance in higher education is to gain better institutional performance to comply with external pressure, attract students, and maintain professional ethos. This study aims to provide quality assurance evidence to promote sustainable development in TNE by exploring the factors affecting the service quality. This study will inform host and export institutions on the improvement and maintenance of high-quality TNE.

Literature review

The relevant literature is organized into three categories: first, transnational education, which reviews the landscape of TNE and addresses the quality assurance problems; second, service quality, which briefly reviews the development of service quality in higher education and introduces the dimensions of service quality; third, transformative learning theory, which introduces the framework to understand student personal growth in the TNE.

Transnational education

The global Higher Education system is not uniform and homogeneous, and universities in different countries are characterized by their own performance standard, which in turn influences their student and staff mobility patterns. The normal direction of student and staff mobility is from poor, underdeveloped countries to the rich nations (Jones and de Wit, 2014; de Wit and Altbach, 2021). In addition, the global Higher Education system is characterized by increasing competition for students, resources, staff and funding (Maringe et al., 2012; Thondhlana et al., 2020). Therefore, universities are tending to keep their graduate attributes in line with globalization imperatives, fostering the internationalization attributes such as competences in intercultural communication, international literacy, international consciousness, global awareness and global perspectives (Maringe et al., 2012).

TNE, as one form of international education, providing cost-effective forms of international learning with limited or no overseas travel, has been rapidly developed over the years (Ilieva et al., 2017). But there is still an absence of systematic research in this area, partly due to disregard shown toward TNE as an area of Higher Education strategy and policy in the research agenda of Higher Education institutions and government bodies (Tsiligiris and Lawton, 2018). In the TNE landscape, local governments usually impose serious regulatory obstacles, including restrictions on foreign investment in education, workforce and migration restrictions and profit-repatriation controls (Tsiligiris et al., 2021). In addition, most host countries limit the type of foreign providers or the types of qualifications and accept only high-ranking universities or renowned qualifications that provide cooperation (Trifiro, 2019). Although host countries benefit from increased access to international higher education and improvement in education quality, and students gain skills in their international outlook and inter-cultural competencies (William, 2021), no evidence shows that TNE providers tailor the special program for host countries (British Council and DAAD, 2014). In practice, there is inter-cultural communication disagreement between institutions from Western developed countries and developing countries, because the former takes an egalitarian student-centered approach while the latter prefers hierarchical structures embracing control over students and the actions of faculty (Mirkasimov et al., 2021). Developing a share-culture in management and quality assurance is one of the challenges for the sustainability of TNE. Two main challenges for TNE risks are the assurance of quality and the maintenance of partner relationships (Healey, 2015). Some authors argue that trust and power asymmetries are key factors impacting on sustainable partnerships (e.g., Maselli et al., 2006; Bradley, 2007; Olsson, 2008; Kinser and Green, 2009). Others argue that there are tensions between commercial priorities and academic, which may lead to a risk of falling standards (Mcburnie, 2008), such as the increased opportunities for corruption of fraudulent diplomas and risks to academic integrity.

To sum up, challenges and opportunities coexist in the TNE landscape around the world. On one hand, TNE offers cost-effective opportunities for internationalization of Higher Education in developing countries. On the other hand, quality concerns have been stressed by host countries, which require a mutual understanding of TNE service quality by both collaborative institutions and countries.

Service quality in higher education

Regarding quality, the first references appear in Aristotelian Greek philosophy. Later, Francis Bacon presents two forms of quality, namely, objective quality and subjective quality (Soares et al., 2017). From the 1980s onwards, with the development of the

service sector in the global economy, management literature increasingly accepts the idea that objective quality connects to the product and subjective quality is associated with service (Grönroos, 1982; Zeithaml et al., 1988). Zeithaml (1998) further explains that quality of service is a construction of a complex nature and a result of the sum of the unique features applied to services, in the way they are perceived by individuals. Since the 1980s, quality assurance has become a standard instrument of higher education policy (Cremonini et al., 2012). Service quality is a vital concept in higher education as it provides the possibility for institutions to monitor the quality of their services and to seek improvements, but it is difficult to define the universal characteristics of this construct (Darawong and Sandmaung, 2019).

Service quality research in higher education is ever changing (Sultan and Wong, 2010), and there is significant debate about defining service quality in higher educational institutions (Becket and Brookes, 2006), since "it is a rather vague and controversial concept" (Cheng and Tam, 1997, p. 23). Over the years, there are two major approaches to understand the essence of service quality, namely, student-as-customer approach and student-deficit approach. Academics holding student-as-customer perspective suggest that service quality should be assessed by the perceptions of students (Aldridge and Rowley, 1998), since students are assumed to be the primary customers of the education service and they are also the product of the educational activities (Sirvanci, 1996; Senthilkumar and Arulraj, 2011). Because competition in higher education has become fierce (Hemsley-Brown and Oplatka, 2006; Curtis et al., 2009), institutions experienced pressure in capturing a bigger market share, which requires continuous improvement of service quality. As a result, institutions have been trying to gain competitive advantages over their competitors in the market, which enable the applicability of quality management principles, methodologies and tools from business context to higher education context (Khan et al., 2011). In contrast to the student-as-consumer approach, some scholars (e.g., Ploner, 2018) claim the "student deficit model," in which international students are assumed sometimes to have unrealistic or even conflicting expectations of "service quality" and it is the students' responsibility to adapt these expectations to "fit into" the institutions.

Student-as-customer approach originated from consumer marketing literature, in which satisfaction is "the consumer's sense that consumption provides outcomes against a standard of pleasure versus displeasure" (Oliver, 1999, p. 34). In the context of education, research shows that students' perceived service quality is an antecedent to student satisfaction (Guolla, 1999; Wilkins et al., 2012; Wilkins and Balakrishnan, 2013). As a result, Elliott and Shin (2002, p. 198) describe student satisfaction as "the favorability of a student's subjective evaluation of the various outcomes and experiences associated with education. Student satisfaction is being shaped continually by repeated experiences in campus life." And student satisfaction is demonstrated as an important indicator for evaluating service quality (Barnett, 2011). Samples could be found in recent studies in assessing student satisfaction and service quality in higher education (Weerasinghe and Fernando, 2017; Pedro et al., 2018; Yilmaz et al., 2018; Tijjani, 2019).

One of the major drawbacks of the student-as-customer approach is that it fails to identify the in-depth factors influencing the service quality, but only addresses the satisfactory or unsatisfactory items. Based on the items of original SERVPERF (Cronin and Taylor, 1992), Ahmad (2015) conducted a survey to six renowned international branch campuses operating in Malaysia. Ahmad employed a five-point Likert scale device to collect students' perception data, and results showed that students were satisfied with the university reputation/image, program quality, lecturers and teaching quality, student learning environment, effective use of technology, counseling and academic advising support, and social life (direct/indirect) facilities. Based on SERVQUAL framework (Parasuraman et al., 1985, 1991), Zhong et al. (2012) conducted a quantitative survey to 1,800 students from 3 TNE institutions and 38 TNE programs in China. The questionnaire's results showed that significant differences between the expectations and the importance of service quality have been found. Three satisfied dimensions in this study are service management, school-running conditions and affective engagement, in which the degree of service management satisfaction is the highest and the affective engagement is the lowest. Both large scale surveys above failed to explore the in-depth factors that influence service quality. Reasons are twofold. First, the Likert scale device with Importance–performance indicators employed by these studies aimed to identify the gap between expectations and performance about certain dimensions and was not designed to explore the factors that influence the quality. Second, quantitative data analysis emphasized descriptive results from students' responses, ignoring social factors underpinning students' attitudes and perceptions. Therefore, in this study, student satisfaction is seen as an important indicator of understanding the quality of service of the TNE program, while student personal growth is seen as another factor that serves to understand the quality of service.

Previous studies on student satisfaction contribute to the dimensions that relate to service quality in higher education. Based on Ahmad's (2015) evaluation of Malaysia International Branch University, Zhong et al.'s (2012) satisfaction analysis of Chinese TNE and Liu et al.'s (2016) evaluation on instructional satisfaction for Chinese TNE, this study concentrates the service quality on the following ten dimensions: university reputation, program and curriculum design, lecturers and teaching quality, academic support, tangible facilities, service management, affective engagement, assessment and feedback, personal development and introducing foreign educational resources. Table 1 shows the dimensions and explanations for investigating the service quality in the current study.

Dimensions in Table 1 inform the design of interview outlines, as well as the coding in data analysis. For example, the interview questions about making decision to join the program mainly focuses on the reputation and recognition dimension, and for

interview questions about learning experience cover dimensions related to service delivery, such as teaching and academic support, introducing foreign educational resources, and service management. In the data analysis procedure, dimensions help to interpret students learning experiences, and generate the understanding of students' sense-making. These dimensions are also discussed with the five-dimensions model introduced by Parasuraman et al. (1985) in the discussion section.

In summary, previous studies on service quality inform the philosophical assumptions and the dimensions to understand service quality in this study.

TABLE 1 Dimensions of service quality.

Dimensions	Explanation
University reputation	The university is internationally known and recognized at home and abroad, and the degrees from the university are more prestigious. Graduating from university gives you a chance to get a better career and higher salary.
Tangible facilities	The university offers modern learning and teaching facilities, and the infrastructure is adequate. The library meets learning needs.
Program and curriculum design	The course of the program is made relevant to the context and intellectually stimulating. The program is accredited by international bodies and prepares students for their future career.
Lecturers and teaching quality	Lecturers are experts in the subject area and well prepared academically. The lecturers can stimulate students' interest.
Academic support	Academic counseling service is always made available to the students. Students are able to find an official to advise on academic matters.
Assessment and feedback	The assessment criteria are clear and are made open to the students. The feedback is detailed and effective.
Introducing foreign educational resources	The number of foreign lecturers is adequate, and the introducing courses and textbooks are adapted for local students.
Service management	The faculty is willing to offer help to students and help to set up students' security and confidence.
Affective engagement	The faculty understands students' personalized needs and deals with students' problems sincerely. The school pays attention to every student and supplies fast service.
Personal Development	The program offers help in students' development of personal skills, in this study, the transformation.

*Dimensions were adapted from Ahmad (2015), Zhong et al. (2012), and Liu et al. (2016).

Transformative learning theory

Transformative learning theory is one of the most intensively researched theories in the field of adult education (Taylor, 2005, 2008; Taylor and Snyder, 2012). The label transformation was first applied in Mezirow and Rose's (1978b) study of the United States women's resuming postsecondary study, which aims to "identify factors that characteristically impede or facilitate" the learners' progress. In this study, transformative learning theory is employed to explore the factors impacting students' change, which is considered the outcomes of education service.

Mezirow (2000) provides the 10 phases of personal transformation to identify factors and characteristically impede or facilitate the learners' progress (see Table 2). According to Mezirow, learners' transformation originates from the disorientating dilemma, and learners who experience the dilemma will initiate a critical reflection on themselves (phase 2) and the context (phase 3), which leads to a reflective communication (phase 4 and 5), and finally result in the action of transformation (phase 6–10).

TABLE 2 Ten phases of transformative learning Mezirow's (2000).

Phase 1	A disorienting dilemma
Phase 2	A self-examination with feelings of guilt or shame
Phase 3	A critical assessment of epistemic, sociocultural, or psychic assumptions
Phase 4	Recognition that one's discontent and the process of transformation are shared and that others have negotiated a similar change
Phase 5	Exploration of options for new roles, relationships, and actions
Phase 6	Planning a course of action
Phase 7	Acquisition of knowledge and skills for implementing one's plans
Phase 8	Provisional trying of new roles
Phase 9	Building competence and self-confidence in new roles and relationships
Phase 10	A reintegration into one's life on the basis of conditions dictated by one's perspective

Research on transformative learning suggests that certain conditions lead to transformation. Liu (2013) points out that transformative learning conditions could be categorized into internal and external conditions, in which the internal conditions include learners' characteristics like age, previous experience, interest, motivation, metacognitive competence and learning strategies, etc., and the external conditions include factors facilitating learning like context, teacher and learning content, etc. The transformative learning theory was employed to understand the internal and external factors that influence the service outcome, here the learners' personal growth.

Research method

This qualitative case study used a purposive sample to explore factors influencing TNE service quality. Themes were developed from convergence of three data sources: semi-structure interviews, program documents and student evaluation feedback forms. Data were inductively analyzed, and themes were generated to provide an in-depth description of the case of TNE program.

Data collection procedures

The sampling case of this study is a Sino-UK MA TESOL program, which has been running since 2003, as one of the pioneers of transnational activities in China, after the release of first formal regulations on transnational educational in China. This program is joint by University of L (hereinafter refers "L University") from United Kingdom and University of G (hereinafter refers "G University") in China. The program aims at training TESOL lecturers and teachers working at tertiary, secondary or primary schools in Chinese education system. All teaching takes place at the G University premises, and L University sends staff to deliver face-to-face teaching. The program lasts one academic year, just like other full-time MA programs offered at L University, from September/October to August/September of the following year. The program enrolls up to 30 students each year, and the entry requirements are the same as those for the L University-based MA TESOL program. Those who are accepted onto the program need to have to meet the following requirements: (1) a first degree in English, from a Tier 1 or 2 university (the Tier 1 and 2 university mainly includes state-running universities and colleges in China), with GPA of at least 75%; (2) a teaching qualification; and (3) normally a minimum of 2 years post-qualification TESOL experience.

I have been working on this program for over 10 years, as an educational service officer. With repeated interactions with students, I have the chance to know the students well, helping me to identify the most informative participants. The target participants are graduate students, since they have experienced the whole learning process and become familiar with the service provided by the program. Furthermore, after finishing the program, students normally have some reflection on their study, which provides an insight into their changes. Out of convenient reasons, I sent invitations to the graduates with strong connections who knew I was doing service quality research on this program. Most of them were interested in participating in this research.

Seven participants were invited to the current study, their demographic information was stated in Table 3. They are female, experienced EFL teachers, having graduated from this program. All participants used pseudonyms from an alphabet order from A to G.

One-to-one semi-structured interviews were conducted with each participant with the purpose of exploring their perceptions of the service and their reflections on personal growth. Each interview approximately took 45–60 min and was recorded with the interviewee's permission. Based on the research question, the design of interviews questions was divided into two parts. The interview questions in the first part are in chronological order according to the program schedule with the purpose of recalling participants' memories easily. The questions in the second part are about the overall sense-making of the program. The interview questions are informed by the program evaluation strategy and cover the main student satisfaction dimensions and transformative learning phrases. The interview questions are used in a flexible manner to move from general issues to more particular issues. For example, interview questions in part one cover participants' whole learning process in the TNE program, including before joining the program, studying in and graduating from the program. The questions are organized in a chronological order and focus on discovering participants' interesting and important things. During the interview, I usually listen to the participants attentively and

TABLE 3 Participant demographic information.

Participant ID	Name	Gender	Age	Entry year	Teaching context
Participant 1	Alice	Female	29	2020	Test preparation training class
Participant 2	Betty	Female	30	2020	Primary school
Participant 3	Cindy	Female	34	2015	Small size training class
Participant 4	Daisy	Female	35	2020	Test preparation training class
Participant 5	Emma	Female	43	2020	EFL teacher educator
Participant 6	Flora	Female	35	2017	International school
Participant 7	Gloria	Female	31	2020	Secondary school

probe at certain points (e.g., when talking about the most impressive things during classroom teaching, I may ask about "Can you tell me the difference between Chinese and foreign lecturers in classroom teaching?"). Interview questions in part two mainly concentrate on the confirmation of learning experiences that participants described in part one. These questions are more abstract and related to the personal judgment of service quality.

The documentation data in the current research includes the Handbook of the MA TESOL Program and student evaluation feedback forms of one module. Documents analysis is used to triangulate the data for a comprehensive understanding of the service quality. The handbook provides basic information about the program operation, describing the curriculum design, the outcome and transferable skills, as well as the program structure and teaching arrangements. The documentation of student evaluation form is a sample of the student evaluation for the module delivery. A module delivered by lecturers from G University was selected as the sample, which contains feedback from 25 students in cohort 2019. This evaluation form was selected as the sample since it provides evidence to better understand the Chinese lecturer's work in localizing the program to Chinese context. The feedback form contains three main sections. Section A and B employ a five-points Likert scale device to evaluate student satisfaction with the module content, lecturers, learning resources and other factors related to learning. Section C contains four open-ended comments on the modules, including the best aspects of the modules, the aspects that benefit further development, the realistic improvements to the module, and other comments on the module. The documentation of student evaluation feedback forms was used to provide triangulated evidence of satisfaction and personal development from the study of specific module.

The ethical issues were carefully considered in the current study. Ethical approval has been obtained from the ethics committee at the researcher's institution before data collection. All students invited in the current study participated voluntarily with consent confirmation. All participants were required to read an information sheet and sign the consent form. They were well informed about confidentiality and the risk of attending the interview. In addition, participants were well informed about data ownership.

Data analysis

The aim of data analysis in this study is to rigorously and creatively organize, find patterns in and elicit themes from data (Burnard and Morrison, 1994). There were only a few researchers providing inherently intuitive analysis procedures in case study (Tesch, 1990). In case study, there are two types of analysis: "within-case" and "cross-case" (Stake, 2006; Creswell, 2007). Cross-case analysis identifies the similarities and differences between themes across the case (Eisenhardt, 1989). The current study employs cross-case analysis to analyze themes across different participants' accounts, in which different participants are viewed as different cases. The cross-case analysis helps to provide of the similarities and differences of the essence of the service quality in the TNE program. In this study, the data analysis first focuses on participants' personal sense-making with the learning experience in the MA TESOL program and then evaluates the service quality in connection with the documentary analysis, with the commitment to an understanding of TNE program. The data analytic cycle in this study is iterative and inductive, and the analytic result is a co-construction of participants and researchers.

As I reviewed in the literature section, the service quality and transformative learning theory comprise the theoretical framework of this study, which informed the data collection and guided the data analysis. Specifically, the dimensions of service quality in TNE and the phases of transformative learning formulated the framework to understand students' perceptions of service delivery and students' personal growth, that is, the service outcome.

All interviews were transcribed into texts by machine voice recognition device and my manual editing. To avoid the inaccurate interpretation, interviews were transcribed and analyzed in the original language, Mandarin Chinese, and the English used for quotes in this paper were my translation of original texts. Each interview transcript as well as the audio recordings were imported into Nvivo 12.0 as a single file for data management and further analysis. The interview texts are analyzed under a constructivism paradigm with four major stages in data analysis, including: transcribing and reading, generating initial coding, developing emergent themes and writing up the themes. These four stages are consistent with Morse's (1994) proposed data analysis framework: understanding, synthesis, theorizing and recontextualization.

In this study, the interview texts were coded with two rounds of noting. The first round of noting uses a repeated reading strategy to ensure that participants are the focus of analysis and avoid over summarization of complex information. At this stage, the noting work mainly focused on participants' concerns, language and abstract concepts, under the framework of perceptions of service delivery, based on the satisfaction dimensions, and the perceptions of personal growth, based on the phases of transformative learning. The second round of noting based on the first round noting and my own interpretation, which was categorized into two classes, namely service delivery and transformations. The characteristics category contains tentative summary of emerging patterns about factors influencing students' satisfaction of TNE quality, such as curriculum, teaching, facility and social life. The transformation category contains tentative summary of emerging patterns about students' personal growth, such as dilemma, reflection and action. And then, documentation analyses were used to triangulate the interview texts by examining the program settings like objectives and teaching arrangement, as well as students' evaluation on module delivery like best aspects of the module. Table 4 presents an example of codes and categories.

After the categorization of massive interview data, major themes emerged from these data by building links among different cases and triangulating the subthemes with documentation. The themes and codes were later reviewed by the second author, and the disagreements of coding were resolved through discussion. Finally, we reached an agreement on two themes and seven sub-themes concerning factors influencing the service quality. Table 5 presents the samples of generating themes from data sources in this study. In this example, different participants repeatedly mentioned the lack of EFL theoretical knowledge. The phenomenon could be traced back to the setting of "Chinese Undergraduate Specialty Catalogue of Higher Institutions" (released in 1989), in which "EFL teaching" was not given a specialty status. Therefore, most EFL teachers were the undergraduate degree holders of English or Education, and most of them lack theoretical knowledge. Combining data from program handbook and evaluation feedback form, the curriculum satisfied local needs could be found through the transformative learning framework.

TABLE 4 Example of codes and categories.

Codes/free nodes	Categories	Tentative summary
1. Lecturers and teaching quality	Service delivery	1. Experienced one-year hard time a. Intensive lecturing b. Heavy written assignment c. …
2. Program and curriculum design		2. Foreign teachers are kind a. Necessary support b. Affective engagement c. …
3. Academic support		
4. …		
1. Dilemma	Transformation	1. Transformation of identity a. from teacher to practitioner b. from knowledge receiver to constructor c. …
2. Community communication		2. Transformation of perspective a. Being critical b. …
3. Reflection		
4. ….		

Findings

High-quality educational resources made relevant To host Country's needs

The term "educational resources" was a broad concept, normally including tangible and intangible educational resources. This program is delivered in a Chinese university where most facilities were shared between students in this program and other local programs of G University. Due to the cross-border nature of TNE, the foreign educational resources are mainly intangible, such as curriculum and flying faculties. From the interview data, the intangible educational resources on the program are the major factor influencing the service quality. Four aspects of intangible educational resources emerged during the data analysis: curriculum, assessment, learning community, and institution reputation.

Curriculum based on local needs

The closed relevance of curriculum and needs of local society is the primary factor influencing TNE service quality. The reasons are twofold. First, there was a need of the theoretical and practical knowledge in EFL teaching in China. Second, there was a need of weekend program for in-service teachers. Evidence could be found from the extract of interviewees' accounts as follows:

> I think this program should be able to promote my future development (Alice).

TABLE 5 Example of generating themes and sub-themes.

Theme	1. High-quality Educational Resources
Sub-theme	**1.1. Curriculum based on local needs**
Data request	a. Interpretation of interview texts: Participants showed that this program offered theoretical knowledge of EFL teaching, which served as the supplement knowledge for their professional development. …I think the four modules are very helpful. It is a professional, systematic and complete system (Flora)."Before I joined the program, I encountered a bottleneck in teaching… with the continuous deepening of learning, we know that English teaching is difficult, or second language teaching is exceedingly difficult. Because it crosses ethnic and cultural backgrounds…" (Cindy).
	b. Program Handbook: the learning outcome requires the MA TESOL graduates to be able "to demonstrate in-depth, specialist knowledge and mastery of techniques relevant to the discipline…"
	c. Evaluation feedback: This lecturer can make abstract points clear and easy to understand; 2. Its context is practical and relevant to teaching (Extract 20) Pay much attention to teaching reality (Extract 21)

> When my front-line practical experience was rich… I may need improvement, that is, some theoretical improvement (Emma).
>
> …I think the four modules are very helpful. It is a professional, systematic and complete system (Flora).
>
> Before I entered the program, I felt that I had strong practical experience, but lacked theory, which made others feel that I am not professional enough, and now I can do this (Gloria).
>
> "Before I joined the programme, I encountered a bottleneck in teaching… with the continuous deepening of learning, we know that English teaching is difficult, or second language teaching is exceedingly difficult. Because it crosses ethnic and cultural backgrounds, it is completely different from the basis of language" (Cindy).

Accounts from participants showed that this program offered theoretical knowledge of EFL (English as Foreign Language) teaching, which served as the supplement knowledge for their professional development. The phenomenon that EFL teachers lack theoretical knowledge in EFL teaching could be traced back to the setting of "*the Undergraduate Specialty Catalogue of Higher Institutions*" (released in 1989) in China, in which "EFL teaching" was not given a specialty status. Therefore, most EFL teachers were the undergraduate degree holders of English or Education, who normally feel the needs of theoretical knowledge in EFL teaching. The theoretical knowledge in EFL teaching provided by the curriculum was perceived as an important educational resource imported from foreign institutions. As stated in the handbook of the program, one of the learning outcomes is to describe and evaluate major approaches to the teaching and learning of TESOL and to demonstrate in-depth, specialist knowledge and mastery of techniques relevant to the discipline.

Additionally, the course content made localized to the teaching context in host country was perceived as another factor contributing to the quality, which could be captured from participants' accounts as follows:

> …Chinese teachers may know more about China, at least about our classmates, learning habits and other specific problems, so they will (pause), er, better meet your learning needs (Daisy).
>
> Therefore, compared with foreign teachers, I think Chinese teachers' teaching is based on our understanding, that is, they know the level of our understanding, so their explanation will be more systematic (Gloria).

Daisy and Gloria valued the teaching content delivered by Chinese due to the close connection to local teaching context. Apart from the teaching content, the teaching schedule of this program meets in-service EFL teachers' needs. As the program structure stated in the program handbook, this program offered face-to-face teaching on Friday night to Sunday from 2017. The new arrangement offered students the rare chance to be possible to gain an MA degree without quitting the job.

With the support of curriculum, the learning outcomes of the program could be interpreted as learners' transformation of identity under the transformative learning theory. The cross-case analysis suggests that students changed from teacher to practitioner after the study, which could be evidenced from Gloria and Flora's account as follows:

> I think the biggest change is the change in my understanding of my own positioning. Before, I thought I was a state-owned school's teacher. I can foresee my retirement in 30 years. But now I find that I am no longer a language teacher only. Now I think I should position myself as a teacher who keeps learning and use such a learning attitude and spirit to influence my students. Although I think the end of my career is retirement, I can do a lot of different things in this process. I can test different teaching methods and new ideas in my students in my teaching. yes. Therefore, my positioning should be different, and my requirements will be higher… (Gloria).
>
> …but after I graduated, under some theoretical guidance, I thought about why some students had special psychological problems and how I could go on to the next step to solve their problems. I used some theoretical knowledge to make my teaching more meaningful or comprehensive… (Flora).

According to Mezirow's ten phases of transformative learning (Mezirow, 2000), the change that happened to Gloria and Flora can be understood as transformation since they were taking action as the new role. They were able to think about the reasons for classroom problems and attempted to improve through practice, which presented themselves as the reflective practitioner.

Reliable assessment and feedback ensuring academic success

Participants provided evidence indicating the importance of assessment and feedback to service quality by providing understandings of academic regulations and grading criteria. Evidence can be captured in the extracts as follows:

> …students may still have some plagiarism problems because of their carelessness in the actual process of academic writing (Alice).
>
> … (The details) like manner of quotation and format of citation were not specifically introduced, although we knew the importance of academic integrity. To avoid plagiarism,

> classmates need to be quite careful to check, and some mistakes were made by carelessness, but were identified as plagiarism… (Alice).

Alice highlighted the significance of assessment by complaining that the regulations of plagiarism were not clear enough. Another aspect concerning assessment is the grading criteria between Chinese and United Kingdom supervisors. In this case, students believed the foreign institutions hold the stronger power in grading decision making and might be stricter in marking, which could be captured as follows:

> …we had always been concerned about the marker of dissertation. We believed that teachers from both sides do the marking together. But when I read the feedback of my dissertation, it seems that there was only one UK teacher… In other aspects, I felt that the UK side is stronger (in marking) (Daisy).

> …some young classmates may feel that some supervisors seem more serious and demanding. They were afraid those supervisors would give low marks… (Emma).

Apart from the assessment criteria, the details of feedback played an important role in students' perceptions of high-quality educational resources. Generally, students in this program showed gratitude for the feedback on their assignment, from which they improved their academic performance. The following extracts from Flora's accounts provided evidence of the effectiveness of the feedback:

> At that time, I was reading literature to get theoretical support, and then copied the theories from the literature to my paper. Then Mr. M (foreign tutor) gave me feedback about reading the literature, I should think about what is relevant to my practical teaching, how it supports my teaching, or what thoughts I get from the process of practice. It must be combined with my own practice, rather than listing a theory on the paper alone (Flora).

Learning community supports personal growth

According to the satisfaction dimensions in the literature review, the learning community can be categorized into social life dimensions. Social life dimensions in the literature emphasize tangible facilities, such as cafeterias, resting areas, accommodation and other leisure activities provided by the university. This subtheme borrows the terms "community of practice" from Wenger (2010) to describe the phenomena that students interacted regularly in resolving an issue, improving skills, and learning from others, which could be captured as follows:

> The discussion is also quite frequent in social media, and the help is of significance (Alice).

> I think we had a strong ability to search for resources. Up to now, our group is still highly active in sharing information (Daisy).

Both Alice and Daisy valued the sharing of literature among classmates, which is in line with the important function of the community, that is, resources sharing. Apart from this, participants in the learning group were inspired by other members of the community, as follows:

> …I set up an online group with several classmates. In fact, all of us may have confusion in research sometimes. When I was confused, my classmates helped me change my thinking in time. They may have more insightful thinking. They did the thinking from the perspective of a tutor, and they acted as an observer and helped me do this (Daisy).

Daisy recognized that some classmates were more capable, so she looked for help in the community. The fact that she was inspired by classmates indicates the help of learning community, which could be echoed by Flora's account as follows:

> Then, in the classroom, the teachers and some students are very active and powerful. They have also made some achievements in the academic field. I think I have learned a lot from my classmates. (Flora)

The learning community plays an important role in students' satisfaction of educational resources. Although the learning community was not provided by the institutions directly as the educational resources, it could be seen as the side effects of the program offerings since the high admission standard guaranteed peer's academic competence in this program.

Institution reputation

The reputation of both institutions was one of the most important factors contributing to students' overall satisfaction since it guarantees the competitiveness of the degree in the job market and the peers' recognition, which could be captured from several participants as follows:

> … I chose this program for many reasons. Of course, there must be a reputation for this program and the endorsement from L University and G University. (Betty)

> the MA TESOL degree is shown to others that I graduated from a prestigious university. To a certain extent, the value of business will be higher. (Daisy)

> In fact, I can get the experience of two universities in disguise through this program, from both L University and G University, and this (experience) gives me great confidence… (Emma)

The accounts stated above conveyed the similar idea that students valued the reputation of both institutions as an important resource. The prestigious name of both universities was considered as an important indicator for students who cared about the competitiveness of the degree. Furthermore, peers' recognition of the program was considered as the crucial indicator contributing to reputation. Third, the admission requirements increase the reputation of the program. As stated in the program handbook, the minimum requirement of language proficiency in the admission requirement was fairly high.

Professional and sympathetic lecturers offered supports to students' success

This theme reveals that the lecturers in the program are the key factors contributing to service quality. The professionalism, affective engagement, responsiveness of the lecturers was perceived as important characteristics to deliver high-quality service.

Professionalism

In the interview, students perceived the professionalism of lecturers from their professional image, classroom teaching and effective academic support. The most convincing example of the lecturer's professional image came from Betty, when she responded to the questions of the most impressive thing in the program, as follows:

> I remember Dr. W was the first teacher I met on this program… he always emphasizes misconduct in academic research. So, I remember this word very clearly. I was influenced by his ideas from different angles (Betty).

The first perceptions of the lecturer were quite important. Alice, showed a similar perception about the first image, which could be captured in her account as follows, "… the most impressive thing was I found that the lecturer who teaches in the classroom is also the researcher of this area after class…" The reason for Alice perceiving the lecturer's professionalism in research may be because she read the lecturers' publications after class. In addition to the general image of professionalism, students had experienced professional training in the classroom, which contributed to the satisfaction of teaching quality. Gloria, expressed her gratitude to both Chinese and foreign lecturers, in which the Chinese lecturers were able to connect the context and theories in China, while foreign lecturers were good at inspiring students, as follows:

> In terms of teaching, I feel Chinese teachers are very close to our reality, because some of the theories they talked about are things we really encountered in our teaching experience. Then I would feel that foreign teachers gave me a new perspective of thinking and research direction… (Gloria).

Gloria valued the classroom teaching since both Chinese and foreign lecturers conveyed professional knowledge from their own strengths. In other words, Gloria was satisfied with the quality of teaching because of the perception of professionalism on both sides. In addition to the lecturer's professional image and professional classroom teaching, students perceived professionalism from lecturer's academic support, which could be found at Floria's response to the academic support and related questions as follows:

> I felt that the UK teachers encouraged us to think and explore more. For example, they strictly required us to write a draft and an outline before a due date, or you can write as much as possible, and then they gave us very detailed feedback, including grammar and sentence suggestions… (Flora).

Affective engagement

From the interview, the lecturers' affective engagement in meeting students' reasonable demand, empathizing the defective students, and paying attention to students' personal needs were perceived as high-quality service. Gloria provided an anecdote that how the lecturer changed the schedule to meet students' reasonable demand as follows:

> … because there was a traffic jam when we came home after class at 4:30 or 5:00. We could discuss it with the teacher and start at 2:00. The teacher was also willing to adjust it. But the UK teachers were very principled about the time, and it was not easy for us to discuss with them and reset the time… (Gloria)

Gloria compared the demand of the class time adjustment between Chinese and foreign teachers, and she showed gratitude to Chinese teacher who was willing to adjust. This small change showed the lecturer's willingness to deal with students' problems sincerely, from which students made sense of satisfaction and respect.

Empathy to defective students was perceived as another factor to satisfaction with lecturers. The term "defective students" here refers to those students who engage in a difficult position of academic success. Flora shared her experiences of being kindly treated by lecturers when she encountered the penalty of plagiarism:

> But what makes me feel very warm is my two mentors, M and J. They participated in my meeting with the Academic Committee, encouraged me and impressed me. M encouraged me and said that this is a normal process to develop, because I have to take into account my work, and the time is very tight, and it is stressful. I felt that instead of being criticized, I was encouraged… (Flora).

The extract from Flora indicated that the lecturers' empathy was important to students' satisfaction. In addition, paying attention to students' personal needs was perceived as another affection factor contributing to students' satisfaction. Emma described her perceptions of meeting personal needs in classroom teaching as follows:

> We have 30 teachers with different backgrounds in the program. When Dr. W talks to different people, he did it according to the student's personal cognitive level or cognitive structure, because in terms of his academic competence, he could know very well what the student needs and help them by delivering what he needs (Emma).

Emma was a teacher educator with a deep understanding of teachers' personal needs from the professional development perspective, and what she made sense of the classroom teaching presented the importance of meeting students' personal needs in teaching quality.

Responsiveness

This subtheme was brought to the fore during the data analysis process because of the different expectations for Chinese and foreign teachers in responsiveness emerged. This phenomenon is worthy of special attention since it reveals the essence of students' satisfaction with service in TNE, since the service was delivered by staff from institutions domestic and abroad.

One question regarding the responsiveness was added in the semi-structure interview, which included two sub questions: (1) Did you experience that foreign teachers do not reply to your email while they are on holiday? (2) Do you think it is acceptable if Chinese teachers do not reply to your email while they are on holiday?

All participants showed their understanding that foreign teachers do not reply to email on holiday. But when talking about Chinese teachers, the response varied. Some participants thought it was still acceptable, while some thought it depended. Daisy stated that it was not acceptable.

When Alice was asked about whether it is acceptable for Chinese teachers do not reply to your email while they are on holiday. She was surprised to hear the question and repeated the questions again. It seems that she never thought about this question before. She replied, "Although I have not encountered it, it is understandable that it depends on the urgency of my problem." Alice showed her expectations that Chinese teachers should response to students' questions on time. Daisy has made it clear that it was unacceptable for Chinese teachers not replied to email when they were on holiday, as follows:

> Because it was a cultural reason. Because there were foreigners in my working environment before, I knew their working culture very well. I know that if they are on holiday, they are completely enjoying their holidays, unlike us, because we might be disturbed on holiday… (Daisy).

Although students showed different expectations on responsiveness between Chinese and foreign teachers due to the different working cultures, the lecturers' prompt response to students' needs was perceived as the important factor contributing to the service quality.

Discussions

Transnational education was treated as a trade service (Nix, 2009), and students are considered as consumers of the educational service in this study. Findings from the Sino-UK MA program suggest the features of a high-quality service with some key components. These components of high-quality service and the sustainability of high-quality service are worth further discussions.

Trichotomy of TNE quality factors

It is necessary to discuss what forms the high-quality service based on this Sino-UK MA program. Findings suggest that the curriculum, the assessment and feedback, the learning community and the institution's reputation. These factors were mainly generated from student-center evaluation data. In fact, from a broader point of view, these factors above could be intertwined with the lecturer's factor depicting a deep structure of high-quality educational resources. Some intertwined features could be summarized as follows. First, the program offers plenty of theoretical and practical knowledge, and the knowledge was originally delivered by professional lecturers who ensure the quality of teaching. Second, the assessment and feedback were conducted by the lecturers, and they ensure the reliability of the service. Third, special support was provided by the learning community and the sympathetic lecturers, in which the lecturers' affective engagement and responsiveness were perceived as the important factor contributing to the effectiveness of service. From the discussion above, high quality can be categorized into three dimensions: service offers, service delivery and service outcomes as stated in Table 6.

This trichotomy contributes a new framework to understand and evaluate the service quality of TNE program. Compared to the dimensions of service quality in previous studies borrowed from management literature, the new framework is well-structured and easy to monitor the TNE service quality, in which the service quality is combined with sociocultural factors in host countries. First and the most, the needs of local society and local students' personal development is the primary factor to evaluate a TNE program. Second, the reliability of service delivery is an important safeguard measure. Third, the service outcome is an important means to verify education services.

TABLE 6 Dimensions of high-quality education.

Dimensions	Elements	Features
Service offers	Curriculum	Curriculum that provides theoretical and practical knowledge to satisfy local students' needs in future development
	Assessment and feedback	Reliable assessment and feedback that ensures the academic standards and students' progress
	Institution reputation	The reputation of the institution and the degree awarded that benefits students' future career development or the competitiveness in the labor market
	Program structure	Well-designed structure that meets local needs and offers chances for students to experience success that has positive influence on self-efficacy
Service delivery	Teaching quality	Professional lecturers with expertise in the academic area that ensures the delivery of inspiring teaching and academic standards
	Responsiveness	Prompt and effective response to students' needs or enquiries
	Learning support	Effective interactions with peers to solve the problem and affective assistance from the tutors
	Affective engagement	Staff taking actions to students' reasonable demand, empathizing the defective students, paying attention to students' personal needs
Service outcomes	Personal development	The program offers help in students' development of personal skills
	Social development	Program cultivates students to better serve the host country's social development

Mezirow (2000), adapted from Kitchenham (2008).

Mutual understanding and equal dialogue as the foundation of sustainable development of high-quality TNE

As discussed in the literature, trust and power asymmetries are key factors impacting on sustainable partnerships, and tensions between the commercial priorities and academic standards become another factor threatening the sustainability of TNE, since TNE increased the opportunities for corruption of fraudulent diplomas and risks to academic integrity. Therefore, a mutual understanding of quality assurance from both host and export institutions is one of the key factors to ensure the sustainability of TNE development. This Sino-UK MA program has been running for nearly 20 years and is one of the longest TNE programs in the world. Based on the study of service quality factors, a deeper conclusion could be summed up, i.e., mutual understanding and equal dialogue between host and export institutions is the basis of sustainable development.

The findings suggest that the mutual understanding of the needs of local society and students is the key factor for the success of this long-term TNE program. Mutual understanding is mainly reflected in two aspects. First, the mutual understanding of local needs. In this case, the lack of systematic knowledge in EFL teaching in China is the basis for cooperation in this MA TESOL program, which can be evidenced from participants' accounts of their urgent need for training in theoretical and practical knowledge of EFL teaching. Based on such understanding, the foreign institution offers particular educational resources, and the local institution localizes the resources to local context. The localization of foreign educational resources is based on the understanding of local EFL teaching context and students' characteristics that were mentioned in participants' interviews repeatedly.

In addition, equal dialogue is the pathway for sustainable partnership. This Sino-UK MA program is designed to award foreign degrees only, which brings the inbuilt power imbalance in decision-making, which has been approved by the other joint program in the world (Knight, 2014, 2016). Findings in this case show the pattern of an equal dialogue between host and export institution in programming, which can be summarized in two levels, namely, the dialogue between institutions and the dialogue between institutions and students. At the institution-to-institution level, the local institution serves as the mediator bridging the foreign educational resources and the local contexts, and the foreign institution adapts to local conditions with trust and restrained power. At the institution-to-student level, developing a share-culture in management and quality assurance is significance for the sustainability of TNE, since the Western institutions take an egalitarian student-centered approach while the Southeast Asian countries prefer hierarchical structures embracing control over students and the actions of faculty (Mirkasimov et al., 2021). In this case, both institutions adopt the egalitarian student-centered approach in programming, which can be found in the process of classroom teaching, assessment and other service management activities. That sympathetic lecturers were perceived as the significant factors to students' success presents the evidence of an equal dialogue between institutions and students.

Conclusion

In summary, the analysis of semi-structure interviews with seven participants and documentations of program handbook and module assessment form presented two important themes indicating the factors influencing the service quality, i.e., the high-quality educational resources that satisfy student personal growth and host country's social development, and the professional and sympathetic lecturers that offer support to student successes. Further discussions were made to reveal the logic for sustainability of TNE programs.

Practical implications from the current study can be made to different stakeholders in TNE. First and the most, TNE should be confirmed as one kind of service for program management. This will offer a service quality perspective to quality assurance in TNE, in which student satisfaction should be considered as an important indicator of service quality, meanwhile the learning outcomes should be emphasized in service quality evaluation. Second, local institutions should insist on the self-centered ideology in cooperation and programming. Local institutions are the gate keeper of introducing high-quality educational resources, and the mediators bridging the local needs and the foreign resources. Local institutions should assume the main responsibility of TNE quality. Third, foreign institutions must insist on exporting high-quality educational resources to the host country and adapt to the host countries' conditions. The automatic inbuilt power in academic criteria, assessment and other decision-making from the degree-awarded institutions should be rationally used.

Limitations and future research

The major limitation is my positioning as the program administrative staff and researcher in this study, which would typically lead to biased problems due to my own experiences and misunderstandings. The first suggestion for future studies is to replicate this student-centered qualitative evaluation study on other TNE programs to provide more in-depth understanding of factors influencing the service quality, such as the programs on different levels and disciplines. The second direction for future research would be to conduct a comparative study on the local programs and TNE programs run in a same host institution, since they share similar tangibles and lecturers and hopefully will provide understandings of inter-cultural factors.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Faculty of English Language and Culture, Guangdong University of Foreign Studies. The patients/participants provided their written informed consent to participate in this study.

Author contributions

HO contributed to design of the study and audit of data analysis. CZ conducted the data collection, data analysis and writing up of the findings. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Family capital, social stratification, and access to higher education: An empirical study in mainland China

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This paper employs Bourdieu's theory of capital—focusing on family cultural, social, and economic capital—to research the early-stage mechanism through which access to higher education is formed. While all three types of capital play a significant role in acquiring higher education, most studies tend to focus on just one type of capital. In recent years, domestic scholars have also analyzed in detail the family factors affecting children's access to higher education (CAHE); however, they have not yet explained the mechanism by which these factors influence CAHE, and authentic tests are rare. Therefore, based on existing research, this paper uses the theoretical concept of family capital to reveal how contemporary Chinese families affect their CAHE. This paper analyzes the relationship between family capital, social stratification, and access to higher education opportunities using an econometric model based on baseline data from the China Family Panel Studies (CFPS) from 2010 to 2020, with 10,318 participants, including 4,419 females and 5,899 males. The results of a binary logistic regression analysis show that the possession of family cultural and economic capital has a direct positive influence on CAHE. Children from the elite stratum often benefit more from the accumulation of family cultural capital. Moreover, although it does not form a distinct stratum, the possession of family social capital also significantly influences children's access to higher education. Driven by China's political, economic, and social environment, some children from the blue-collar stratum have a comparative advantage in terms of access to higher education. The possession of family capital is an important factor in the stratification of CAHE, and cultural capital is the most influential type of capital. Parents with a low level of education should be encouraged to become engaged in schools and communities to take professional courses in assisted learning, emotional counseling, decision-making, and voluntary service.

KEYWORDS

Bourdieu's capital theory, China family panel studies, blue-collar stratum, cultural capital, higher education, logistic regression model

1. Introduction

Educational equity is related to national development and people's livelihoods (Duerrenberger and Warning, 2018). Against a backdrop of educational reform, theoretical research relating to educational equity provides a valuable assessment of change. Higher education is becoming increasingly integrated into our lives as an important tool to help improve the status of children from social strata that possess few social resources (Li and Qiu, 2018). Academic qualifications and access to social resources are strongly correlated (Zhao and Qin, 2021). People with higher academic qualifications can achieve higher prestige occupations and obtain more income and rights (de Wit and Altbach, 2021).

Among the many factors affecting access to higher education opportunities is a family's amount of capital, which has a direct differential influence on the acquisition of children's education (Aitken et al., 2019). An objective elimination mechanism does exist in higher education institutions, but the elimination criteria are the social strata of individual families (Althusser, 2019). Since the capital and habitus possessed by families from the dominant stratum potentially create symbolic violence, and the hidden exclusion from resources continues to aggravate the "involution" of education, equity becomes impossible to achieve (Gao et al., 2021).

According to Bourdieu and Passeron (1990), families with a high socioeconomic status (SES) provide extra educational resources for their children, leading to higher academic achievement in adolescents. Moreover, according to Coleman (1988), families with a high SES are often able to provide their children with a better living environment. As a result, their children have access to additional educational resources, and they do not need much parental involvement. Adolescents from low SES families benefit more from parental involvement than those from high SES families.

Based on the model of cultural mobility, Dimaggio (1982) argued that low SES levels encourage parents to invest in their children in order to compensate for other disadvantages. According to Liu et al. (2014), based on data from the Independent Freshman Admissions office at an elite university, adolescents from affluent families are more likely to succeed in the university admissions process. For adolescents in low SES families with less social capital, their parents' involvement is more significant.

Due to the importance of access to higher education to future social stratification, relevant scholars in pedagogy and sociology have focused on "what factors lead to the differences in access to higher education for children of different families" (Mishra, 2020). Among the many factors affecting higher education access, family social status is considered the most essential structural element (Roksa and Kinsley, 2019; Liu and Morgan, 2020). The higher a family's social status, the more likely its children are to receive higher education (Van Bavel et al., 2018). This conclusion conforms to Bourdieu's theory of capital and has been confirmed by many other scholars (Romele, 2021).

The impact of family capital on children's access to higher education (CAHE) is not applied directly. Instead, it is a long-term effect of certain specific factors. Although domestic scholars have analyzed in detail the family factors affecting CAHE in recent years, they have not yet explained the mechanism by which these factors influence CAHE, and authentic tests are rare. Therefore, based on existing research, this paper uses the theoretical perspective of family capital to reveal how contemporary Chinese families affect their CAHE.

In light of the fact that education has become increasingly important for class mobility, and that Chinese families face educational anxiety and social involution. This paper employs Bourdieu's theory of capital—focusing on family cultural, social, and economic capital—to research the early-stage mechanism through which access to higher education is formed. While all three types of capital play a significant role in acquiring higher education, most studies tend to focus on just one type of capital. However, they have not yet explained the mechanism by which these factors influence CAHE, and authentic tests are rare. Therefore, based on existing research, this paper uses the theoretical concept of family capital to reveal how contemporary Chinese families affect their CAHE. As part of this study, we aim to gain a better understanding of the types of family capital that affect CAHE. This paper uses baseline data from the China Family Panel Studies (CFPS) from 2010 to 2020 to answer the following questions:

1. Does a significant difference exist in CAHE among children from families with different levels of family capital?
2. Is CAHE primarily influenced by the distribution of family capital?

2. Theoretical background and hypothesis

Due to its strong explanatory power, the concept of "capital" has been widely used across multiple research fields. French sociologist Bourdieu (2005) argued in "The Forms of Capital" that human capital takes diverse forms and can usually be divided into cultural, social, and economic capital. Accumulating any type of capital requires time and energy (Breinholt and Jæger, 2020). As a kind of accumulated labor, when exclusively possessed by actors or their aggregates, capital can provide social resources in a specific form. Cultural capital refers to a personal temperament that can be inherited and accumulated, such as interest preferences, knowledge literacy, and technical ability. These are usually represented by educational background and the possession of a diploma (Pokrovskaia et al., 2019). Social capital refers to the aggregate of actual or potential resources that individuals can obtain through an institutionalized social network, and it is the product of continuous effort, long-term operations, and the reciprocal communication of interest. This form of capital is

usually characterized by professional status and number of family members (Ehsan et al., 2019; Shiell et al., 2020). Economic capital refers to explicit material wealth from which currency can be obtained by direct exchange. This capital includes operating, wage, and property income; government subsidies; and economic support from others, for example (Bauer and Zanjani, 2021).

Bourdieu's distinction between these three types of capital has prompted scholars to examine how families with different cultural, social, and economic backgrounds take advantage of their existing capital to help their children attain a better education or higher social status, or to maintain their current status (Gilleard, 2020). Data analyzed from 14 universities in Jiangsu Province, China, showed that advantages related to family cultural capital are indirectly converted into educational opportunities, improving the likelihood that children will receive a higher education (Yao et al., 2015; Zhimin and Yao, 2015). In addition, Children from families with a high level of cultural capital have a better chance of studying at China's top universities (Hu and Wu, 2021).

Du (2018) researched the influence of father's occupational background on CAHE. The results showed that children with fathers in mid- and senior-level white-collar jobs are more likely to receive a higher education than children whose fathers have a lower occupational status. Wu et al. (2020) also noted that children from middle and upper class families enroll in higher education at a higher rate than those from lower class families.

Guo and Min (2006) established a relevant measurement model based on urban household survey data from the National Bureau of Statistics of China. Children whose families possess sufficient economic capital have a greater chance of receiving a higher education than children from poorer families. Kaye (2021) also confirmed that gaps in family income inevitably result in an inequality of access to higher education. However, Duan et al. (2018) noted that parental involvement, rather than economic conditions, is the primary source of family capital that contributes to CAHE.

Although all three types of capital are found to play a significant role in the acquisition of a higher education, most studies focus on a single type of capital. However, according to Bourdieu's theory of multiple forms of capital, the study of the influence of family capital on CAHE cannot limit itself to one type. Instead, this question requires a comprehensive analysis of the action mechanism of cultural, social, and economic family capital (Li et al., 2020).

This paper incorporates the three types of capital into one analytical framework. It compares the intensity and direction of their influence on CAHE for different families. Moreover, it considers the relationship between families' strata and their children's access to higher education. Following Bourdieu's theory of human capital (Figure 1), this paper develops the following measurement indicators: (1) Father's and mother's highest academic qualification is selected as the measurement index of "family cultural capital," and (2) father's occupation and number of family members are selected as the measurement index of "family social capital." Following the National Standard Occupational Classification of the People's Republic of China, family size is determined by the number of family members with the same registered residence as the subject. Finally, (3) "family economic capital" is measured using the family's total income over the past 12 months.

The literature review suggests that family capital has a significant effect on the access of children from different strata to higher education. Therefore, this paper puts forward the following three hypotheses:

> H_1: The amount of family cultural capital has a direct positive influence on CAHE.

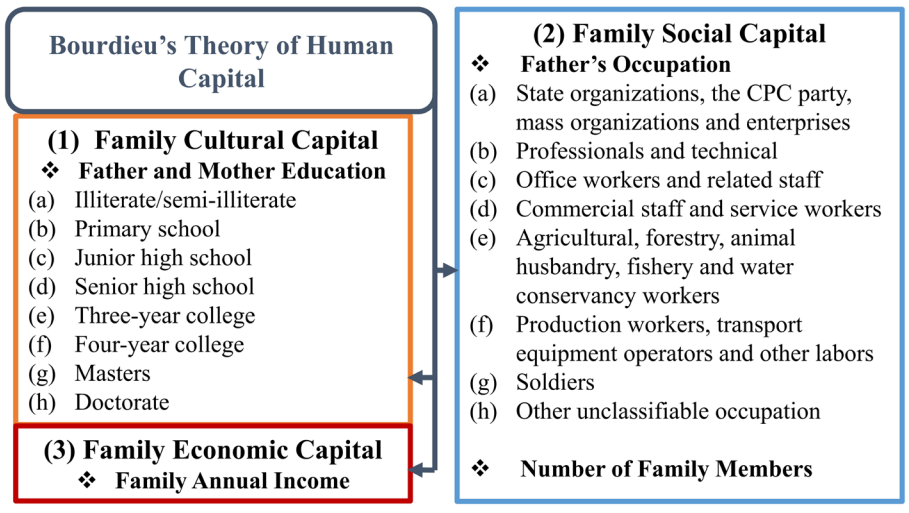


FIGURE 1
Based on Bourdieu's theory of capital, indicators of data analysis.

> H_2: The amount of family social capital has a direct positive influence on CAHE.
>
> H_3: The amount of family economic capital has a direct positive influence on CAHE.

3. Methodology

3.1. Sample data and research process

Descriptive statistical methods were used in this study. All the data sets in this research come from the latest entries in the CFPS open database. By tracking and collecting microdata from three levels (individual, family, and community), the CFPS project surveys the economic and non-economic welfare of Chinese residents (CFPS, 2015). It tracks data in several research areas, such as educational achievements, economic activities, population migration, family relations and dynamics, and health through a multidisciplinary, large-scale social tracking survey at the national level. The CFPS project includes a broad sample and a rich volume of data. Its interviews began in 2010, with data from that year acting as the baseline. Since then, the data have been updated *via* interviews every 2 years. So far, the project has completed five tracking interviews, in 2012, 2014, 2016, 2018, and 2020, covering 25 provinces, municipalities, and autonomous regions. The target sample size is 16,000 families, and the survey's object category is all the family members of a sample family.

The research process contains data collection and data analysis. In the process data collection, it focuses on respondents aged 18+ (as of 2020). The main variables include the following aspects: (1) basic information about the respondents, such as gender, academic qualifications, and registered residence; and (2) the respondents' family background, namely parents' education level, father's occupation, number of family members, and annual family income. After discarding surveys with missing values, odd ratio, and other related variables, a total of 10,318 respondents were included in the research data set for use in the research hypothesis test. Zhimin and Yao (2015) used logistic regression analysis of survey data from 14 representative universities in Jiangsu Province is conducted to analyze the impact of family capital on the quantity and quality of higher education achieved by individuals. In line with previous studies, binary logistic regression model was used to analyze screened data to determine whether family capitals have a direct impact on CAHE.

3.2. Design variables

The dependent variable was set as "whether children can obtain higher education enrollment opportunities." The independent variables were set as "father's highest academic qualification (dummy variable)," "mother's highest academic qualification (dummy variable)," "father's occupation (dummy variable)," "number of family members (continuous variable)," and "family annual income (continuous variable)." The control variable was set as "gender of the sample (i.e., men and women as separate categories, with women as the base variable)" and "registered residence of the respondent (i.e., urban and rural as separate categories, with rural as the benchmark variable)."

The dependent variables were coded as follows: children have access to higher education = 0; children have no access to higher education = 1.

Parents' highest academic qualification were coded as follows: illiterate/semi-literate = 1; primary school = 2; junior high school = 3; senior high school = 4; 3-year college = 5; 4-year college = 6.

Father's occupation was coded as follows: the CPC Party, state organizations, mass organizations and enterprises = 1; professionals and technical = 2; employees of the office and related personnel = 3; workers in the commercial and service sectors = 4; forestry, agricultural, and animal husbandry workers and workers in the fields of fisheries and water conservation = 5; production workers, operators of transportation equipment and other laborers = 6; soldiers = 7.

3.3. Analysis model

To test the hypotheses, the logit model was adopted to investigate the influence of family capital on CAHE. Firstly, the logistic distribution function was used, expressed as $F(x) = ex/(1 + ex)$, where the range of x is $(-\infty, +\infty)$; the value range of $F(x)$ is (0, 1) with a monotonically rising S-shaped curve (Figure 2).

Let the probability P of an event depend on multiple independent variables (X1, X2, …, XK); then $P = e\beta0 + \beta1X1 + \beta2X2 + \ldots + \beta kXk + \mu/(1 + e\beta0 + \beta1X1 + \beta2X2 + \ldots + \beta kXk + \mu)$, where the range of P is (0, 1), and the range of $\beta0 + \beta1X1 + \beta2X2 + \ldots + \beta kXk + \mu$ is $(-\infty, +\infty)$. Then the relationship between the probability of the event and the variables fits the binary logistic regression model or the logarithmic dominance linear regression model.

That is, $\mathrm{Ln}[p/(1 - p)] = \beta0 + \beta1X1 + \beta2X2 + \ldots + \beta kXk + \mu$, where β0 is a constant term, β1, β2, …, βk are the regression coefficients of k independent variables, and μ is the error term.

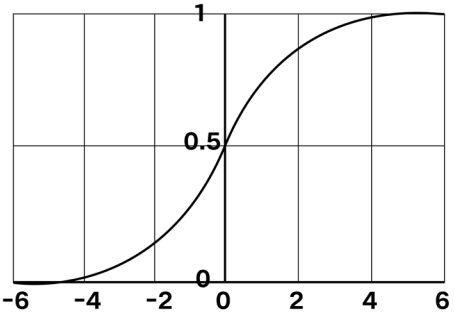


FIGURE 2
Logic distribution function curve.

The following regression model was built according to the sample data in this paper:

$L = Ln(opportunity)[p/(1 - p)] = \beta 0 + \beta 1$ father's edu $+ \beta 2$ mother's edu $+ \beta 3$ father's occupation $+ \beta 4$ number of family members $+ \beta 5$ family's annual income $+ \mu$.

Let Y represent the explanatory variable, "whether children have access to higher education." Because it is a binary variable, the study adopted the binary logistic regression model to analyze the ratio of the probability of "have access" and "have no access" in terms of higher education opportunities, with P being the probability of "have access" and 1 – P that of "have no access." The ratio P/(1 – P) is called the chance ratio, and the logarithm L of the chance ratio is called the logarithmic unit.

4. Results

4.1. Descriptive statistical description

In the study, 10,318 pieces of valid data were selected. SPSS26.0 was used to classify the data based on urban versus rural area and gender (see Tables 1, 2). As shown in Table 1, among the selected participants from rural areas, 89.6% had completed a senior high school education or below, with 11.7% being illiterate/semi-illiterate. In contrast, 10.4% had a 3-year college degree or higher, 0.2% had a master's degree, and none had a doctorate. This indicates that higher education has not been popularized among this population. While the academic qualifications of the rural population were generally low, the academic qualifications of the urban population were relatively high, with 29.7% having a 3-year college degree or higher, indicating the popularization of higher education among this population.

As shown in Table 2, among the selected female respondents, 79.0% have a senior high school education or below, with as many as 11.5% being illiterate/semi-illiterate. Meanwhile, 21.0% have college-level qualifications or above. In contrast, among the male respondents, 82.1% have a senior high school education or below, with only 6.2% being illiterate/semi-illiterate. This was 5.3% lower than the female respondents. Among the male respondents, 18.0% have 3-year college degree or above, which was 3.0% lower than the female respondents. As a whole, the female population shows a more obvious "bipolar" differentiation in terms of education level.

TABLE 1 Individual highest academic qualification and urban/rural classification variables based on data from the National Bureau of Statistics.

Items	Rural sample		Urban sample		
	F	%	F	%	Total
Illiterate/semi-literate	651	11.7	223	4.7	874
Primary school	1,124	20.2	469	9.8	1,593
Junior high school	2,132	38.4	1,473	30.9	3,605
Senior high school	1,073	19.3	1,185	24.9	2,258
3-year college	342	6.2	673	14.1	1,015
4-year college	222	4.0	679	14.3	901
Master's degree	10	0.2	56	1.2	66
Doctoral degree	1	0.0	5	0.1	6
Total	5,555	100.0	4,763	100.0	10,318

TABLE 2 Individual highest academic qualification and personal gender.

Items	Female sample		Male sample		
	F	%	F	%	Total
Illiterate/semi-literate	509	11.5	365	6.2	874
Primary school	599	13.6	994	16.9	1,593
Junior high school	1,441	32.6	2,164	36.7	3,605
Senior high school	941	21.3	1,317	22.3	2,258
3-year college	467	10.6	548	9.3	1,015
4-year college	428	9.7	473	8.0	901
Master's degree	33	0.7	33	0.6	66
Doctoral degree	1	0.0	5	0.1	6
Total	4,419	100.0	5,899	100.0	10,318

4.2. Evaluation of the structural model

According to the regression model, L = Ln(opportunity)[p/(1 − p)] = β0 + β1 father's edu + β2 mother's edu + β3 father's occupation + β4 number of family members + β5 family's annual income + μ. By regressing the data using the binary logistic command of the SPSS26.0 software, the sample processing results were obtained (see Table 3).

Table 4 presents the misjudgment matrix of the model. In this study, among the 8,330 people without access to higher education in the actual samples, 8,093 were correctly identified by the model and 237 were wrongly identified, for a correct rate of 97.2%. Among the 1988 people with access to higher education in the actual samples, 393 were correctly identified by the model and 1,595 were wrongly identified, for a correct rate of 19.8%. The field "the cut value is 0.500" in the footnote under the diagram indicates that if the prediction probability value was greater than the critical value of 0.5 (i.e., 50%), the correct prediction rate of variable classification was considered to be 100%. Otherwise, the correct prediction rate of variable classification was considered to be 0. Therefore, the correct prediction rate of the above model was 82.2%, and the result was within the acceptable scope (i.e., greater than 50%).

Table 5 presents the significance test results of the model. Step statistics refers to the likelihood ratio test results of each step compared with the previous step. Block refers to the likelihood ratio test results of Block $_n$ compared with Block$_{n-1}$. Model refers to the likelihood ratio test results of the model after the variables in the previous model and the current model change. When Method = Forward: LR was selected, the three statistical results and the hypothesis test results were completely consistent. The above statistical results showed that the regression model passed the significance test.

When the significance value (Sig) is less than the cut value (i.e., 0.05), the null hypothesis is rejected. In this case, no significant difference was found between the observed value of the dependent variable and the predicted value of the model, so there was a significant difference between the predicted value and the observed value of the model. Otherwise, the null hypothesis could not be rejected, and the estimation of the model fit the data at an acceptable level. According to the goodness of fit test results in Table 6, in Step 5, the X2 value corresponding to the Hosmer–Lemeshow Test statistics of the model was 9.775, the degree of freedom was 8, and the Sig value was 0.281; that is, Sig > 0.05, and the difference was not significant. Therefore, the hypothesis that the predicted value would be consistent with the observed value could not be rejected. This indicated that the model had sound goodness of fit. Because of the difference between the predicted value of the model and the observed value, the hypothesis was accepted. There was a significant correlation between CAHE and family capital.

Table 7 presents the significance test results of the model parameters. The variables passing the Forward: LR test were father's highest academic qualification, mother's highest academic qualification, father's occupation, number of family members, and family's annual income. According to the Sig value of the significance of the regression coefficient, father's highest academic qualification (Sig < 0.001), mother's highest academic qualification (Sig < 0.001), father's occupation (Sig < 0.001), number of family

TABLE 3 Case processing summary.

Unweighted cases[a]		*N*	Percentage
Selected cases	Included in analysis	10,318	100.0
	Missing cases	0	0.0
	Total	10,318	100.0
Unselected cases		0	0.0
Total		10,318	100.0

[a]Constant is included in the Model & represents unweighted cases.

TABLE 4 Final prediction classification table (Forward: LR).

	Observed		Predicted		
			Individual higher education opportunities		Percentage correct
			0	1	
Step 5	Individual higher education opportunities	0	8,093	237	97.2
		1	1,595	393	19.8
	Overall percentage				82.2

[a]Constant is included in the model. [b]The cut value is 0.500.

TABLE 5 Omnibus tests of model coefficients (Forward: LR).

		Chi-square	df	Sig.
Step 1	Step	720.900	6	0.000
	Block	720.900	6	0.000
	Model	720.900	6	0.000
Step 2	Step	262.768	7	0.000
	Block	983.667	13	0.000
	Model	983.667	13	0.000
Step 3	Step	231.784	1	0.000
	Block	1215.451	14	0.000
	Model	1215.451	14	0.000
Step 4	Step	211.224	1	0.000
	Block	1426.675	15	0.000
	Model	1426.675	15	0.000
Step 5	Step	70.732	6	0.000
	Block	1497.407	21	0.000
	Model	1497.407	21	0.000

[a]Variable (s) entered in step 1: Mother's education; [b]Variable (s) entered in step 2: Father's occupation; [c]Variable (s) entered in step 3: Number of family members; [c]Variable (s) entered in step 3: Number of family members; [d]Variable (s) entered in step 4: Family's annual income; [e]Variable (s) entered in step 5: Father's education.

members (Sig < 0.001), and family's annual income (Sig < 0.001) were all found to have a significant influence on CAHE.

Firstly, parents' academic qualification has a significant positive influence on CAHE. The higher the parental academic qualification, the greater the probability of CAHE. Therefore, hypothesis H1 is accepted. As shown in Table 7, both parents' highest academic qualification (illiterate/semi-illiterate, primary school, junior high school, and senior high school) significantly influenced the explained variables at a significance level of 1%. Notably, the mother's academic qualification had a greater influence on CAHE than the father's academic qualification, if viewed from the absolute value of regression coefficient B.

Secondly, when the father's occupation was an official of a state organization, head of a mass organization or enterprise, professional or technical worker, production worker, or transport equipment operator, the regression coefficient B was positive. This is conducive to CAHE opportunities. In contrast, when the father's occupation was office worker; commercial staff or service worker; agricultural, forestry, animal husbandry, or fishery and water conservancy worker; or soldier, the regression coefficient B was negative. This is not conducive to CAHE opportunities. Among these, father's occupation (commercial staff and service worker) was significant at a significance level of 1%, father's occupation (soldier) was significant at a significance level of 1%, and father's occupation

TABLE 6 Hosmer and Lemeshow test (Forward: LR).

Step	Chi-square	df	Sig.
1	0.000	2	1.000
2	3.219	5	0.666
3	26.928	8	0.001
4	10.598	8	0.226
5	9.775	8	0.281

TABLE 7 Variables in the equation (Forward: LR).

		B	S.E	Wald	df	Sig.	Exp (B)
Step 5	Father's education	***		69.820	6	0.000	
	Illiterate/semi-literate	0.346***	0.092	13.992	1	0.000	1.413
	Primary school	0.557***	0.091	37.286	1	0.000	1.746
	Junior high school	0.833***	0.107	61.027	1	0.000	2.300
	Senior high school	0.855***	0.184	21.705	1	0.000	2.352
	3-year college	0.504	0.261	3.746	1	0.053	1.656
	4-year college	0.429	1.510	0.081	1	0.776	1.536
	Mother's education	***		145.972	6	0.000	
	Illiterate/semi-literate	0.320***	0.074	18.623	1	0.000	1.377
	Primary school	0.699***	0.076	84.961	1	0.000	2.013
	Junior high school	1.077***	0.105	104.567	1	0.000	2.935
	Senior high school	0.805***	0.197	16.696	1	0.000	2.236
	3-year college	0.143	0.333	0.186	1	0.667	0.866
	4-year college	22.033	40192.969	0.000	1	1.000	3,706,706,030
	Father's occupation	***		110.755	7	0.000	
	State organizations, the CPC Party, mass organizations and enterprises	0.237	0.215	1.223	1	0.269	0.789
	Professionals and technical	0.002	0.209	0.000	1	0.991	0.998
	Office workers and related staff	−0.430*	0.202	4.518	1	0.034	0.651
	Commercial staff and Service workers	−0.970***	0.181	28.743	1	0.000	0.379
	Agricultural, forestry, animal husbandry, fishery and water conservancy workers	−0.426*	0.183	5.422	1	0.020	0.653
	Production workers, transport equipment operators and other labors	0.864	1.204	0.515	1	0.473	2.374
	Soldiers	−0.609**	0.189	10.327	1	0.001	0.544
	Number of family members	−0.239***	0.016	234.940	1	0.000	0.787
	Family's annual income	0.000***	0.000	180.028	1	0.000	1.000
	Constant	−0.895	0.207	18.752	1	0.000	0.409

(a)*indicates that sig < 0.05; **indicates that sig < 0.01; ***indicates that sig < 0.001.

(office worker, agricultural, forestry, animal husbandry, or fishery and water conservancy worker) was significant at a significance level of 5%. Consequently, hypothesis H_2 is accepted. Notably, as the father's occupational status decreased, the probability of CAHE did not decrease accordingly. When the father's occupation was production worker or transport equipment operator, the probability of CAHE rebounded significantly, which may be directly correlated to the Chinese population's social and industrial structure.

Thirdly, number of family members had a significant influence on the explained variables at a significance level of 1%. At the same time, the number of family members was negatively correlated with CAHE. That is, as the number of family members increased, the probability of CAHE decreased accordingly.

Finally, annual family income had a significant positive influence on the explained variables at a significance level of 1%. Thus, hypothesis H_3 has been accepted. This shows that when other conditions remain unchanged, the higher the annual family income, the greater the probability of CAHE.

5. Discussion

5.1. Influence of family cultural capital on children's access to higher education

As a result of the empirical findings, it is confirmed that the possession of family cultural capital has a direct positive influence on CAHE, which supports the research hypothesis. Based on the empirical evidence, research hypothesis H_1 has been accepted. This study shows that the possession of family cultural capital has a direct positive influence on CAHE. This may be directly related to intellectual factors, personal effort, supply of learning resources, or parental guidance, for example. Lissitsa and Chachashvili-Bolotin (2021) found that variations in individual effort, learning resources, and parental guidance stem largely from different levels of family cultural capital. Limited cultural capital negatively impacts children's preparation and judgment when aiming toward higher education opportunities. These conclusions mirror the findings of another study that parents who are rich in cultural capital have a relatively positive attitude toward their children entering higher education. They consciously increase their educational investment, interact more with their children, and potentially encourage their children's cultural literacy, interests, tastes, and ideas with a benign family cultural atmosphere (Cheng and Kaplowitz, 2016; Hu and Yin, 2021). Under such parental influence, these children often have a strong internal motivation to strive for higher education opportunities. They hope to develop their professional abilities through higher education and realize their own potential values. In contrast, families with weak cultural capital have comparatively ambivalent views on higher education. Most parents do not have a higher education background and are unlikely to recognize its value for their children's future and personal growth. This parental ambivalence continues to restrict children's understanding of higher education through inter-generation transmission (Hao and Pilz, 2021). Hu and Wu (2021) argued that families with more economic capital do not always have more cultural capital. They maintained that the key factor affecting family cultural capital is the parents' academic qualifications. For example, the Chinese College Entrance Examination is designed to screen elite students. Parents with high academic qualifications have accumulated more cultural capital, so they can give their children an early competitive advantage. This inter-generation transmission is gradually converted into an exam score advantage.

Interestingly, this study finds that the influence of family capital on access to higher education is significantly greater for females than for males. Similarly, Si (2022) found that if a female comes from a family with better economic conditions, her family conditions have a greater positive influence on her access to education opportunities. In addition, compared to men, women's access to higher education is more limited by family economic background (Guo et al., 2018).

The current study also found that mothers have a significantly greater influence than fathers on their CAHE, which may result from family tradition and the social division of labor. As Zhang et al. (2020) explained, mothers pay more attention than fathers to their children's early social development and assume the most responsibility for their children's education. In particular, the cultural capital investment of mothers from middle-stratum families is advantageous for their children's educational achievements. This finding is similar to Hou et al.'s (2008) conclusion that mothers' academic qualifications have significantly more influence on their CAHE than fathers' academic qualifications.

5.2. Influence of family social capital on children's access to higher education

A significant influence of family social capital on CAHE is confirmed by the empirical findings, thus supporting the research hypothesis. As previous studies have shown, parents with close social relations and shared values across a social network can rely on these relationships to receive support from others. Moreover, they can exploit the social capital in their relationship network to increase their children's competitive advantage in education (Han, 2019). In modern eastern China, the elite screening system represented by the College Entrance Exam is the principal gateway to obtaining higher education opportunities. However, the competition for access to higher education opportunities begins long before the College Entrance Examination. This competition is often reflected in the family's choice of educational resources for their children during the stages of preschool, primary school, junior high school, and senior high school. Currently, the distribution of educational resources in China indicates that eastern China is better resourced than central and western China, urban areas have more resources than rural areas, and key schools are better resourced than ordinary schools (Li and Qiu, 2018). In contrast, families with weak social capital usually have few powerful

social relationships and a single source of information on higher education. This significantly limits parents' expectations that their children will obtain higher education (Chen and Liu, 2021).

The regression analysis also found that children in larger families are less likely to access higher education. This may be directly related to parental values. Hoffmann et al. (2020) demonstrated that the number, gender, and especially the age of children in families with less social capital directly affect how much the parents invest in educational resources. However, another study (Zhu, 2019) suggested that the development of national modernization has weakened the influence of hereditary factors such as sex and race on children's access to education. At the same time, the influence of individual effort has strengthened.

5.3. Influence of family economic capital on children's access to higher education

According to the results, the level of family economic capital has a positive influence on CAHE, which confirms the research hypothesis. Since its reform and opening up, China's market economy has developed vigorously. Under the production principle of giving priority to efficiency and consideration to fairness, the economic gaps between different strata and regions have expanded accordingly. The resulting differences in family economic capital have directly affected the continuity of children's access to education. As another study found, the influence of family economic capital on CAHE is gradually increasing with the marketization of China's higher education. Children from families with abundant economic capital can obtain more high-quality educational resources through after-school instruction and private tutors. If they fail their entrance examinations, they may still enroll in foreign universities. However, children from families with relatively weak family economic capital lack the means to access high-quality educational resources. Moreover, the expense of higher education potentially suppresses their academic expectations. Their material poverty and reduced expectations push them to consciously give up on opportunities for further study (Wu et al., 2020).

A previous study analyzed the average cost for undergraduate students attending certain colleges and universities in Beijing and found that students must bear a minimum personal cost of 11,596 RMB every year (Shen and Luo, 2021). The cost of higher education for economically disadvantaged families has decreased in recent years due to the improvement of the national scholarship and student loan system. However, living expenses—including clothing, food, housing, and transportation—that families must bear for their children during school remain higher than 10,000 RMB (Cai et al., 2019; Yang, 2022). Moreover, such an expenditure cannot be repaid in the short term. At the same time, since the expansion of college enrolment, the employment situation has become more competitive, while education costs have not decreased. Children from economically disadvantaged strata—especially those from rural families—often choose to terminate their studies at a particular educational transition stage, making the pragmatic judgment to enter employment as soon as possible for the economic benefit of their families (Mok and Marginson, 2021).

The results presented in this paper show that some children from the blue-collar stratum also have a comparative advantage in obtaining higher education opportunities. Mishra (2020) argued that individuals whose parents have weak social relationships may also be able to obtain higher educational returns. Due to the insecure environment of these disadvantaged strata, their members value educational opportunities and are eager to improve their social status through higher education. Furthermore, families with scarce social capital may concentrate on family capital to enhance their children's educational competitiveness and help them pass the standardized entrance examination (Mishra, 2020). However, most families from disadvantaged strata are likely to consciously avoid or abandon this high-risk strategy.

5.4. Implications

This study concludes that family capital is an important factor affecting the stratification of CAHE. A family's economic capital has a direct positive influence on CAHE. However, family cultural capital has a greater direct positive influence on CAHE. Families with low incomes are more likely to have parents with low education levels. This limits the educational resources they can offer their children. When parents in low-income families have greater cultural capital (e.g., a higher education), they can help their children be more competitive. Due to their weak risk tolerance, low-income families can benefit from government investment in economically disadvantageous regions. The government should improve its gradient compensation mechanism to reduce regional differences in the allocation of educational resources. In particular, the parents in low-income families tend to be less educated. These parents should cooperate with schools and communities to take professional courses in assisted learning, emotional counseling, decision-making, and voluntary service. Schools and parents can also learn from the Parent Teacher Association (PTA) model in the United States to increase parents' involvement in their children's education.

5.5. Limitations

This study did not include the entire sample from the CFPS (2010–2020) database, thus reducing the representativeness of the findings. Additionally, the authors lack a comprehensive understanding of alternative theories in demography, politics, and sociology, which would enable them to provide a more comprehensive assessment of equity in higher education. Future studies will build a stronger theoretical framework by using a broader sample. A more accurate mathematical model will also be developed. This will allow us to investigate how family capital influences children's education acquisition at different levels and types of colleges and universities.

6. Conclusion

This study concludes that family capital is an important factor affecting the stratification of CAHE. Compared with family economic capital, family cultural capital has a more significant influence, benefiting children from elite strata. In addition, the influence of family capital on access to higher education is significantly greater for females than for males. The current study also found that mothers' education has a significantly greater influence than fathers' education on CAHE, which may result from family tradition and the social division of labor in China. Although family social capital influences access to higher education, no clear difference was found between strata. China's political, economic, and social environment gives some children from the blue-collar stratum a comparative advantage. The regression analysis shows that children's access to higher education does not decrease with the father's lower occupational status. It also found that children from larger families are less likely to access higher education. Moreover, the children of production workers and transport equipment operators have a significantly higher probability of accessing higher education. These results demonstrate that not all forms of family capital create strata differences in terms of access to higher education. In poor families, family cultural capital has a greater influence on improving children's competitive advantage in accessing higher education opportunities. When parents in low-income families have more cultural capital (e.g., higher education), they can help their children be more competitive.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

CL and QT presented the main idea and wrote the first draft of the manuscript. SA and CL interpreted the data and drafted the manuscript. PW reviewed the manuscript. SA and LT revised the manuscript based on the critical comments and finished the final submission. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The importance of prevention programs to reduce bullying: A comparative study

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Bullying is a growing and increasingly worrying phenomenon. In recent years, a number of different bullying prevention programs have been implemented to create a more positive school environment. This paper offers a description of these prevention programs, focussing on the three most commonly implemented in schools: TEI, KiVa and Mediation Teams. A qualitative, descriptive and comparative analysis was made using semi-structured interviews with tutors, coordinators and experts at nine schools, three schools for each of the programs. The results show that these bullying prevention programs help raise awareness of this problem within the entire school community, improving the school environment and reducing conflict and instances of bullying. Overall, participating schools reported being highly satisfied with the results of these programs and it is therefore important to consider the mandatory implementation of bullying prevention programs in all schools.

KEYWORDS

bullying, prevention, programs, TEI, KIVA, Mediation Teams

1. Introduction

Bullying has been an unfortunate reality since education has been imparted to students grouped in classrooms. Whether referring to 'mobbing' or 'bullying' (Olweus, 2010), aggression and harassment in schools has received wide attention and great efforts have been made to prevent and eliminate this behaviour. Instances of bullying have become increasingly prevalent, not only because victims are more willing to report situations of abuse but because, unfortunately, the number of cases is simply greater year by year (Medina and Reverte, 2019).

The term 'mobbing' was coined by Lorenz (1971) to refer to instances in which a group of animals will attack a single victim. However, in his study of classroom behaviour in Norway during the 1990's Olweus (2010) used the term 'bullying'. Attempting to clearly identify this behaviour, Olweus conducted a survey, concluding that 'bullying' refers specifically to the exposure of a victim to aggression on repeated occasions occurring over an extended period of time.

To clarify the meaning of the term bullying, it is important to differentiate bullying from other types of aggression and abuse. Authors such as García-Piña and

Posadas-Pedraza (2018) conducted a study to define bullying in schools, identifying three key aspects which characterise bullying: it is a phenomenon which occurs within an educational environment repeatedly over time; that is, the abuse is frequent; it is intentional; and the victim suffers feelings of defencelessness, unable to escape from the situation. These three factors are necessary to consider instances of abuse or harassment as "bullying."

Bullying can be categorised in many ways, given that no instance of bullying is the same. Piñuel and Oñate (2005) consider bullying as not only physical abuse but also psychological and verbal. However, in attempting to identify the different types of school bullying, various authors (Caballo et al., 2011; Smith, 2018) have proposed the existence of five types of bullying: 1. Physical abuse: this type of abuse is characterised by aggressive physical behaviour directed at the victim (pushing, punching, etc.). 2. Relational abuse: characterised as behaviour intended to isolate the individual, damaging their relations with their friends and classmates. 3. Verbal abuse: verbal attacks through insults and humiliations. 4. Cyberbullying: this is a form of harassment that has appeared in recent years along with the development of technologies, taking place on chats, email or social media such as Instagram or Facebook used to insult, humiliate or threaten other people. 5. Carnal abuse: a form of harassment through sexist or chauvinist comments towards the victim or, more seriously, derogatory comments about the body or physical appearance of the victim or intimate touching without their consent.

Within the school context there is an interaction among the three different actors involved. It is important to clearly identify these actors. The first is the victim, the person suffering the aggression, becoming the target of the bully. Victims of bullying are generally insecure or introverted, with low self-esteem and with difficulties socialising (Arias, 2014). The second actor is the aggressor or bully, often characterised as one who uses force as a means of domination. Bullies often have an impulsive character with a tendency to violence, with little empathy or self-control. They often have difficulty in accepting rules, have poorly developed social skills or the ability to resolve conflicts and are often exposed to violence and aggression (Cerezo, 2009). Finally, there are the observers or spectators; those who witness the aggression (Arias, 2014). Spectators can play an active role in abuse, helping the aggressor or the victim; or be passive, merely observing the aggression without taking any action to prevent what they are witnessing. A great deal of research into the phenomenon of bullying has highlighted the important role played by spectators. It has been demonstrated that when these actors take action against the aggression, reporting it or supporting the victim, abusive behaviour diminishes or may even disappear entirely (Conde-Vélez and Ávila-Fernández, 2018).

With this explanation of the characteristics and participants in incidents of bullying we can analyse the evolution of the phenomenon of bullying along with students themselves through different stages of education.

Pre-primary Education is an important stage of development for children, both cognitively and psychologically. A number of studies have found that bullying does not take place during this stage but the signs of aggressive behaviour begin to manifest themselves (Equipo Pedagógico de la Asociación Mundial de Educadores Infantiles, 2018). There has been very little research into the phenomenon of bullying during the earliest years of school. However, some authors, such as Bautista (2020), detect signs of bullying at this stage but with a number of differences from later years. According to the study with children aged 2 and 3, young students are not aware of their aggression and act on their own egocentrism. At the age of 4, aggressive behaviour becomes intentional, consciously aggressive, given their level of cognitive, social and psychological development.

When students enter Primary Education, their cognitive and social development is much higher and they can understand bullying, the harm it can cause and the consequences it may have. Thus, it is in Primary Education where the levels of bullying and aggression are highest (Piñuel and Oñate, 2005).

In Secondary Education, instances of bullying generally diminish, virtually disappearing by the later years although in the majority of schools bullying, harassment and aggression continues to be a reality in the classroom during this stage of education (Martínez et al., 2019).

As we have seen, in all stages of education many students suffer from bullying and harassment, which can cause severe physical, emotional, psychological and relational consequences. For this reason, experts in the field have created a number of programs to be implemented in schools to prevent bullying and to take action when this takes place in the classroom.

The following is an outline, in chronological order, of some of the most important programs established to address the problem of bullying in schools.

First, the *Equipos de Mediación* (Mediation Teams) program was created in the 1960's to resolve conflicts among students through dialogue and with the help of a mediator, finding solutions to problems and fostering a better relation between the persons in conflict (De la Hoz, 2019). It is important that this mediator be someone external and impartial, who is able to foster communication and dialogue between the persons involved (González, 2015). Authors agree on a series of steps to effectively implement the program: first, the acceptance of the mediator (Martín, 2008); second, the mediator makes initial contact with the persons in conflict; third, each person tells their version of events, analysing the situation with the mediator. The second step is to search for solutions through brainstorming sessions with the participants and, finally, to reach a satisfactory solution to the problem (González, 2015). This program has proven effective in improving the atmosphere in schools and social interactions.

The Olweus program was developed in Norway in 1983 to prevent and reduce bullying, aiming to create a safe and positive school environment (Riese and Urbanski, 2018). The program addresses the problem of bullying on different levels (school, classroom, community, etc.) in order to prevent and reduce

instances of bullying in Primary and Secondary schools (Riese and Urbanski, 2018). By restructuring the school environment, the inducements and opportunities for bullying are reduced (Gaffney et al., 2021). As the first step in implementing the program, students complete a survey on bullying and based on the results, schools establish a series of norms that students must follow (Hazelden Foundation, 2007).

The PIKAS program was created in 1989, designed not to prevent bullying but to intervene in existing situations of bullying within schools. The objective is to dissuade the aggressor and to raise the awareness of all those involved about the situation (Pérez, 2010). This program takes a slow, gradual approach in changing the attitudes and behaviour of the aggressors (Cáceres, 2009). For this, a series of interviews are conducted in three distinct stages: (1) the first stage consists of individual interviews with the aggressor, the victim and observers/spectators to try to understand the conflict; (2) the second stage is to have a meeting of the participants to assess the evolution of the conflict; (3) the final stage consists of a group interview of all participants in order to reach a point of resolution and reconciliation. The aim of the interviews is to address the roots of the problem and to resolve the conflict (Pérez, 2010).

The SAVE program (*Proyecto Sevilla Anti-Violencia Escolar*) was a pioneer program in Spain created in 1995 aimed at eliminating and preventing bullying in the classroom through the participation of the entre education community (Cedeño, 2020). The program focusses on educating students about tolerance and diversity, understanding feelings and emotions through curricular projects. SAVE consists of four stages, each with specific actions; one of which, for example, is to create social groups and build friendships for those who are socially isolated, thus reducing the likelihood of suffering from bullying; another is the direct intervention of teachers and tutors in situations of bullying. Through these and other actions the aim is to foster a positive school environment (Ortega and Del Rey, 2001).

The *Proyecto Andalucía Anti-Violencia Escolar* (ANDAVE) was created in 1998 to replace the SAVE program, building on the foundations of another project in Seville focussed on developing interpersonal relations through curricular work and projects. This program focusses on self-perception of the school environment, self-perception as victim and the types, places and characteristics of abuse and of aggressors. There are five lines of action: raising awareness, training of teachers and educators, didactic materials and resources, direct attention for the victim and investigation into instances of abuse (Ortega and Del Rey, 2001).

The *Modelo Construir la Convivencia* project (MCC), working to prevent school bullying and cyberbullying can be considered as a continuation of the SAVE and ANDAVE programs. MCC was designed to create a positive school environment and preventing bullying and cyberbullying in line with these previous programs. It focusses of prevention during Primary and Secondary education, working to resolve conflicts and improving communication. The aim is for students to develop their ability to resolve conflicts before bullying takes place. In cases where prevention is not enough, the program includes an intervention stage in which teachers and families work directly with the aggressor and the victim (Ortega-Ruiz and Córdoba-Alcaide, 2017).

The TEI program (*Tutoría entre Iguales*), created in 2002 by Andrés González Bellido for the prevention of school bullying. According to the author (González-Bellido, 2015), TEI was developed with the aim of raising awareness of the entire education community of the importance and gravity of bullying; the program establishes a reference figure for students (tutors) to help resolve conflicts and create a safe and positive environment at school. The TEI has very clear guidelines for implementation; first, school directors or the school board must approve the implementation of the program; once approved teachers receive training in putting the program into practice. This is followed by initiatives to raise awareness among students of bullying and tutors are assigned. An evaluation is later conducted for the entire school to verify the objectives have been achieved. Finally, a report is created on the program which includes proposals for improvements for the following academic year (Hamodi & Jiménez, 2018).

The ABC program in Ireland was created by Mona O'Moore in 2004 after many years of research in which she observed the high prevalence of bullying in Irish schools. O'Moore worked for several years to create the program which was implemented in a number of Primary schools in 2004 (James and O'Moore, 2008). The program is based on the participation and intervention of all members of the school community (teacher, directors, school staff and families). ABC consists of four phases: teacher training, creation of resources and materials, information for parents, and finally, the implementation of the program itself. To be effective, all members of the school community must be aware of the problem of bullying and be motivated to implement the program, assuming responsibilities and taking part in its execution (Hamodi & Jiménez, 2018).

The AVE program was created by Iñaki Piñuel and Araceli Oñate in 2005, with the aim of eliminating bullying in schools. The CEU School (Colegio CEU, 2019), where the program was implemented, reported that the goal of the program was not only to eliminate bullying but also to measure and prevent violence and aggression within the school. There are six principles for the successful implementation of the AVE program: (1) to create a culture of zero tolerance for bullying, (2) to foment the participation and protagonism of students, (3) to provide schools the tools to anticipate and respond to bullying, (4) to evaluate regularly the level of aggression and violence within the school, (5) to react early and quickly, and (6) to create a 'risk map' that includes preventive actions. Levels of aggression and violence within the school are evaluated using the AVE and TEBAE tests, in which students indicate their opinion of each of their fellow students. Based on the responses, a 'risk map' that identifies students who may be at risk of bullying. The goal is to anticipate and address potential bullying before it arises (Sánchez-Venteo, 2017).

The KiVa program was created in 2007 by Ari Kaukiainen and Christina Salmivalli in Finland aiming to prevent and reduce bullying in schools (KiVa Antibullying Program, 2007). The program works to raise the awareness of students against bullying from a very early age. The principal objective is to prevent bullying, minimising the negative impact on victims and to create a positive environment in schools. The KiVa program has a clear and specific methodology, indicating the steps to be followed and protocols when instances of bullying are detected in the school. KiVa works through two types of measures: universal and specific. Universal measures are preventive, oriented towards educating students (Herkama et al., 2022). On a regular basis (approximately every 2 weeks) teachers give a class on emotions and values, as well as patterns of abusive behaviour in order to recognise when bullying is taking place. Although students have learned about bullying from the beginning of their school experience, instances of bullying may arise. This is when anti-bullying measures come into play, consisting of specific actions aimed at the participants to stop abusive behaviour, implemented when a case of bullying is detected. According to Mäkelä and Catalán (2018), these measures are implemented by a team of KiVa professionals, tasked with resolving conflicts through interviews with victims, aggressors and classmates. This KiVa team consists of three or more adults working in the school (generally teachers) responsible for intervening in the event of a case of bullying (Johander et al., 2021). The success of both of these measures depends on: the training of teachers, the involvement of the entire school community, prevention, oversight, a structured methodology and easy implementation of the program. The KiVa program also includes an online tool for the initial evaluation of the academic year as well as a constant oversight or monitoring of the changes taking place.

The *Buen Trato* program, created in 2007, focusses particularly on the active participation of adolescents. The authors Sánchez and Blanco (2017) explain that the program is grounded in the effort to improve the school environment by encouraging classmates to help each other through active listening of the worries and fears of their fellow classmates. Teachers and experts provide training to a group of students, giving them the tools to provide guidance and support to other students 2 or 3 years younger than themselves. Once students have received training, they in turn become teachers of their classmates, transmitting what they have learned in dealing with uncomfortable or conflictive social situations. The program works to create a climate of trust and understanding, where young people can positively develop their social relations.

The program *Lucha Contra el Acoso Escolar de la Comunidad de Madrid* was developed in 2016, consisting in the creation of a Unidad del Acoso Escolar as a permanent area within schools. This special unit is dedicated to addressing the issue of bullying through training for teachers, inspectors and school directors, giving them the tools and experience necessary to deal with instances of bullying and aggression. It is also responsible for updating and improving the Action Guide for Bullying provided to all schools as well as conducting awareness campaigns about classroom bullying (Consejería de Educación y Juventud, 2020). This plan also addresses the issue of detection, through the use of the SociEscuela Test, an online test available to all schools, designed to identify students at risk of suffering from bullying and to prevent it before it occurs (EducaMadrid, 2020).

Following on this outline of the principal bullying prevention programs within the Spanish education system, Table 1 presents the most significant characteristics of each program: name, author (s), year, target, description, training, materials, stages and evaluation strategies.

In exploring the characteristics of bullying prevention programs, considered a valuable tool for schools, this paper will use as a reference the three most commonly implemented programs in Spain: the KiVa program, the TEI program and the Mediation Teams program.

The KiVa, program, before arriving in Spain, was implemented in over 90% of schools in Finland given its proven effectiveness in the prevention and reduction of school bullying (Mäkelä and Catalán, 2018). Since its implementation in Spain, the publishing company Macmillan (2020), responsible for the implementation of this program in Spanish schools, reports that over 100 schools have opted for this program, meaning over 30,000 students are benefiting from the program.

Regarding the TEI program, Saura (2018) reports that over the course of 15 years, this program has been implemented in over one thousand schools in Spain, with over 30,000 trained teachers and over a million students tutors or tutored in the program for the reduction of bullying in their schools.

The Mediation Teams program has a long history in Spain. As noted by Viana-Orta (2018), the program has benefited from over 25 years of experience. Since its first implementation in the Basque Country in the 1990's the program has spread to the rest of the Autonomous Communities. The program continues to be one of the most widely used program in Spanish schools. It is also the only program included in education legislation of the Autonomous Communities which establish the practice of mediation as a method to resolve conflicts and combat bullying.

The purpose of this research project is to verify the effectiveness and functioning of these programs based on the following question: *What are the most important benefits these bullying prevention programs (KiVa, TEI and Mediation Teams) offer to Spanish schools?*

To answer this question, the study compared the three most representative bullying prevention programs currently implemented in Spanish schools: KiVa, TEI and Mediation Teams (*Equipos de Mediación*). The study also had a number of additional specific objectives:

- To identify the most significant causes or drivers that led schools to implement these types of programs.
- To identify the participants and target of these bullying prevention programs.

TABLE 1 Comparison of bullying prevention programs.

Name	Author	Year	Target	Description	Training	Materials	Stages	Evaluation strategies
Mediation teams	No author	1960	Teachers and students	Program aiming on conflict resolution through the intervention of a third person (mediator).	No	No	Acceptance, Pre-mediation, 'Tell me', Locate conflict, Solutions and Agreement	No
Olweus	Dan Olweus	1983	Teachers and students	Program aiming to improve the school environment by promoting good relation among students.	Yes	No	Class level, school level and community level	Yes
Pikas	Anatol Pikas	1989	Teachers and students	Program seeking to reduce instances of bullying by working with the aggressor.	No	Yes	Individual interviews, follow-up interviews and group meetings	Yes
Save	Government of Andalucía	1995	Teachers and students	Program aiming to prevent bullying through education in values and tolerance.	No	Yes	Democracy, cooperative work, education in values and program for victims	No
Andave	Government of Andalucía	1998	Teachers and students	Program aiming to prevent bullying by improving interpersonal relations.	No	Yes	Positive school environment, victim and types of abuse	No
MCC	Government of Andalucía	2001	Teachers and students	Program aiming to prevent bullying by improving interpersonal relations.	No	Yes	Prevention and direct intervention	No
TEI	Andrés González Bellido	2002/2003	Teachers, students and families	Program in which older students assume the role of tutors for younger students.	Yes	Yes	Raising awareness, approval for implementation, training, pairing, evaluation and reporting	Yes
ABC	Mona O'Moore	2004	Teachers, students and families	Program that works with the aggressor and the victim to resolve conflicts.	Yes	Yes	Training, production of materials, information for parents, program launch	No
AVE	Iñaki Piñuel & Araceli Oñate	2005	Students	Prevention program which uses an evaluation test to determine the probability of suffering from bullying.	Yes	Yes	Interviews, evaluation of positive attitudes	Yes
KiVa	Aro Kaukiainen & Christina Salmivalli	2007	Teachers, students and families	Bullying prevention program using personal interviews to reduce aggression and harassment.	Yes	Yes	Universal measures, Specific measures	Yes
Buen trato	Fundación Anar	2007	Teachers and students	Program working on bullying through student teamworking	Yes	Yes	Creation of guide groups, training of participants	No
Lucha Contra EL Acoso	Ministry of Education, Community of Madrid	2016	Teachers and students	Program to improve measures to prevent bullying and aggression.	Yes	Yes	Creation of a school anti-bullying unit, training, awareness campaign	Yes

Source: the authors.

- To describe the training provided to each of the agents involved in these programs.
- To observe the evaluation and oversight of these programs.
- To assess the effectiveness and level of school satisfaction with bullying prevention programs.

2. Materials and methods

This is a qualitative study using a descriptive-comparative methodology to evaluate the implementation, functioning and effectiveness of various bullying prevention programs implemented in schools. Using a qualitative paradigm, the study compares and contrasts the characteristics and methodologies of these programs and their results in school across the country.

The dependent variable of the study, to evaluate the functioning of the prevention programs, is structured into six categories: the causes of implementation, the target, training received, effectiveness, evaluation and general satisfaction with the program. Additionally, the independent variable is the type of prevention program focussing specifically on three: KiVa, TEI and Mediation Teams.

The sample consisted of nine schools, three for each of the programs being evaluated (three of KiVa, three of TEI and three of Mediation Teams), within the Community of Madrid, represented in the study by the coordinators or directors of the anti-bullying programs. Participating schools were selected using a non-probability sampling method among schools within the Community of Madrid which had implemented one of the three prevention programs subject to this research. The relevant data is provided in Table 2 below.

The study was based on the results of interviews with the participants. A series of *ad hoc*, semi-structured interviews were conducted using an instrument of 11 questions to gather information about the functioning and effectiveness of the various bullying prevention programs in schools. The interviews were structured into three blocks: The first block focussed on the general characteristics of the program; the second block dealt with the implementation of the program in the school, with questions about the time the program has been in place, reasons for the choice of program, the participants, the training received to implement the program, etc.; the third and final block explored the opinion of the interviewees on the effectiveness of the program, it's strengths and weaknesses, etc.

TABLE 2 Schools participating in the study.

School	Type of program	Implementation period	Type of school
KiVa 1	KiVa	5 years (2016)	Private
KiVa 2	KiVa	4 years (2017)	Charter
KiVa 3	KiVa	5 years (2016)	Private
TEI 1	TEI	2 years (2019)	Charter
TEI 2	TEI	5 years (2016)	Public
TEI 3	TEI	5 years (2016)	Public
Mediation teams 1	Mediation Teams	17 years (2004)	Public
Mediation teams 2	Mediation Teams	12 years (2009)	Charter
Mediation teams 3	Mediation Teams	21 years (2000)	Public

Source: the authors.

The format of the interviews and the measurement instrument were adapted to an online format and implemented by email and by telephone.

The next step was to create a database with the contact details of school which had implemented one of the three bullying prevention programs subject to this paper. This information was collected *via* the internet or through personal contacts. The schools were then contacted by email, requesting their participation and attaching the interview questionnaire for participants to respond online. Participants were also provided with the contact details of the researchers, telephone number and email, to be available to resolve and problems or doubts during the interview process.

The data was analysed using the triangulation technique of the Atlas-ti program, with an exhaustive comparison of the responses from different schools where the programs were implemented. The facilitate analysis, the information was structured into six variables or categories (cause, target, training, evaluation, effectiveness and satisfaction) to organise, compare and contrast the responses of participants.

3. Results

In evaluating the results of the interviews, the responses of tutors and administrators regarding the prevention programs in different schools were compared and analysed according to the research variables. The results were structured according to the six variables being evaluated: cause, target, training, program evaluation, effectiveness and school satisfaction.

3.1. Causes

This section offers an analysis of the reasons why school chose one the bullying prevention programs KiVa, TEI or Mediation Teams. While all of these programs are aimed at preventing bullying in schools, not all the schools chose these programs for this reason. One KiVa school and another Mediation Teams school reported implementing these programs to deal with growing conflicts between students that was leading to instances of bullying. This was confirmed by the school Mediation Teams 1: *"because the school environment is much more complex than before,"* while school KiVa 2 noted that *"three years ago we began to have lots of problems and conflicts in the higher grades."* However,

the rest of the schools implementing the KiVa, TEI or Mediation Teams programs did so not because of a need for intervention but to *"to improve the school environment*" as the Mediation Teams 2 school reported. The coordinator of the Mediation Teams 3 school added that *"it is an effective way to deal with conflicts and to improve the school environment*." Many school administrators similarly reported their concern about the ignorance about the issue of bullying in general. This is another reason cited by schools for their decision to implement one of these programs; that is, that the program would serve, not only to improve the atmosphere in the school but also to raise awareness among school community of the issue of bullying. This is reflected in the observation by school TEI 3 *"that the school has no serious conflict problems but there is concern about the ignorance of the gravity of school bullying*"; KiVa 3 school affirmed that "*it is socially imperative to eliminate bullying and to make it a real priority,*" while the Mediation Teams 3 school noted that through these programs *"students learn important values, such as dialogue and communication to resolve conflicts*."

3.2. Target

Another aspect analysed in the study were the target. To whom the program is aimed and who works with it. All programs aim to involve the entire school community in order to improve the culture of the school and create a safe and positive environment for learning. The coordinator of the school Mediation Teams 2 reports that *"the entire school community is involved*." In all programs the principal actors are the students. For example, school TEI 3 noted that *"the program is followed by the whole school community, but the main protagonists are the students*." Teachers also work with the students, either directly or indirectly, providing guidance and support where and when necessary. For example, the coordinator of the school TEI 3 affirmed that "*the teachers help students develop their conflict resolution skills*." In no cases did families participate in the start-up of the program. However, as indicated by school KiVa 3 *"parents are informed about the measures implemented through the program*." The TEI schools also held a training session for families. Thus, the three programs share the same target, the protagonists are the students, while the rest of the school community is available at all times to help carry out the programs.

3.3. Training

The third aspect is training, that is, the type of instruction on the programs received by teachers and school professionals. The schools which implement KiVa and TEI receive specialised training about the programs through courses imparted by experts in the implementation and application of these programs. The tutor at the school KiVa 2, reported that at their school *"all teachers received a training course of 10 to 15 h in three sessions*." The coordinator at school KiVa 1 added that *"the publisher McMillan provided the training for all teachers*." In the case of the TEI program, school TEI 3 explained that *"two 4-h sessions of presential training are provided, plus a one-hour remote training session*." School TEI 2 noted that *"both the presential and online sessions were given by a TEI trainer*." For the Mediation Teams program training is not regulated and diverse types of training is provided depending on the aspects schools wish to focus on. Thus, each school with Mediation Teams receives a different type of training. The coordinator of the school Mediation Teams 3 explained that "*the teachers train themselves through seminars or with the help of the local authorities*" and the coordinator of the school Mediation Teams 2 reported that there was *"a course by an expert in school relations from the University of Alcalá*."

3.4. Evaluation

The surveys and evaluations of the programs offer a general overview of how they work and the level of school satisfaction. As mentioned above, the KiVa and TEI programs are highly structured; both programs include evaluation surveys to measure the effectiveness of the program. According to school KiVa 3, these surveys "*are made by the students at the beginning and end of the year*." The evaluation of the TEI program, according to the school TEI 3 *"consists of a survey made by the students and teachers every quarter on levels of satisfaction, feelings of wellbeing, type of relations,* etc.*"* The majority of school gather this data not only to assess the functioning of the program but also to propose changes and *"proposals for improvements,*" according to school TEI 3. Compared to KiVa and TEI, the Mediation Teams program is less structured or staged, with no established evaluation system in the program; in these cases the schools themselves organise their own surveys. The school Mediation Teams 1 reported that "*se the program is done at the end of the year with the participation of teachers, students and families*." At school Mediation Teams 3, rather than use the surveys, they *"evaluate the conflicts that arose during the year to see if these were resolved*." It should be noted that all evaluations of all programs by all schools were very positive.

3.5. Effectiveness

By analysing this variable, the aim is to determine to what extent bullying is truly being reduced and classroom environments improved. Thus, it can be observed that all schools reported an improvement in the classroom environment. As the school KiVa 2 responded *"there have been fewer conflicts and the students are more aware of the problem*." School TEI 3 also reported *"notable changes, principally among tutors, who feel themselves the protagonists of the positive environment in the school. Incidents of conflicts have notably decreased*." Furthermore, as noted by the school Mediation Teams 2, *"the atmosphere is different from before; there is more help between classmates and the*

awareness of a good environment is real among the students," while school KiVa 1 reported that the program "*spurs the students to actively participate, enabling them to intervene to manage minor conflicts*."

3.6. Satisfaction

This final variable aims to evaluate the level of satisfaction of schools with the program. Experts in KiVa affirm "*they are very pleased and that the program meets their objectives*" (KiVa 2). Schools with the TEI also reported "*a more positive atmosphere in the school can be perceived*" (TEI 2). Schools implementing the Mediation Teams program also reported their satisfaction: according to the Mediation Teams School 3 "*there is a good atmosphere and relations among students*."

Although the level of general satisfaction is high, schools of the KiVa and TEI programs propose certain improvements to adapt these programs to their specific needs. In both cases, school propose improvements in program materials, with school TEI 3 suggesting "*better technological or digital materials*," and school KiVa 1 recommending "*better adaptation of the materials to the ages of the students*."

Thus, it can be concluded that, in general terms, all schools are pleased and satisfied with their anti-bullying programs, which are effective in preventing and reducing instances of aggression and bullying in the classroom.

Table 3 below offers a structure comparison of the bullying prevention programs KiVa, TEI and Mediation Teams by causes, target, training, evaluation, effectiveness and satisfaction with the programs.

4. Discussion

The responses from school administrators and program directors from a number of schools offer an overview of the experiences and opinions regarding these prevention programs. Firstly, the study found that, while each are very different, the KiVa, TEI and Mediation Teams programs were all highly rated by schools which generally agreed that the programs meet the needs of the school and are effective in preventing and stopping instances of aggression and bullying in the classroom. These responses indicate that the three programs are truly effective in preventing and eliminating instances of bullying and aggression in schools, the principal aim of these programs.

Schools implemented these anti-bullying programs to create a more positive school environment, reduce conflicts and to prevent bullying. The reasons cited by schools are all very similar regardless of the specific program, fully agreeing with the general intentions and purposes underlying these programs. Some program coordinators go further, affirming their belief that addressing the issue of bullying is a pressing social need and of the importance of educating students in positive values and communication, giving them the skills to resolve conflicts.

The three programs all aim to involve the entire school community with students always playing a central role, in line with Cross et al. (2021). Only the TEI program includes a structured training plan for families although some school using Mediation Teams intend to involve parents more directly in the coming academic years.

Training is also an important aspect of bullying prevention programs. At TEI and KiVa schools this training is highly structured and is the same for all schools implementing these programs, where teachers receive between 10 and 20 h of training divided into two or three sessions and which also include resources and materials for both teachers and students and, in the case of TEI, for families as well. The Mediation Teams program is less structured with diverse forms of training.

Professionals and coordinators of the programs all report an improvement in the school environment and a reduction of conflicts since their implementation. Furthermore, the study shows that students are also more aware and vigilant about the problem of bullying, feeling themselves the protagonists and active participants in preventing instances of violence and creating a positive atmosphere in their school.

To verify the functioning and effectiveness of bullying prevention programs, TEI and KiVa, being the most highly structured, include an evaluation survey. The KiVaa survey, conducted at the start and the end of the academic year, is aimed exclusively at students. The TEI surveys are completed by both students and teachers every semester. The Mediation Teams program does not include a formal evaluation mechanism and the centres themselves decide on their methods of evaluation.

As noted by Avilés et al. (2008), the Mediation Teams program aims to resolve conflicts through dialogue, communication and the participation of a mediator. The results of our research show that this program is effective according to reporting from the schools themselves. Although no studies have been conducted which clearly show a reduction in cases of bullying (Usó et al., 2009), schools report they have noted a difference in classrooms where there is a more positive environment with fewer conflicts.

The TEI program for the prevention of bullying was created to raise awareness of this issue among the entire education community (González-Bellido, 2015). A number of schools have implemented this program, not only to eliminate classroom conflicts but also, as the program itself explains, to heighten awareness of the reality and the gravity of bullying. Studies of this program (González-Bellido, 2015) show it to be very effective, reducing instances of bullying and aggression in schools to zero. Given this success, many schools have implemented this program, all reporting it to be highly effective.

The KiVa program to prevent and eliminate bullying in schools (KiVa Antibullying Program, 2007) has been highly effective in the schools where it has been implemented, reducing instances of conflict. According to available figures, the program has successfully reduced bullying in schools by some 80% (KiVa

TABLE 3 Results of the KiVa, TEI and mediation teams programs.

Name	KiVa	TEI	Mediation teams
Causes	Prevention of bullying. Awareness campaign about bullying. Conflict resolution.	Manage a positive school environment. Raise awareness about bullying. Prevention of bullying.	Eliminate conflicts. Improve school environment. Educate values.
Target	Students. Tutors, teacher also participate.	Students. The entire school community. Training of teachers, students and families.	Students. The entire school community.
Training	Specialised presential and online courses. Additional program materials.	Specialised presential and online course. Offers materials.	No formal, structured training. Training at universities or local councils.
Evaluation	Survey of students evaluating the effectiveness of the program.	Questionnaires for teachers and students each semester to evaluate the effectiveness of the program.	Subjective evaluation using own method. Study of cases or surveys.
Effectiveness	Improved relations in schools. Reduction of instances of aggression and bullying. Greater awareness of bullying.	Improved relations in schools. Greater awareness of bullying. Reduction of conflicts.	Effective program. Improves the environment in schools. Reduction of conflicts.
Satisfaction	Positive opinion of the program. Schools are satisfied.	Very positive opinion of the program. Schools are satisfied.	Good levels of satisfaction on the part of schools.

Source: the authors.

Antibullying Program, 2007). The results of our study confirm a significant reduction in cases of bullying and conflict.

Schools reported being highly satisfied with their bullying prevention initiatives, regardless of the specific program implemented. Schools using more structured and guided programs (TEI and KiVa) agree that part of this success is due to the structured nature of the program, allowing step by step implementation. However, schools using the Mediation Teams program reported feeling lost when beginning the implementation process given the less structured nature of the program. Despite their satisfaction, the TEI and KiVa program coordinators have identified areas for improvement, particularly noting that materials should be more closely adapted to the age of the students, their educational circumstances, and social realities.

5. Conclusion

The present study offers an in-depth look at some of the anti-bullying programs currently being implemented in Spain, through an analysis of the responses and opinions of experts and coordinators of these programs.

The coordinators of these programs report an improvement in the school environment and better relations both among students and between students and teachers since the implementation. These changes clearly demonstrate that initiatives to prevent bullying have a positive impact on the school environment regardless of the specific program. Thus, it is essential to heighten public awareness about the importance of this issue and the need to address and eliminate harmful and abusive behaviour in schools.

The general assessment of all three bullying prevention programs (KiVa, TEI and Mediation Teams) is very positive. Experts agree that these programs meet the needs of the school communities and are effective in preventing, identifying and stopping instances of bullying. It has been seen that, prior to the implementation of these programs, the issue of bullying was silenced, almost a taboo subject, about which most people preferred not to speak. The programs have served to heighten awareness of the importance and gravity of bullying throughout the school community (students, teachers and families) generating a culture of zero tolerance for violence. The result has been a decrease in conflicts and instances of bullying and abusive behaviour in all of the participating schools.

Given the circumstances of the COVID-19 pandemic, the limitations on this study have been considerable. The number of participants was to be much higher initially and interviews were to have been conducted in person. However, although the sample size was not very large, the responses of schools were very similar and it may be supposed that a larger sample would not have provided any relevant additional data. Sufficient information for the purposes of this study was obtained using a limited sample although it should not be considered as representative.

Analysing the results obtained in the study, it would be instructive to explore further the different anti-bullying programs implemented throughout Spain, with the participation of more schools representative of the entire country, in order to conduct a comparison on a national scale. Furthermore, it would be helpful to expand the sample to include other types of prevention programs in order to observe first-hand the differences and benefits of the various programs implemented in schools nationwide.

It is important to underscore the important role of governments and public authorities in the prevention of a problem

which causes daily harm to girls and boys in schools (Cantera et al., 2021). Public institutions must provide schools with the funding and resources necessary to undertake these initiatives. Furthermore, it is important that governments enact legislation to support the actions of schools to create a safe learning environment and protect students from violence and abuse.

It would also be instructive to know the measures undertaken in other countries in this area. A comparative study of the legislation and protocols established across Europe would help identify the measures which are most effective in preventing bullying in schools.

Given the conclusions of this research project, one may imagine a future where these types of programs are universal and obligatory for all schools with the support of government authorities and applicable legislation. Universal application of prevention programs would enhance the classroom environment, raise awareness of the issue of bullying among the entire education community, creating a safe and positive environment for students where they can happily learn, grow and reach their full potential.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/ next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

VS and BM-M equally contributed and wrote the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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How to construct an appropriate research design for the study of learner identity in blended learning?

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learner identity, blended learning, online collaborative writing, research design, validity and reliability

1. Introduction

With English language becoming the norm for academic communication and knowledge exchange for scholars and students around the world, the focus of English as a foreign language (EFL) or English as a second language (ESL) has gradually shifted from English for general purposes (EGP) to English for academic purposes (EAP) (Li, 2020; Maswana and Yamada, 2021). EAP aims to cultivate learners' academic English language ability as well as to broaden their knowledge of disciplinary culture (Hyland and Hamp-Lyons, 2002; Jund, 2010; Douglas and Rosvold, 2018). Under this circumstance, learner identity in EAP education witnesses an increasing attention from researchers in the field (see Etherington, 2006; Charles and Pecorari, 2022). Some studies (Lave and Wenger, 1991; Sinha, 1999; Coll Salvador and Falsafi, 2010; Delahunty et al., 2014) reveal that the acquisition of new knowledge has an impact on individual's construction of learner identity in a given context. Compared with massive studies on learner identity constructed in traditional face-to-face classrooms (Trent, 2008; Wearmouth et al., 2011; Nasrollahi Shahri, 2018; Lan and Lan, 2022; Xu and Kim, 2022) or online learning (Ginns and Ellis, 2007; Mayrberger and Linke, 2014; Kwon et al., 2021), to date, research studies on learner identity constructed with blended learning method seem scarce and insufficient, attaching to EAP courses in particular.

Besides, it appears that few studies have examined learner identity from the perspective of dynamic process in collaborative writing. To be more specific, collaborative writing is frequently employed as a learner-centered approach to engage students in English learning because of the limited class hours set for the course (Chen et al., 2022; Lan and Lan, 2022). Abound with meaning of negotiation, the benefits of collaborative writing in facilitating interaction and development of basic language skills have been widely documented (Storch, 2005; Kim, 2008; Wigglesworth and Storch, 2009; Shehadeh, 2011; Dobao, 2014; Ahmad, 2020; Anggraini et al., 2020). In addition, learner identity construction in collaborative writing has also captured researchers' attention (see Arnold et al., 2012; King, 2015; Brown and Pehrson, 2019; Chen et al., 2021). Among the scarce studies on learner identity, researchers mainly focus on the linguistic elements in learners' written products rather than the dynamic process to examine learner identity in collaborative writing.

As teachers and researchers, we show our concern about the learner identity in blended EAP education, and we read with great interest the newly-published article entitled "*Exploring learner identity in the blended learning context: A case study of collaborative writing*" by Chen et al. (2022). For the sake of reader's convenience, we will refer it as "the article" hereafter. The article aimed to explore six Chinese university students' learner identities constructed in

the online and offline collaborative writing sessions of an EAP course. It paid special attention to the construction of learner identity in relation to learners' engagement and interaction during the process of blended collaborative writing section. In our view, the article has bridged two above-mentioned gaps and contributed a conclusion with both interpretative and illuminating evidences, which demystified and specified the construction of learner identity and its influencing factors in a blended EAP course. We believe the article will provide researchers and practitioners with a new perspective of learner identity construction. Therefore, we would like to comment on the strengths and weaknesses of the article, especially focusing on the validity and reliability of research design, aiming to provide constructive suggestions for future relevant studies in the field. In order to better guide our analysis, we propose the following two research questions:

1. How did the article select participants in order to dig out more relevant data to address its research questions?
2. How did the article analyze the data to facilitate the in-depth exploration and understanding of the intricate phenomenon such as learner identity construction in relation to learners' engagement and interaction?

In our discussion process, we adopt content analysis method (Bell et al., 2022) to examine the selection of participants, data analysis and research findings of the article. Concerning the data analysis process in our article, first, we read the article recursively and independently. Then, we coded and categorized the description and discussion texts relating to the selection of participants, data analysis and research findings of the article. For the sake of trustworthiness, we compared each other's coding, discussed how to reach a consensus on different coding between us, and finally modified them until agreement and consistency were maintained. We also sought feedbacks from two expert researchers to solicit their suggestions for the purpose of triangulation.

Before we analyze the article in detail, we think it is necessary to review and explicate a key term in the article, namely, learner identity in order to help better understand and interpret the article. Some researchers (see Sampson, 1978; Burke, 1980; Scotton, 1980; Heller, 1984) interpreted learner identity as fixed personalities, learning styles, and motivations, but recent studies of learner identity adopt a dynamic approach, thus making a sharp contrast to those in the early stage. Coll Salvador and Falsafi (2010) made a distinction between learner identity and learner identity process (LIP), in which learner identity was a fixed image separating from learning situations, while LIP was a process that emphasized the experience and adaption of learner identity to a particular learning context. Based on a post structural perspective, Norton (1997, p. 410) defined identity as "how a person understands his or her relationship to the world, how that relationship is structured across time and space, and how the person understands possibilities for the future". This definition was echoed by Flórez González (2018) who claimed identity was fluid, context-dependent, and context-producing, constructed in certain historical and cultural circumstances (see also Toohey, 2000; Pavlenko and Blackledge, 2004; Norton and Toohey, 2011; Nasrollahi Shahri, 2018; Lan and Lan, 2022).

In following sections, we will first provide a summary of the article, then discuss its advantages and limitations by addressing our two guiding questions, and finally summarize the implications of the article.

2. The study

Qualitative in nature, the article employed a case study approach to examine learner identity construction and its influencing factors in a blended learning context. Six non-English major male participants were selected from a comprehensive university based on an initial four-week observation due to their diverse engagement in learning activities.

In regard to the data collection, the article collected multiple sources of data derived from four collaborative writing sessions, including class observations, field notes, semi-structured interviews, history logs on the writing platform and the transcriptions of participants' offline group discussions for the purpose of triangulation.

With reference to the data analysis, the article examined the data that revealed the learner identity and their influencing factors inductively and deductively by classifying the data into online and offline categories. First, the data that expressed learner identity in offline collaborative learning sessions were analyzed by taking a discourse analysis method. Specifically, the article identified, coded and categorized participants' verbal characteristics in offline classroom discussions by drawing on Poupore (2016) analytical framework, followed with the statistics of frequencies of each participant's verbal characteristics. In this way, the article aimed to reveal learner identity separately. Second, the data that reported learner identities in online collaborative writing sessions were analyzed by adopting the framework of work load roles proposed by Arnold et al. (2012). Be specific, the frequencies of participants' writing revisions which acted as a main reflection of participant' online engagement were counted to investigate the learner identities in online sessions. Finally, two rounds of semi-structured interviews were transcribed, coded and categorized to examine the factors influencing learner identity construction in online and offline sessions.

The article revealed three major findings based on the data analysis. First, the article demonstrated that the construction of learner identity in blended learning depended largely on specific learning activities and learning contexts, with more positive identities in offline sessions and negative ones in online sessions. Such divergence may be caused by teacher's different involvement or pedagogical guidance in two learning sessions. In addition, the article also disclosed that both individual and contextual factors had an impact on learner identity, in which individual factors intersected to affect learner identity construction in both learning sessions, while the impact of contextual factors changed according to different learning sessions. Finally, the article illustrated that the learner identity construction displayed different patterns in online and offline sessions, with some participants demonstrating consistency and others revealing changes. This finding further proved that individual's learner identity was constantly confirmed and reconstructed through LIPs.

In the end, the article provided implications for course design, pedagogical practice, and materials development in blended learning context, appealing that a careful course design and teacher's active

involvement or guidance are essential for maintaining learners' positive learner identities and improving learning outcomes.

3. Discussion

In this part, we would like to make comments on the selection of participants, data analysis and research findings, aiming to examine the validity and reliability of the article for the sake of facilitating further research in this field. In particular, by discussing the group size in the article, we attempt to arouse researchers' attention to the intention, representativeness as well as transparency of the selection of participants. In addition, comments on the data analysis intend to raise researchers' concern about the importance of analysis unit, data analysis triangulation as well as transparency of analysis process. Finally, by comparing the findings in the article with those in previous researches, we appeal that the first priority should be given to the selection of theoretical framework.

3.1. Selection of participants

The article picked a focal group with six participants demonstrating diverse engagement in learning activities based on an initial four-week observation. Obviously, the article selected the focal group intentionally, attempting to explore the relationship between learners' interaction and learner identity construction. Nonetheless, one thing that puzzles us is the size of group, since the article did not explicate the reason why the group consisted of six participants. In our opinion, it would be better to make an explanation about it, as many studies have revealed that the size of group has a tremendous impact on participants' involvement in group discussion (Mishra, 2016) and interaction in collaborative writing (Arnold et al., 2012; Dobao and Blum, 2013; Dobao, 2014). Therefore, we argue that future study should include groups of different sizes to make a comparison in order to have a deep and detailed understanding of the impact of learners' interaction on learner identity. As Tenny et al. (2022) indicate the more representative the sample is to the expected research population, the more likely the researcher will take various factors at play into consideration. We believe that the selection of participants should be purposeful (Sargeant, 2012) to saturate the data, and at the same time the details and processes involved in the selection should be elaborated for the purpose of transparency (Oun and Bach, 2014).

3.2. Data analysis

As far as we are concerned, the data in the article seemed to be clearly classified into online and offline categories and analyzed inductively and deductively with peer debriefing adopted to ensure the trustworthiness of the data analysis. However, after taking a close look at the analysis process of learner identity in online collaborative writing, we perceive some problems regarding the selection of analysis unit, reliability of analysis framework and transparency of the analysis process. First, drawing on the work load roles put forward by Arnold et al. (2012), the article utilized revision frequency as an analysis unit to identify learner identity without considering the type of revision, such as formal or meaning-based one. In reality, Arnold et al. (2012) discovered that learner identity transferred when different types of revision were taken into account, for learners made different efforts to revise different types of errors or problems based on their own perceived advantages and limitations. Therefore, we suggest that the type of revision should be a better choice for being an analysis unit, as data analysis aims to describe a phenomenon in detail in qualitative study (Flick, 2014).

In addition, we are skeptical about the reliability of the analysis framework adopted in the article as we discover that the criterion used to examine work load roles in the article is inconsistent with that in Arnold et al. (2012). Specifically, work load roles were judged by the workload of revision in Arnold et al.'s study, while it is determined by the frequency of revision in our commented article. As addressed by the authors themselves, the frequency of revision served as a proxy of students' online involvement (Chen et al., 2022, p. 6), which, in our opinion, is not equivalent to actual contributions of revision. Given the divergence mentioned above, we suggest that another analytic method be combined for researchers to eliminate bias and seek convergence among a variety of data to build up themes or categories (Golafshani, 2003). In other words, it is suggested that triangulation of data analysis methods be employed, if necessary, to make up for the weakness of a single technique and enhance the interpretation and reliability of research findings (Thurmond, 2001).

Finally, we find no clue as to how the learner identities are verified from the two rounds of semi-structured interviews for there is no description about the process of data analysis in this regard. In fact, the elaboration of analysis process is indispensable because data do not speak for themselves, it is the analyses and interpretations on the part of researchers that yield descriptive and causal inferences in qualitative study (Moravcsik, 2020).

Given the major influence of data analysis on research findings (Flick, 2014), we appeal that future research should give weight to the selection of analysis unit in that an appropriate unit is conducive to locate the data relevant to research questions (Mezmir, 2020). In addition, researchers should make sure that data analysis method selected is suitable for the study. If necessary, another analysis method can be combined for triangulation (Leech and Onwuegbuzie, 2007). Finally, the process of data analysis needs to be transparent and trustworthy (O'Kane et al., 2021).

3.3. Research findings

With regard to the research findings of the article, on the one hand, the factors that influenced learners' engagement and interaction in the online collaborative writing sessions are distinct from those in previous researches. When we examine the findings carefully, we find that only the individual (learners' English ability, character and perception) and contextual factors (assigned roles and teacher's involvement) are disclosed. However, previous studies have found that various factors may affect learners' engagement and interaction, such as the genre of writing (Reed et al., 1985), the type of task (Li and Zhu, 2017) and computer-mediated contexts (Wang, 2019). Moreover, different communication modes, for instance, using online conference or online editing software will elicit changes in learners' engagement and interaction in collaborative writing (Aubrey, 2022). Based on the description in the article and our investigation of writing platform, we figure out that the very

limited interaction in online collaborative writing can partly attribute to the communication mode of platform, on which participants communicate mainly through text messages asynchronously. As mentioned by one participant in interview, it was difficult for group members to communicate on the internet platform, and it was challenging for new revisers to comprehend the previous one's intention (see Chen et al., 2022, p. 10). Therefore, future research could incorporate above-mentioned factors into online course design. This suggestion also echoes the finding that lack of a well-organized online learning session resulted in the transformation of a positive LIP into a negative one in blended learning (see Chen et al., 2022, p. 11).

On the other hand, no macro-level factors related to learner identity construction were discovered. In fact, many macro-level factors, such as race and culture (Kubota and Lin, 2009), societal power relations (Norton, 2013), educational policy (Hajar, 2017) have a significant influence on learner identity. We assume that the inconsistency of influencing factors can be ascribed to different focuses and organizations guided by theoretical frameworks adopted. It is obvious that the theoretical framework employed in the article mainly focused on learner identity in particular learning context. To the best of our knowledge, as a social being, learner identity is not only contextual constructed but also historically, culturally and politically situated (Pavlenko and Blackledge, 2004). Therefore, an alternative, for instance, the framework proposed by Norton (1997) could be adopted to examine both micro and macro influencing factors. In fact, the selection of theoretical framework is vital because it is the base for the construction of knowledge (Osanloo and Grant, 2016) and provides an anchor for analysis and interpretation of data as well as research findings (Merriam and Tisdell, 2016). As a result, we argue that researchers should give their first priority to the selection of theoretical framework for it not only determines the focus, organization, exposure and hiding of meaning in the study, but also relates the study to previous scholarship and concept (Collins and Stockton, 2018).

4. Conclusion

In summary, the article is a thought-provoking, well-explored, and illuminative piece. Firstly, it expounds the interplay of learner identity construction and learners' social interaction. In addition, the process of collaborative learning activities rather than the static writing product is examined. Finally, the patterns of learner identity construction across different learning sessions are revealed. All in all, the article provides readers with new insights into the complexity of learner identify and variety of influencing factors. We believe that, after reading the article, course administrators, teachers and students can have a better understanding of learner identity and factors that hinder or facilitate positive learner identity construction in blended learning context, which prompts them to make corresponding adjustments in their course design, teaching or learning respectively. Hence, we would like to recommend the article without any hesitation to more readers, particularly those who are keen on learner identity in blended learning.

Author contributions

XL and XZ selected the commented article together. XL drafted the opinion. XZ provided insights and valuable suggestions during her writing and helped revise the text. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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College EFL teachers' demotivation to conduct research: A dynamic and ecological view

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Competences for conducting research is vitally important for college EFL teachers' career development, but many college English teachers are demotivated in academic research. To investigate teachers' motivation on academic activities, this study firstly explored motivational changes of college EFL teachers (mean age 37.39, SD 9.77) for conducting research in their teaching career, and then delved into the factors underlying their demotivation by sending questionnaires. In the end, several English teachers and officers managing research projects were interviewed to elicit solutions to overcome EFL teachers' demotivation to conduct research. This study found that college EFL teachers had large possibilities to suffer from demotivation to conduct research. Exploratory factor analysis indicated five factors causing their demotivation, including weak research ability, negative emotions and attitudes, poor research surroundings, research management problems and insufficient resources. Thematic analysis demonstrated that ecological solutions should be taken by different stakeholders in EFL teachers' working ecology, including universities, research communities, government, and publishers. This study problematized the static view on teachers' demotivation to conduct research and provided some insights and implications for reasons and solutions for demotivation.

KEYWORDS

EFL teachers, EFL teacher education, motivation, research competence, demotivation to conduct research

1. Introduction

In the fierce competition of higher education in the world, academic research intensity is one of the essential indicators of the overall educational quality of universities (Mägi and Beerkens, 2016). To improve the competitive edge in the university rankings, many universities encourage their teaching staff to conduct academic research. For example, numerous universities in China tend to link teachers' promotions and incentives with their research output and hence urge college teachers to pursue scholarship (Zhao, 2015; Peng and Gao, 2019). From the perspective of English as a foreign language (EFL) teachers, conducting research could deepen their understanding of EFL learners, teachers, teaching practice and other crucial elements in their career (Gao and Chow, 2011; Borg and Liu, 2013). Therefore, college EFL teachers, an important group in college teachers, should conduct academic research for the sake of themselves, their students and the universities they are working in. However, it is not uncommon to find that many college EFL teachers spend fairly limited time on academic research (e.g., see Chen and Wang, 2013) even though encouraged by universities with various benefits. Consequently, many college EFL teachers' research capacities and publications were rather limited (Bai and Hudson, 2011; Wang and Han, 2011). Considering the importance of research to EFL teachers, the scant investments, competences, and publications might hinder their career development and their students' English learning.

Currently, English teachers' demotivation in their teaching career has been noticed among several researchers in different countries (e.g., Yaghoubinejad et al., 2017; Nagamine, 2018; Khanal et al., 2021; Kim and Kim, 2022), but a paucity of studies distinguished their (de) motivation of English teaching from that of conducting academic research or even shift their focus to EFL teachers' research intensity (Yuan et al., 2016). Indeed, several studies investigated English teachers' motivation to conduct research (e.g., Borg and Liu, 2013), but the dark side of motivation (i.e., demotivation) was neglected, and hence the factors underlying EFL teachers' demotivation to conducted research (hereinafter, DTCR) and corresponding solutions were rarely explored. Besides, although there exist little research focusing on EFL teachers' research behaviors, few researchers investigated the dynamic and flexible process of (de) motivation in their long teaching career path.

Based on these considerations, this study explored the dynamic processes of college EFL teachers' (de)motivation to conduct research, investigated the factors underlying their DTCR, and delved into the solutions to overcome it. This study could help to understand EFL teachers' DTCR better and provide suggestions for stakeholders to overcome DTCR.

2. Literature review

2.1. Motivation, amotivation, and demotivation

Studies on motivation increased gradually after Gardner and Lambert (1972) proposed their classic concepts of integrative motivation and instrumental motivation. However, there is no universally accepted definition on motivation until now because of its complexity (Han and Yin, 2016). For example, Kleinginna and Kleinginna (1981) classified existing motivation definitions into nine categories in light of their focuses. By drawing upon various definitions, Dörnyei and Ushioda (2011) concluded that direction and magnitude of human behavior were the two dimensions most researchers agreed for defining motivation. In other words, motivation stipulated the reasons why individuals are determined to do an activity, the length they will sustain the activity and the efforts they are going to make for this activity.

Apart from motivation, its dark sides were also frequently investigated in related studies. Currently, amotivation and demotivation were often applied to express the meaning that people work or study with decreased motivation in existing studies (e.g., Balkis, 2018; Wu et al., 2020; Albalawi and Al-Hoorie, 2021). Amotivation was firstly used in self-determination theory (Deci and Ryan, 1985), where it was defined as the relative absence of motivation that is caused by an individual's feelings of incompetence and helplessness when faced with an activity. For example, when encountered with unmasterable situations, people would suffer from helplessness, depression, listlessness, and self-disparagement, which would lead to the decrease of motivation. Compared with amotivation, demotivation was more frequently used by researchers in second language acquisition (SLA) field (Ren, 2022). Dörnyei and Ushioda (2011, p. 139) once defined demotivation as "specific external forces that reduce or diminish the motivational basis of a behavioral intention or an ongoing action." They compared the two terms of amotivation and demotivation, and thought amotivation is related to some unrealistic expectations, while demotivation is linked with specific external reasons. In fact, neither the definitions of the two terms could cover the complex phenomenon of motivation decrease among college EFL teachers. For example, several researchers (e.g., Sakai and Kikuchi, 2009; Clare et al., 2019) disagreed with Dörnyei and Ushioda (2011)'s definition of demotivation and included both internal and external factors when they were investigating demotivation. In this demotivational study, both the scopes of "demotivation" and "amotivation" were included. However, considering the terminology of "demotivation" was more frequently used in L2-related research articles than "amotivation" (see Table 1), this paper applied the term "demotivation," though the definition was slightly different from that in the great book of Dörnyei and Ushioda (2011).

Based on the above considerations, college EFL teachers' DTCR was defined as low or decreased investment and engagement in conducting research because of both internal and external factors in this study. This definition was drawn upon and synthesized from the studies conducted by Clare et al. (2019), Sakai and Kikuchi (2009), Pishghadam et al. (2021), Deci and Ryan (1985), and Dörnyei and Ushioda (2011), etc.

2.2. Teacher demotivation

There were several studies conducted to explore EFL teachers' demotivation in various educational stages. For example, Yaghoubinejad et al. (2017) found the major demotivating factors for Iranian junior high school English teachers included lack of social recognition and respect, few adequate rewards, lack of supports or understanding regarding English education, and a large number of students in a single English class. Kim et al. (2014) compared the differences of demotivating factors between English teachers (in elementary and junior high schools) in China and South Korea. Their study indicated that large English class size was the common detrimental factor for English teachers in the two countries. But there existed some different demotivating factors for English teachers in the two countries. For example, only English teachers in China perceived "excessive interference or expectations of school parents" was a demotivating factor, while "large amounts of administrative tasks and students' lack of interest" were found to be the demotivating factors for English teachers in South Korea. Similarly, Baniasad-Azad and Ketabi (2013) compared the factors causing English teachers' demotivation in Iran and Japan, and found some analogous and different underlying factors. In addition, Ozturk (2021) went even further and investigated only one ability of English teachers (i.e., assessment) in the teaching process and uncovered the reasons for EFL teachers' demotivation to be more assessment literate in Turkey.

However, most of the existing research only focused on investigating the underlying factors or reasons causing EFL teachers' demotivation in their language teaching, but few explored their DTCR. Therefore, research on EFL teachers' DTCR should be strengthened. First, teachers' teaching and research are distinct in several dimensions, though they are often interrelated with each other (Cochran-Smith and Lytle, 1990;

TABLE 1 Frequency of results from google scholar.[a]

Words keyed in	Frequency
Demotivation	About 82,600
Amotivation	About 33,700
Demotivation in language teaching	About 31,200
Amotivation in language teaching	About 11,700

[a]Data was retrieved on 3/September/2022.

Liu et al., 2010). Research on teachers' demotivation to teach might not provide enough information for understanding their DTCR. Hence, the different properties between teaching and research require studies specifically on research demotivation. In addition, teaching and research are the two most fundamental functions of universities, and they are the two sides of college teachers' identities (Liu et al., 2010). Therefore, both demotivation of teaching and research deserve attentions in studies. Third and practically, universities tend to encourage and press their teaching staff to conduct academic research to gain competitiveness in the world university rankings and other various evaluations (Mägi and Beerkens, 2016). These practical research policies, regulations or requirements need more attentions paid on EFL teachers' DTCR. For example, the factors causing EFL teachers' DTCR and the solutions to overcome this problem and remotivate them should be investigated.

People's (de)motivation was a changeable and dynamic process (e.g., see Waninge et al., 2014; Song and Kim, 2016; Zheng et al., 2020; Wang and Littlewood, 2021), but current studies seldom considered the fluctuation of teachers' motivation of conducting research. Most of the motivation studies were conducted to delve into the factors underlying their motivational behaviors (e.g., see Bai and Hudson, 2011; Borg and Liu, 2013; Yuan et al., 2016), but little research paid attention to the motivation tendency in EFL teachers' long teaching career. Therefore, to have a better understanding of the overall characteristics of this dynamic phenomenon, studies should be conducted to investigate the changing process of EFL teachers' (de)motivation.

2.3. Ecological systems theory

Ecological systems theory (EST) was proposed by Bronfenbrenner (1979), which has changed the approaches for conducting research on the relations between human beings and their surrounding environments among numerous behavioral scientists and sociologists (Ceci, 2006, p. 173). Ecological systems were composed of a set of homocentric and nested sub-systems, including microsystems, mesosystems, exosystems, and macrosystem based on the extent of closeness between a person and the corresponding systems. Microsystems refer to those activities, roles, and interpersonal relations sensed by the progressing human being in a particular setting. Mesosystems are founded on the microsystems, and for a mesosystem, it is composed of the interrelations among two or more settings where the progressing human being directly take part. Exosystems are the settings that are not directly related to the progressing human being. However, those indirect settings could still impact or be impacted by the progressing person through the connecting person or even systems. Macrosystem refers to the setting at the culture or sub-culture levels. The above three lower-order systems are embedded in macrosystem. Macrosystem could be the underlying belief or ideologies for the above three systems (for more details, see Bronfenbrenner, 1979).

Although EST was originally proposed to explain the influences of environment on children's development (Graves and Sheldon, 2018), this theory has been gradually drawn upon as a theoretical framework to guide the studies of teacher education. For example, Hwang (2014) delved into how ecological contexts influence South Korean teacher educators' professional development and found global, political, social and institutional contexts could exert impacts on their development. Price and McCallum (2015) applied this theoretical framework to investigate teachers' well-being and "fitness" among 120 pre-service teachers and concluded that ecological influences were regarded to impact on their well-being and competence to be suitable for sustainable performance. Mohammadabadi et al. (2019) inspected the factors influencing cognition among EFL teachers at various levels and found ecological factors at microsystem, mesosystem, exosystem and macrosystem levels could be the causes underlying their cognition. Therefore, EST could be applied as an appropriate theoretical framework in the research of EFL teachers. In addition, people's behaviors are usually influenced by different environment factors (e.g., see Rubenstein et al., 2018), indicating that ecological perspectives should be considered when the reasons and solutions for EFL teachers' DTCR were investigated.

Based on the review of the current studies and theories, this study aims to answer the following research questions:

1. How does college EFL teachers' motivation for conducting research change in their career?
2. What are the reasons causing college EFL teachers' DTCR?
3. How to help college EFL teachers overcome their DTCR or remotivate them?

3. Methods

Both quantitative and qualitative data were applied to answer the 3 research questions in this study. To collect data, this study applied two instruments among college EFL teachers, including questionnaires and interviews. Totally, 339 English teachers returned the questionnaires, and 15 English teachers or officers accepted the interviews. Exploratory factor analysis and thematic analysis were applied as the data analyzing method to analyze quantitative and qualitative data.

3.1. Instruments

Research instruments applied in this study include questionnaires and semi-structured interviews. The questionnaire included three sections, i.e., basic information (Section 1), identifying question and motivational change graph (Section 2), and 7-point Likert scales (Section 3). The first section aimed to induce the information of college English teachers' basic information, including age, teaching experience, etc. In the second section, the participants were firstly asked to indicate whether they had experience of DTCR and then to draw lines or carves on the motivation change graph. The motivation change graph was firstly created by Jung (2011) in his investigation of students' motivational changes and was adopted by Wang and Littlewood (2021) and Song and Kim (2017) when they were delving into the dynamics of students' demotivation. In this study, this instrument was used to stimulate college EFL teachers to chart their motivation changes over their teaching career. They were guided to dot to indicate their motivational levels from very boring (−2) to very interesting (+2) at a particular year in their teaching experience and then to draw graphs by linking those separated dots. The teachers who had more than 20 years' teaching experience were only required to display their first 20 years' experience. In Figure 1, one EFL teacher's motivational changing track for conducting research was demonstrated. As demonstrated in this curve, this teacher had 8 years' teaching experience, during which her motivation levels of conducting research fluctuated. Specifically, she was quite demotivated in conducting research at the beginning of her career

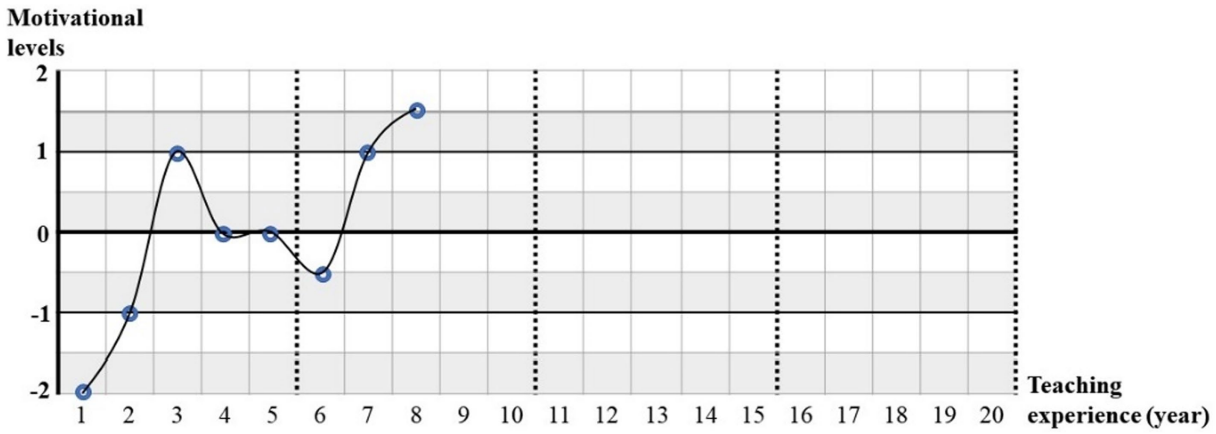


FIGURE. 1
Sample of motivational change graph for academic research. Motivation level 2=very interesting, 1=interesting, 0=neither interesting nor boring, −1=not interesting, −2=very boring.

but increased her motivation sharply in the 2nd and 3rd years. However, her motivation decreased gradually from the 3rd to 7th years but were followed by a rapid increase during the 6th to 8th years.

The last section was a scale with 20 factors that might underlie college EFL teachers' DTCR. This scale was designed based on questionnaires and qualitative data in former related studies (e.g., Yang et al., 2001; Borg and Liu, 2013; Chen and Wang, 2013; Kim et al., 2014; Peng, 2019). The whole questionnaire was displayed in the Appendix. This questionnaire was firstly reviewed and checked by several EFL English teachers and questionnaire designing experts to ensure its appropriateness. The corrected version was then distributed to participants in this study.

The semi-structured interviews were used to induce solutions to overcome DTCR and remotivate college EFL teachers to conduct research. The interview questions were all revolving around how to motivate them and reduce their DTCR. Since all the interviewees were native Chinese, the interviews were conducted in Chinese to improve communication efficiency. Informed consent was given to each interviewee before the interviews, and the interviews lasted from 17 to 46 min.

3.2. Participants

This study adopted simple random sampling to select college EFL teachers in three types of universities[1] in a city of central China. The paper questionnaires were sent to college English teachers in 10 universities. A total of 400 questionnaires were sent and 339 English teachers returned the questionnaires, among which 318 questionnaires were valid. In valid samples, 216 teachers indicated they had experienced of DTCR, among which 163 (75.46%) participants were female and the other 53 (24.54%) were male teachers. With regards to their age, those teachers ranged from 25 to 66 (mean 37.39, SD 9.77). Specifically, 52 (24.07%) English teachers were in their 20s, 106 (49.07%) were in their 30s, and 58 (26.85%) were in their 40s or above. As for their teaching experience, 75 teachers taught English <5 years, 86 taught 6–10 years, and 55 taught more than 10 years. The majority of them (185 teachers, accounting for 85.65%) hold master's degrees, and 25 (11.57%) were PhD holders, and the other 6 (2.78%) teachers only hold bachelor's degrees. Although the participants were teaching English courses in universities, they graduated from different majors: 87 (40.28%) teachers majored in English education or teaching, 55 (25.46%) majored in translation, 39 (18.06%) majored in linguistics, and 29 (13.43%) majored in English literature. While the other 6 (2.78%) teachers were from non-English related majors, like international politics, food science and engineering, management, etc.

This study adopted purposive sampling (Merriam and Tisdell, 2015) and interviewed 12 English teachers and 3 officers administering teachers' academic research projects in universities. Those participants included ordinary EFL teachers who were fairly demotivated and motivated in research, a PhD supervisor in EFL field, and several research project managers. The basic information of those participants was demonstrated in Table 2.

3.3. Data analysis

In this study, 318 valid questionnaires were numbered firstly, and they were the foundation to draw the general motivation change track of EFL teachers. To this end, the motivation level of each teacher in every year was noted and the average motivation level in each year was calculated, and then those average values were dotted and linked on the chart.

In the valid questionnaires, 216 English teachers indicated that they suffered from DTCR in their career. The demotivational reasons in the

1 In China, universities are operated by different entities, including government and companies. Thus, they could be divided into public universities and private universities. Usually, public universities are ranked higher than private ones, and they are operated with different standards of quality. Generally, the universities listed in the "double first-class" university project (Ministry-of-Education, 2022) boast better student sources and education quality than those excluded from the project. Based on those considerations, the three different types of universities were identified as: private university (PRU), ordinary public university (OPU), and good public university (GPU) in this study.

TABLE 2 Information of the interviewees.

Code	Age	Teaching experience (years)	Degree	University type[a]	Position	Academic title
HB1	43	15	Master's	PRU	EFL teacher	Associate professor
HB2	36	11	Master's	PRU	EFL teacher	Associate professor
HB3	38	12	Master's	PRU	Officer	Lecturer
HB4	41	13	PhD	PRU	EFL teacher	Professor
HB5	49	24	Master's	PRU	Officer	Professor
HB6	39	12	Master's	PRU	EFL teacher	Lecturer
DU1	36	11	PhD candidate	OPU	EFL teacher	Associate professor
DU2	34	8	PhD candidate	OPU	EFL teacher	Lecturer
LT1	32	6	Master's	PRU	EFL teacher	Lecturer
LT2	30	5	Master's	PRU	EFL teacher	Lecturer
LT3	43	17	Master's	PRU	Officer	Associate professor
CH	32	6	Master's	OPU	EFL teacher	lecturer
AH	33	6	Master's	GPU	EFL teacher	Lecturer
HU	50	25	PhD	GPU	EFL teacher	Professor, PhD supervisor
CU	30	4	Master's	GPU	EFL teacher	Assistant professor

[a]PRU means private university; OPU means ordinary public university; GPU means good public university (see Footnote 1).

216 questionnaires were analyzed by exploratory factor analysis (EFA) to figure out the factors underlying EFL teachers' DTCR.

In addition, this study interviewed 15 English teachers and officers in charge of teachers' academic research, and all the interviews were permitted be recorded. The recorded interviews were transcribed into texts by https://www.iflyrec.com/zhuanwenzi.html, and were proofread by the researcher. Those texts were then input into NVivo 12 Plus to analyze. Thematic analysis (Braun and Clarke, 2006) were applied to analyze the 15 files, and they were iteratively read coded, compared, categorized, and integrated.

4. Results

4.1. Motivation changes for conducting research

This study drew a general motivation fluctuation graph to demonstrate EFL teachers' motivation changes of conducting academic research. Every teacher's motivation value was noted down based on their teaching experience (years), and finally an average curve of those 318 EFL teachers' motivation levels were drafted (see Figure 2).

This curve demonstrated the general tendency of EFL teachers' motivation to conduct academic research. It could be found from the curve that teachers' overall motivation levels were not very high, and the average curve never surpassed 1 during teachers' 20 years' teaching experience (Clearly, there were 2 summits of motivation in the curve at the years of 3 and 8. But neither of them exceeded "interesting" level.). In addition, this curve even exhibited that EFL teachers generally had low motivation to conduct academic research in three periods (1st year, 4th to 5th years, and 10th to 12th years) in their career, with motivation level below 0. Apart from the overall motivation levels in each year, this curve also displayed some fluctuations in EFL teachers' teaching career, especially before the year of 12. For example, there were 2 significant declines in the curve (3rd to 5th year, and 8th to 11th year). Since DTCR covers both low investment and interests in academic research and gradually decreased investment and interests in it, generally 9 years (i.e., 1st year, 3rd to 5th years, and 8th to 12th years) could be named as DTCR years in EFL teachers' career. Therefore, it could be concluded from the curve that college EFL teachers in China were very likely to suffer from DTCR in their teaching career.

4.2. Factors underlying DTCR

Table 3 demonstrated the results of KMO and Bartlett's test of sphericity. The KMO value reached 0.908, and the Sig. ratio of Bartlett's test was $0.000 < 0.05$. indicating that it was suitable to run factor analysis.

This study applied the method of principal components to extract factors based on Eigenvalues greater than 1. In addition, varimax was chosen as the method in rotation. This study extracted 5 components, explaining 78.02% of the total variance. Therefore, the 5 components could reasonably represent the original data. The rotated component matrix was displayed in Table 4. The factors were named based on the contents of the items affiliated to them. For example, item 5, 9 and 20 indicated that EFL teachers' DTCR was because of their insufficient time, academic resources and social connections. Therefore, the corresponding factors were named as "insufficient research resources."

Cronbach Alpha coefficient for the reliability of the scale was 0.934. In addition, Cronbach Alpha and Omega coefficients for the five factors were displayed in Table 5.

These scores showed that Cronbach Alpha and Omega coefficients for each factor were quite high. These results could be regarded as an indicator that the scale was reliable.

The EFA results indicated that EFL teachers were demotivated by five factors for their DTCR, including weak research ability, negative emotions and attitudes, poor research surroundings, research management problems and insufficient resources. These findings

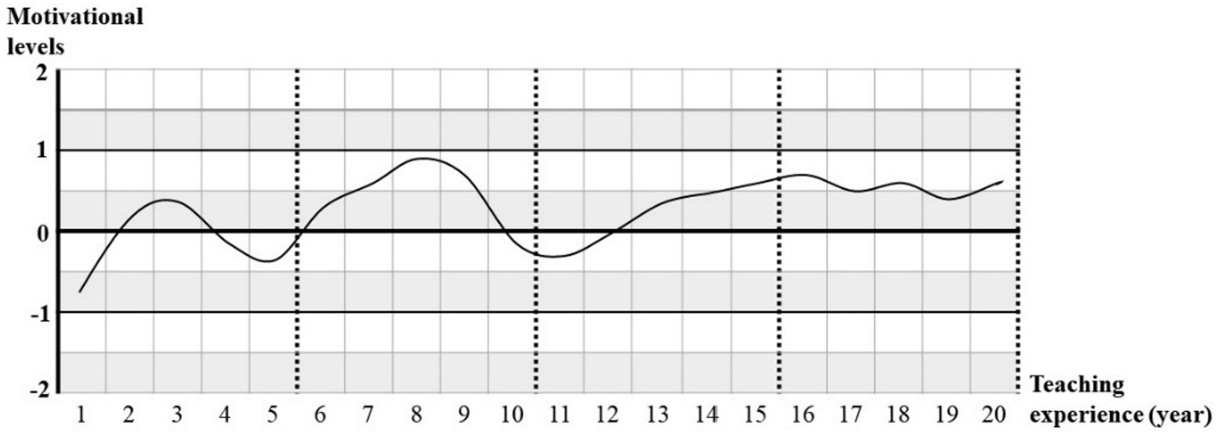


FIGURE. 2
Average curve of EFL teachers' motivation change. Motivation level 2=very interesting, 1=interesting, 0=neither interesting nor boring, −1=not interesting, −2=very boring.

TABLE 3 KMO and Bartlett's test.

KMO		0.908
Bartlett's test	Chi-Square	3406.093
	df	190
	Sig.	0.000

TABLE 4 Rotated component matrix.

Factors	Items	Factor loading				
		1	2	3	4	5
1. Weak research ability	Q3	0.811				
	Q2	0.797				
	Q4	0.781				
	Q18	0.771				
	Q1	0.732				
	Q19	0.729				
2. Negative emotions & attitudes	Q14		0.872			
	Q11		0.840			
	Q16		0.829			
	Q17		0.724			
3. Poor research surroundings	Q6			0.816		
	Q8			0.794		
	Q13			0.721		
	Q15			0.683		
4. Research management problems	Q12				0.881	
	Q7				0.870	
	Q10				0.849	
5. Insufficient research resources	Q5					0.841
	Q9					0.804
	Q20					0.793

Extraction method: Principal component analysis, Rotation method: Varimax with Kaiser normalization, Rotation converged in 6 iterations.

demonstrated that, besides EFL teachers' own factors (i.e., weak research abilities, negative emotions, and attitudes), external factors could also cause their DTCR.

4.3. Solutions to overcome DTCR

This study interviewed 12 EFL teachers and 3 officers administrating college teachers' research and academic projects. The 15 interviews were transcribed into Chinese texts and were analyzed through thematic analysis method (Braun and Clarke, 2006). Based on the steps of thematic analysis, the interview data was firstly coded with blank mind. Overall, 36 initial codes were generated, and those codes were further abstracted into 7 themes. Some examples of coding results and processes were displayed in Table 6.

From the themes generated from suggestions, it could be concluded that four stakeholders were involved to overcome EFL teachers' DTCR, including universities, research communities, government, and publishers. After analyzing the underlying logic of the suggestions proposed for overcoming EFL teachers' DTCR, this study drew a mind map (see Figure 3) to demonstrate the relations between different suggestions.

Drawing upon ecological systems theory (Bronfenbrenner, 1979), this study constructed an ecological model to demonstrate the relations among stakeholders who could make efforts for overcoming EFL teachers' DTCR (Figure 4) based on the thematic analysis results.

This model demonstrated that different stakeholders (including government, publishers, universities, and research communities) in EFL teachers' working ecology could help them to overcome their DTCR. For example, universities could decrease teachers' teaching loads to give them more time to conduct research; academic leaders could give advice to novice researchers on their academic activities. What was noteworthy was that measures could also be taken among those stakeholders (except EFL teachers *per se*) to promote teachers' research behaviors. For instance, government could issue some regulations to prohibit some journals' academic misconduct, such as selling publication qualification to teachers.

TABLE 5 Cronbach alpha and omega coefficients for the five factors.

Items	Weak research ability	Negative emotions and attitudes	Poor research surroundings	Research management problems	Insufficient research resources
Cronbach's α	0.939	0.917	0.863	0.918	0.801
Omega	0.940	0.916	0.865	0.921	0.802

TABLE 6 Thematic analysis results (excerpt).

Original texts	Codes	Themes	Notes
I have more than 12 classes every week. How can I spare time on research? … I hope our university could reduce my class work.	Reduce class work	teaching load reduction	This means that universities should reduce EFL teachers' teaching loads. They can allocate teachers less classes or divide positions into teaching and research ones, so that teachers in research positions could have more time on research.
My suggestion is that universities could separate research position from teaching position. In this way, teachers in research position only have very limited classes, and hence could spend more time on research.	Separation of teaching and research position		
I think universities should conduct more research training programs.	Provide training programs for research	appropriate research training provision	Universities should provide some programs to train teachers' research skills. But universities should notice that the contents should be more specific and well directed. The contents had better focus on foreign languages rather than other fields.
Our universities indeed have conducted several research training programs. But I think the values were limited. For example, a lecture in one program I attended only taught us how to fill in the application form for research funds! However, I want to learn some skills to conduct research. That was a waste of time.	Training program should focus on research skills		
Research training program should pay more attention to the discipline of foreign languages. I have attended many training classes, but many of them were very general. Some of them were even conducted for science and engineering disciplines.	Training program should focus on foreign languages		
I think English teachers only with master's degree do not have enough ability to conduct academic research. I suggest universities should encourage their teachers to further their studies to get PhD.	Encourage further studies	degree promotion encouragement	PhD programs could give well-round research trainings. Therefore, some officers and teachers encourage EFL teachers' PhD studies.
I heard *** university provide about 20,000 RMB award for those who publish papers on SSCI indexed journals. I think this could improve teachers' motivation.	Paper publication incentive	Award and punishment policies	Universities could award those with research motivation while fine those who do not conduct research.
As for some hard science disciplines, many universities require teachers to apply for academic research funds and to publish papers every year. I think this measure could also be used in EFL disciplines. … Specifically, EFL teachers who do not conduct research and publish papers should be fined.	Punishment on those without research production		

(Continued)

TABLE 6 (Continued)

Original texts	Codes	Themes	Notes
I think we should create a research team and focus on one research topic. In this way, we can communicate and discuss with other members and maintain our research motivation.	Research team needed	Research communities constructing	A research community should be constructed. In this community, EFL teachers could communicate their academic ideas and keep motivation.
When I firstly began to conduct research, I just liked a headless chicken. I did not have a fixed research interest then. I think a research leader could help to answer my research problem.	Research leader needed		
It is almost impossible for English teachers in private universities to publish papers in CSSCI indexed journals. Those journals paid too much attention to authors' degree, academic titles, affiliations. I really hope Chinese journal could truly promote double blind review.	Paper review method reform	Academic fairness promotion	Some unfair practice impedes EFL teachers' research motivation. Those inappropriate practice should be curbed.
I hope National Social Science Fund could favor teachers in ordinary universities. This is because I found many funds were issues to applicants in good universities.	Fund support to ordinary teachers		
To promote professional titles, some English teachers even buy publication qualification or papers from some editors or agencies. … I think this phenomenon should be prohibited by government.	Academic misconduct prohibition	Illegal research practice prevention	Some teachers resort to abnormal ways to publish papers or get degrees. Those ways are usually illegal.
I think you must have heard about the news recently: some teachers "buy" PhDs from the Philippines. I think this trend should be immediately curbed because those "water PhDs" could not really enhance teachers' research abilities and motivation.	Illegal foreign PhD programs curb		

5. Discussion

This study investigated the dynamic processes of college EFL teachers' (de)motivation, explored the factors underlying their DTCR and proposed the solutions to overcome it. It is found that EFL teachers' motivation to conduct research fluctuated largely and they were very likely to suffer from DTCR in their career. Five factors were found underlying EFL teachers' DTCR, including weak research ability, negative emotions and attitudes, poor research surroundings, research management problems, and insufficient resources. To help teachers overcome their DTCR, comprehensive measures should be taken by stakeholders in the ecology around EFL teachers, including universities, research communities, government, and publishers.

This study explored college EFL teachers' motivation changes in their career and found teachers' motivation levels were generally not high but with large fluctuations. Teachers' motivation fluctuations in their career echoed with the regulations conferring of professional titles in China. Working period requirements for college teachers with different degrees (i.e., master's and doctoral) to promote professional titles were almost the same. For example, master's degree holders should work in universities or colleges for at least 2 years before they could be conferred the title of lecturer and then should work no <5 years to apply the title of associate professor. While PhD holders should work at least 2 years before they could be conferred the title of associate professor and then at least 5 years to be conferred professor title. Because EFL teachers need conduct academic research and publish papers to meet the requirements in the regulations in the specified time period, they tended to motivate themselves. This explained the first summit of the motivation change curve in the second and third years. The underlying reasons were the same for the second summit in the curve, when teachers were preparing for their second academic titles. For EFL teachers, achieving the academic title of professor is difficult and needs more time spent on research (Gao and Li, 2018), therefore their motivation remains comparatively high for long time after the 13th year. According to the motivation dynamic curve, EFL teachers demonstrated significant demotivation in their career in three periods, including 1st year, 3rd to 5th years, and 8th to 12th years. Most of the demotivated periods were just after they got new professional titles. This fluctuation curve of EFL teachers' DTCR might underlie the "roller coaster" phenomenon in research output of college teachers before and after the title appraisal (Yang and Wang, 2015). Besides, the curve demonstrated that many EFL teachers' experienced DTCR when they did not need to prepare for the professional titles in the near future, which

supported Yuan et al. (2010)'s concern about current annual and tenure checking systems. They thought those systems might not motivate teachers when they are not eager to achieve higher academic titles.

The fluctuated curve of EFL teachers' research motivation echoed many studies on EFL teachers' motivation changes. For example, it shared similar findings with Kimura (2014)'s longitudinal case study to investigate EFL teachers' teaching motivation in Beijing that teachers' motivation of teaching was also fluctuated. Similar conclusions were also drawn in Song and Kim (2016)'s case studies on two South Korean experienced EFL teachers that EFL teachers' teaching motivation changed over time. But those study only included quite limited participants in their case study, while the present study demonstrated fluctuations of research motivation were popular among EFL teachers. Though Kim and Kim (2022) investigated (de)motivation dynamics among 144 Korean English teachers and found English teachers with 4–6 years of teaching experience suffered more demotivation in their teaching than teachers in other stages, this study only paid attention to EFL teachers' motivation fluctuation of conducting research rather than teaching as the other studies did. But overall, those studies (no matter about EFL teachers' teaching or researching) indicated that a dynamic view should be considered when motivation was investigated.

This study found five factors underlying EFL teachers' DTCR, including weak research ability, negative emotions and attitudes, poor research surroundings, research management problems and insufficient resources. Those factors involved both internal and external factors. This finding echoed the opinions of Clare et al. (2019) and Sakai and Kikuchi (2009) on demotivation that both internal and external factors should be considered when exploring people's demotivation. Among the five factors causing EFL teachers' DTCR, an internal factor, i.e., weak ability, was frequently reported as one reason for demotivation among various groups of people. For example, weak ability (sometimes this factor was named as weak competence, lack of confidence, etc.) was often found to be a factor for students' demotivation to learn English (e.g., Ghadirzadeh et al., 2012; Ren and Abhakorn, 2022) and teachers' demotivation to teach English (e.g., Chireshe and Shumba, 2011; Nagamine, 2018). These similar findings supported Bandura (1977)'s self-efficacy theory that people's subjective evaluation of their abilities could influence their motivation.

This study interviewed several teachers and officers for their suggestions to overcome DTCR, and constructed a model based on their various suggestions. This ecological model echoed Bronfenbrenner (1979)'s ecological systems theory that a person is influenced by different setting s/he lives in, the relations among the settings and even the larger contexts where those settings are included. Although Bronfenbrenner (1979)'s theory emphasizes the influences of ecological systems on children's development, this study demonstrated that this theory could also be shifted and applied to explain the relations among the stakeholders as to overcome EFL teachers' DTCR. However, there existed some differences between the model in this study and Bronfenbrenner (1979)'s ecological systems model. First, there are four systems in ecological systems model, including microsystems, mesosystems, exosystems, and macrosystem, while there were only three systems in the model of this study, without the most outside one (i.e., macrosystem). This is because the macrosystem in ecological systems model refers to dominant beliefs and ideologies. Considering the relative stability and consistency of it (Zwicker et al., 2020), the interviewees in this study might thought those invisible values and beliefs could not be changed shortly and largely and do much help to overcome DTCR. Second, ecological systems model exhibited that different settings and contexts could interact with each other, while the relations between different stakeholder in this study were unidirectional. This might be because the interviewees in this study were EFL teachers and officers, without university managers, journal editors or government officials. Those EFL teachers and officers could only unidirectionally sense the influences from the stakeholders in other systems, but their influences on other stakeholders could not be elicited.

6. Conclusions and prospects

This study found there existed fluctuations in motivation levels for conducting research among EFL teachers in China, and many of them were very likely to suffer from DTCR in their career. There were five factors causing EFL teachers' DTCR, including weak research ability, negative emotions and attitudes, poor research surroundings, research management problems, and insufficient resources. To help teachers overcome their DTCR, comprehensive measures should be taken by stakeholders in the ecology around EFL teachers. Specifically, except for college EFL teachers themselves, this study also provided implications for other entities, including universities, research communities, government, and publishers

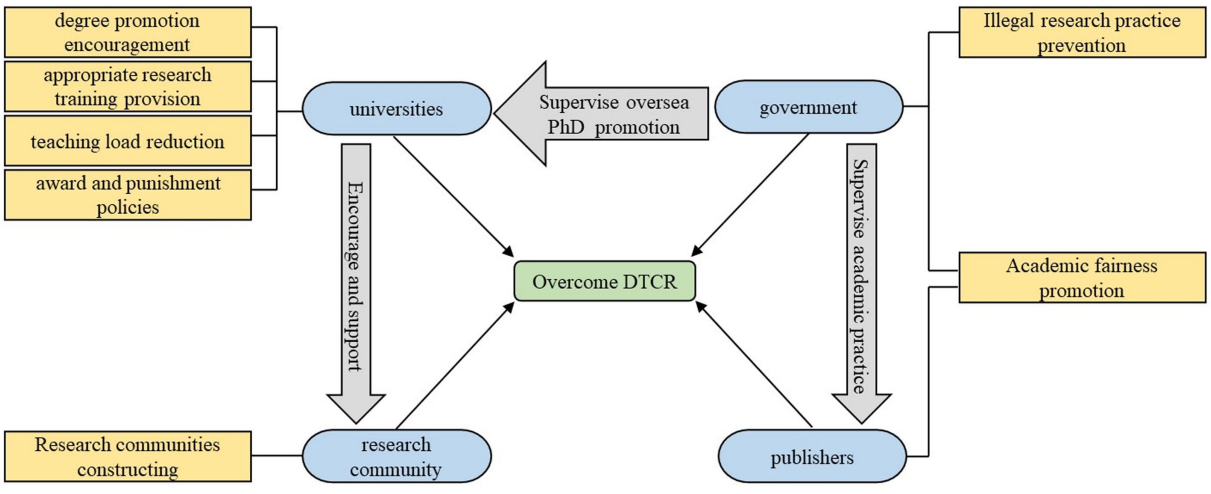


FIGURE. 3
Mind map for thematic analysis results.

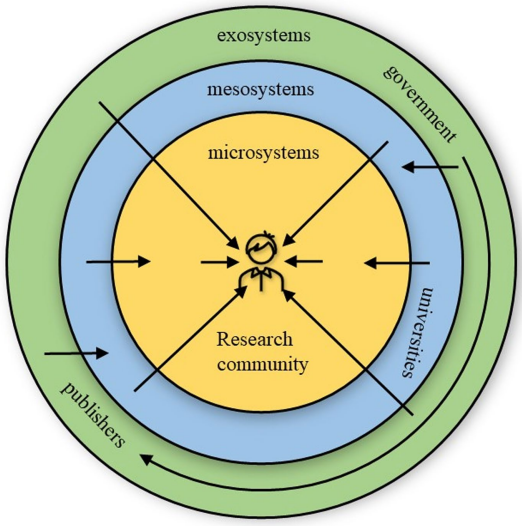


FIGURE. 4
Ecological model for overcoming EFL teachers' DTCR.

that they could make their corresponding efforts to help EFL teachers to overcome their DTCR. For example, universities could decrease teachers' teaching loads to give them more time to conduct research; government could issue some regulations to prohibit some journals' academic misconduct, such as selling publication qualification to teachers.

A motivation change graph was demonstrated in this study to showcase the dynamicity of college EFL teachers' motivation to conduct research. Although the method of drawing graphs was often applied in students' motivational research, this method was seldom used in studies among other groups of people, e.g., EFL teachers. This study improved this method and exhibited its good validity. Therefore, future studies could utilize this method to explore motivational dynamicity among different groups of people.

This study found EFL teachers tended to suffer from DTCR in some periods of years (i.e., 1st year, 3rd to 5th years, and 8th to 12th years), and investigated the reasons underlying DTCR. However, the factors for DTCR in different periods might be differentiated. For example, the factors for EFL teachers' DTCR in the first year were very likely different from those for 8th to 12th years. Therefore, future studies could be conducted to investigate and compare the factors for DTCR in particular periods and explore the reasons underlying the differences.

This study constructed a model to demonstrate the stakeholders who should make their efforts to help overcome college English teachers' DTCR by interviewing college English teachers and officers managing college teachers' research. Although the model involved universities, government, and publishers in different systems, this study did not interview people in those sectors and triangulate the model. Therefore, these people should be included, and the influences of the interactions between different stakeholders on EFL teachers' motivation to conduct research should be investigated in future DTCR related research.

7. Limitations

To answer the questions in the questionnaire applied in this study, participants needed to retrospect their past research experience. Considering some teachers had long working experience (e.g., some had more than 10 years), they might not remember very clearly of their research motivation features in a specific year, especially in such a limited time for filling the questionnaire.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

XR was responsible for designing the research, analyzing the data, and writing the original manuscript. FZ collected the data, and provided many suggestions for revising the manuscript.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1071502/full#supplementary-material

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School climate and left-behind children's achievement motivation: The mediating role of learning adaptability and the moderating role of teacher support

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School climate has been reported to have an important impact on children's achievement motivation, but the mechanism for the impact of school climate on left-behind children has not been fully explored. The purpose of this study is to investigate the roles of left-behind children's learning adaptability and teacher support in mediating and moderating the relationship between school climate and achievement motivation. In this study, 1,417 left-behind children were surveyed. The results showed that: (1) after controlling for gender and age, the school climate still had a positive effect on the achievement motivation of left-behind children (c'=0.177, p<0.001). (2) School climate perceived by left-behind children directly predicted their achievement motivation, and indirectly through their learning adaptability ($a1$=0.338, p<0.001; b=0.341, p<0.001). In other words, left-behind children's learning adaptability may play an intermediary role between school climate and achievement motivation. (3) The indirect effect of school climate on achievement motivation through learning adaptability was moderated by teacher support ($a2$=0.153, p<0.001), and this indirect effect was more significant for left-behind children who perceived high teacher support. The research reveals the importance of school climate and teacher support to the growth and development of left-behind children, thus holding theoretical significance for improving the achievement motivation of left-behind children.

KEYWORDS

left-behind children, school climate, teacher support, learning adaptability, achievement motivation

1. Introduction

As an important part of the social growth of individuals, achievement motivation was originally called "Need to achievement," which was proposed by psychologist Murray (1938) in his book "Investigation of Personality." Later, McClelland et al. (1953) borrowed Murray's concept. He formally proposed the Achievement Motive, which he defined as: "a need or drive for success learned by an individual in competition with his good principles (McClelland et al., 1953). "He also points out that an individual's childhood experience can have an impact on his motivation to achieve. As a special group of left-behind children in the process of social development, achievement motivation is the power source for the stability and development of their internal psychological and personality characteristics (Fini and Yousefzadeh, 2011), which is the internal power to ensure the healthy growth of left-behind children. For left-behind children, their parents went to other places to work,

causing the alienation of the parent–child relationship and the lack of family functions. In addition to the family environments, school as the main place for children to study and live may replace some functions and responsibilities of the family. It plays a key role in making up for the lack of family support functions for left-behind children (Wang, 2018).

Although studies (Pescaru, 2015; Tan et al., 2020; Zhou et al., 2022) have identified the influence of many family factors on left-behind children, very few have investigated the role of school factors on the growth and development of left-behind children. As the main place for children's study and life, it is necessary to conduct an in-depth exploration of schools. School climate is a key factor in the school, and some researchers have explored the role of the school climate on children's achievement and development (Aişi Lăzărescu, 2012; Maxwell et al., 2017). In addition, the school climate has a more significant influence on left-behind children (Wang, 2018). Prior studies suggest that the school climate has a significant impact on students' achievement motivation (Anderson, 1982; Cohen et al., 2009). A good school climate positively promotes the social–emotional, and achievement development of adolescents (De Pedro et al., 2016). However, some researchers have pointed out that it is not enough to discuss the direct relationship between variables, and that potential mediating variables need to be introduced to answer the question of how campus climate works (Johnson and Stevens, 2006; Loukas and Murphy, 2007). Learning adaptability refers to the ability of learners to adapt to the school environment and learning activities under the school climate. Adequate learning adaptability can have a significant impact on the development of personal achievement. Previous studies have shown that learning adaptability has a significant mediating effect on the relationship between external environmental factors and student development (Zhao et al., 2020). This study intends to further explore whether the mediating effect of learning adaptability is significant in the relationship between school climate and achievement motivation. Therefore, this study introduced the variable of learning adaptability, used it as a mediation variable between the school climate and achievement motivation, and examined its mediation effect on the relationship between them.

As the behavioral subject of school development (Furman and Buhrmester, 1992), teachers not only play an important role in school education and teaching but also are one of the main factors affecting the development of students' cognitive and noncognitive abilities. The supporting role of teachers can buffer the effects of family adverse factors caused by migrant parents on students' academic performance (Luthar et al., 2000), which is the key factor affecting the achievement and development of left-behind children in rural areas. At the same time, high-quality teacher support can enhance students' understanding of ability and learning autonomy, to enhance their achievement motivation and learning participation (Lee and Simpkins, 2021). To explore whether different levels of teacher support have different effects on the relationship between school climate and learning adaptability, this study introduced teacher support as a variable to explore its mechanism.

The studies above have shown that school factors have an important influence on the achievement motivation of left-behind children. Therefore, this study is necessary to further explore the potential mechanisms of school climate on achievement motivation development of left-behind children. We hope to find a direct or indirect relationship between the school climate and the performance motivation of left-behind children, and to determine the intermediary effect of learning adaptability and the adjustment effect of teacher support. To address this issue, this study used the PROCESS plugin in the SPSS software to fill the gaps in the literature by testing mediation variables (i.e., learning adaptability) and adjustment variables (i.e., teacher support for school climate and learning adaptability).

1.1. The relationship between school climate and achievement motivation

Schools are one of the places where students develop close relationships with others beyond their family ties (Bronfenbrenner and Evans, 2000; Eccles and Roeser, 2011). School climate is a relatively stable and lasting environmental feature that members of the school can perceive in terms of organization, teaching, and interpersonal relationships (Roeser et al., 2000; Cohen et al., 2009). Self-determination theory is a kind of motivational process theory about human self-determined behavior. It was developed by American psychologists Deci Edward L. and Ryan Richard M. in the 1980s. According to self-determination theory, the external environment can enhance the internal motivation of individuals, promote the internalization of external motivation and ensure the healthy growth of individuals by supporting the satisfaction of the three basic psychological needs of autonomy, competence, and relatedness (Deci and Ryan, 2000a,b). It can be seen that the theory emphasizes the role of the situation and its role in satisfying individual needs and points out that the degree to which basic psychological needs are satisfied affects the effective execution of various tasks. According to this view, school, as an important external environment for children's growth, can create the best conditions to meet students' basic needs (Kulakow, 2020), thereby enhancing children's motivation to pursue success. It can be seen that a good school atmosphere helps to improve children's achievement motivation. The literature suggests that a good school environment can affect adolescent motivation in many ways (Cohen et al., 2009). For example, school culture (Wang M. T. et al., 2022), campus relationships (Anderson, 1982), and classroom environments (Alonso-Tapia and Ruiz-Díaz, 2022) are all related to high achievement motivation (Doğan and Sezer, 2010). Adolescents perceive the school environment as contributing to personal achievement motivation when it provides clear expectations, consistency and predictability of responses, emotional support, opportunities to learn and master meaningful material, and adequate or appropriate support for students' individual goals and interests, Students' academic self-concept and subjective task attention have been improved (Wang and Eccles, 2013). Based on the research above, it can be concluded that an effective and active school climate can facilitate the implementation of school learning activities and the realization of educational goals so that students can achieve success. Therefore, the following hypothesis is proposed:

> *H1*: School climate has a positive predictive effect on the achievement motivation of left-behind children.

1.2. Mediating role of learning adaptability

Learning adaptability refers to the ability of individuals to make appropriate adjustments to their behaviors, cognition, or emotion when facing uncertainties in the learning process (Martin et al., 2013). Previous studies (Liu et al., 2014; Stockinger et al., 2021; Şahin and Gülşen, 2022) have shown that learning adaptability plays an important role in students' development. Learning adaptability significantly predicts students' self-efficacy, academic achievement,

and self-regulated learning behaviors (Martin, 2017; Burns et al., 2018). Students with stronger learning adaptability can better deal with uncertain factors in their learning environments by generating positive achievement motivation and actively responding to the challenges of the environments (Collie et al., 2017). The study above discussed the importance and practical value of learning adaptability. This study chose learning adaptability as the intermediary variable. The main reason is that learning adaptability is the internal driving force for the development of adolescent achievement motivation in the school climate (Zhao et al., 2020). For left-behind children, due to the lack of family support, their schools assume the main educational responsibilities. Proper learning adaptability is helpful for left-behind children to rapidly integrate into a new community, facilitating the development of positive interpersonal relationships and the formation of learning motivation (Mu and Zhao, 2015).

Based on self-determination theory, meeting innate psychological needs is believed to be essential for students' development and well-being (Deci and Ryan, 2000a). Self-determined motivation was positively predicted by the satisfaction of psychological needs and negatively predicted by the thwarting of psychological needs (Trigueros et al., 2019). A good school climate is conducive to meeting the basic needs of individuals for competence, autonomy, and relatedness (Kulakow, 2020), and meeting these needs has an important impact on individual adaptability. In education, research has proved that the psychological needs of students are met with various aspects of adaptation. Students' basic psychological needs are closely related to students' participation, academic self-efficacy, career adaptability and other adaptive outcomes (Şahin and Gülşen, 2022). Studies have shown that perceived psychological needs predict higher academic adjustment scores, For example, deep learning method, high level of intrinsic motivation (Doménech-Betoret and Gómez-Artiga, 2014), high level of academic adaptation, adaptive learning strategy, active classroom participation (Ratelle and Duchesne, 2014; Sulea et al., 2015). Unmet basic psychological needs are the main reasons for the decrease in students' learning interest and learning engagement, their aversion to school life, and their learning burnout (Luo et al., 2014; Maralani et al., 2016), which are all manifestations of learning maladjustment in children. Therefore, based on self-determination theory, when the school provides a supportive environment to meet the individual's needs for autonomy, competence, and relatedness, these variables further promote the emergence of students' learning adaptive behaviors. Some studies can prove that students' perception of school climate is significantly related to their learning adaptability (Kuperminc et al., 2001). Several studies have found that student behaviors and learning performance can be predicted by different classroom climates (Alonso-Tapia and Ruiz-Díaz, 2022), which can improve student participation in learning and allow students to adapt better (Eccles, 2004; Roorda et al., 2011). Moreover, positive interpersonal relationships in the school climate are also the main factors that promote learning adaptability (Lee et al., 2019). According to the self-determination theory (Deci and Ryan, 2000b), when left-behind children perceive the care from their teachers and classmates, their basic psychological needs are likely to be met, and they can develop the agency and capacities to cope with challenges and solve problems (Hawkins et al., 2001; Amemiya and Wang, 2018).

To sum up, a positive school climate will promote the development of students' learning adaptability, and subsequently affect the development of their achievement motivation. Therefore, this study proposes the following hypotheses:

> *H2*: School climate has a positive predictive effect on the learning adaptability of left-behind children.
>
> *H3*: The learning adaptability of left-behind children can significantly predict their achievement motivation.

1.3. The moderating role of teacher support

Teacher support refers to students' perception of teachers' care and helps as well as their trust in teachers (Trickett and Moos, 1973; Ryan and Patrick, 2001). To reveal the effect mechanism of school climate on the motivation of left-behind children, this study focuses on the "condition" of variable relationships based on constructing an intermediary action model of learning adaptability.

By adding a moderating variable (i.e., teacher support), the study built a moderated mediation model to investigate how the interplay between school climate and teacher support affects the development of left-behind children. Research (Quin et al., 2018; Pap et al., 2021) shows that teachers can increase students' learning engagement and motivation through supportive behaviors and improve their academic performance. In addition, the mentoring role of teachers can contribute to the development of children's academic achievement (Trigueros et al., 2020). In the absence of parental support, teacher support helps left-behind children maintain enthusiasm for learning (Hardre and Reeve, 2003). Teachers are considered important persons in the life of left-behind children, whose concern and encouragement can enable left-behind children to fully tap their potential (Liu et al., 2021). Meanwhile, the more teachers support left-behind children perceive, the easier it is for them to adapt to school life and the higher their learning adaptability will be (Zhang et al., 2021). Following this line of argument, it can be seen that teacher support has an important impact on the physical and mental development of left-behind children and the formation of achievement motivation.

In addition, social support theory suggests that individuals' perceived supportive behaviors from their social networks are universally gainful and contribute to individuals' psychological health and development (Ma et al., 2021). If individuals perceive that their organization promotes a healthy learning culture through feedback and guidance, their motivation to learn and share new knowledge will be further enhanced (Banerjee et al., 2017). As such, it can be argued that if left-behind children believe their teachers forge a genuine learning culture, they will continue to strengthen their sense of belonging to their schools, which ultimately contributes to their motivation to pursue academic success. In addition, teachers are important supporters of students in the school environment, and their supportive behaviors influence how students' basic psychological needs are met. Prior research (Wang Q. et al., 2022) has shown that students show higher levels of motivation when their psychological needs are met by the environment in which they live. A favorable school climate is conducive to the satisfaction of students' basic psychological needs. The more support the left-behind children get from their teachers, the more likely it is for them to develop trust and a sense of belonging to their teachers and schools, and the higher their willingness to achieve academic success. Therefore, this study proposes the following two hypotheses:

> *H4*: Teacher support plays a moderating role in the relationship between school climate and left-behind children's achievement

motivation. When teacher support is high, school climate has a greater influence on their achievement motivation.

H5: Teacher support plays a moderating role in the relationship between school climate and left-behind children's learning adaptability. When teacher support is high, school climate has a greater impact on their learning adjustment.

Based on the above analysis, the study developed a moderated mediation model, which is illustrated in Figure 1. The main purposes are two-fold: (1) to investigate the possible mediating role of learning adaptability between school climate and achievement motivation of left-behind children; (2) to verify whether the teacher support adjusts the mediation model. This model could deepen our understanding of the relationship between school climate and achievement motivation. It not only reveals how school climate is related to the achievement motivation of left-behind children but also helps identify how teachers' support could regulate the relationship between the two factors.

2. Methodology

2.1. Participants and research setting

This study investigated 1,417 left-behind children in rural areas of Gansu Province, China. As this province's economy is relatively backward, there are a large number of local farmers and workers going out to work. Several primary schools and middle schools were approached through the local educational bureau. Their permission was obtained. Four classes from each grade in the schools were randomly selected to fill out the survey. According to local government standards, left-behind children in rural areas refer to those under the age of 18 who have one or both parents working outside for at least 6 months (Yang and Liu, 2020; Wang and Liu, 2022). Children were selected according to the following inclusion criteria: (1) children are younger than 18 years old; (2) one or both of the parents of children have been away for at least 6 months. The demographic information is shown in Table 1. The study included 664 male and 753 female participants aged between 9 and 17 ($M = 12.05$, SD = 1.81). According to the situation of parents' mobility, left-behind children can be divided into three types: left behind with father ($N = 83$, 5.9%), left behind with mother ($N = 575$, 40.6%), and left behind with grandparents ($N = 759$, 53.6%). In terms of education levels, the students are divided into three categories: primary education (no schooling, primary school), secondary education (junior high school, senior high school, or technical secondary school), and higher education (university and above). 54.7% of respondents' fathers had received primary education, 41.6% had received secondary education and 3.7% had received higher education, while 62.9% of respondents' mothers had received primary education, 33.6% had received secondary education and 3.5% had received higher education.

The study was approved by the Institutional Review Committee. Before conducting the survey, the researchers obtained the informed consent of the participants' caregivers and guardians. The data collection process was completed during school hours in an online classroom environment. The head teachers supervised the whole process by explaining the purpose and details of the study and answering any questions participants had as they filled out the questionnaire. Participants were told there was no right or wrong answer and were allowed not to discuss the topic with each other, and each completed four questionnaires. Participants took about 25 min to complete the test.

2.2. Instrumentation

2.2.1. School climate

The school climate scale (Li et al., 2016) was used to measure students' perceptions of school climate. After factor analysis of the original scale, items with factor loadings lower than 0.40 were deleted from the scale (Pituch and Stevens, 2015). The final scale included four dimensions: teacher-student relationship (e.g., "Teachers often care about our daily lives"); Student–student support (e.g., "I get on well with my classmates"); Teaching atmosphere (e.g., "The school often holds various competitions"); Learning atmosphere (e.g., "Everyone in the class likes to study"). Each item on the scale was rated on a 5-point Likert scale (1 = "completely disagree," 5 = "completely agree"). The scores of the scale were calculated after the item scores were averaged. The higher the total score was, the more positive the school climate would be. This scale has been widely used in the context of China (Zhang et al., 2020). In this study, the Cronbach's alpha coefficient of this scale was 0.913, which was acceptable.

2.2.2. Learning adaptability

The study mainly used the learning adaptability scale developed by Feng et al. (2006) to evaluate the learning adaptability of the subjects. There were 9 questions in total, including 4 questions from the dimension of learning attitude (such as "I never ignore difficulties in

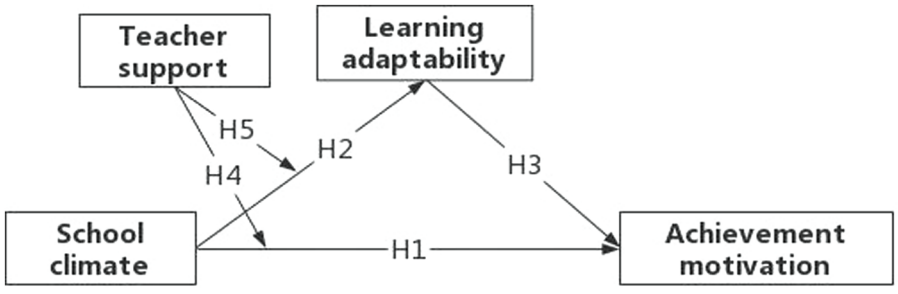


FIGURE 1
Conceptual model diagram.

TABLE 1 Means, standard deviations, and correlations among variables.

	M (SD)	1	2	3	4	5
1. Gender	1.53 (0.50)	-	-	-	-	-
2. Age	12.05 (1.81)	0.024	-	-	-	-
3. School climate	4.01 (0.63)	−0.009	−0.099***	-	-	-
4. Achievement motivation	3.92 (0.53)	0.016	−0.094***	0.475***	-	-
5. Learning adaptability	4.08 (0.66)	0.036	−0.095***	0.606***	0.561***	-
6. Teacher support	4.44 (0.62)	−0.001	−0.056*	0.765***	0.459***	0.608***

Gender is a dummy variable, male = 1, female = 2; ***$p < 0.001$, *$p < 0.05$.

learning") and 5 questions from the dimension of learning ability (such as "I can solve new problems with what I have learned"). Each item was rated on a 5-point Likert scale (1 = "completely disagree," 5 = "completely agree"). Previous studies have proved that this scale has good reliability and validity and can effectively measure students' learning adaptability (Liu et al., 2014). In this study, Cronbach's alpha coefficient was 0.899, indicating that the revised scale had adequate reliability.

2.2.3. Teacher support

The perceived teacher support scale developed by Wong et al. (2018) was used. The scale included two dimensions: instrumental support (e.g., "When I meet difficulties in learning, the teacher can help me in time") and evaluative support (e.g., "The teacher can find our bad habits and help us correct them"). Each item was rated on a 5-point Likert scale (1 = "completely disagree," 5 = "completely agree"). The scale score was calculated after the item scores were averaged, with the higher score indicating that children perceived higher support from teachers. Previous studies have confirmed that the scale has high reliability and validity and can reflect teenagers' perception of teacher support (Sadoughi and Hejazi, 2021). In this study, Cronbach's alpha coefficient of the teacher support scale was 0.914, implying a satisfactory internal consistency and acceptable validity.

2.2.4. Achievement motivation

The achievement motivation scale (Yu and Yang, 1987) was developed to evaluate achievement motivation. This scale has been widely applied in the measurement of Chinese children and adolescents (Zhang, 1998). The scale includes two dimensions, social-oriented achievement motivation and personal-oriented achievement motivation, and contains a total of 37 questions. The 5-point Likert scale was used to score each item on the scale (1 = "completely inconsistent," 5 = "completely consistent"). The higher the average score of each dimension, the higher the corresponding "social-oriented" and "individual-oriented" achievement motivation would be. In this study, the scale showed high reliability, with Cronbach's alpha value of 0.921.

2.3. Data analysis

The effective data collected were analyzed by SPSS 24.0 software. Firstly, the Harman univariate test was used to test the existence of common method bias. Descriptive statistics and correlation analysis were conducted for the six variables to determine the relationship between the variables. In addition, collinearity diagnosis was performed to confirm the existence of multiple collinearities among variables. Secondly, model 8 in PROCESS version 3.5 of SPSS 24.0 macro program was used to test the mediating effect of learning adaptability and the moderating effect of teacher support after controlling for gender and age. Results show that the control two variables of gender and age, the school atmosphere and achievement motivation between the direct and indirect influence of left-behind children learning adaptability in school plays a role of intermediary between atmosphere and achievement motivation, learning adaptability and the intermediary variable in the intermediary role between the two by regulating variable regulation of teachers' support. Moreover, teacher support plays a moderating role in the relationship between school climate and achievement motivation. Finally, in order to further understand the regulation of moderating variables on the model, the point selection method and Johnson-Neyman (Dearing and Hamilton, 2006) method were used to test the simple slope, so as to have an in-depth understanding of the moderating effect of different levels of moderating variables on the model.

3. Results

3.1. Common method bias and multicollinearity diagnosis

On the one hand, the common method deviation is controlled by designing a partial reverse problem and adopting an anonymous measurement method. On the other hand, the common method bias is controlled by cross-validation of partial problems with different forms of the same problem. After data collection, the common method deviation was controlled from the aspect of statistical control by analyzing the non-rotating exploratory factor analysis results. The results were as follows: KMO and Bartlett Test of Sphericity results was 0.965 ($p < 0.001$), indicating that it was suitable for the factor analysis. Then 13 factors with characteristic roots greater than 1 were extracted by principal component analysis, and the cumulative variance explanation rate of the first factor was 26.51% (less than 50%; Podsakoff and Organ, 1986), indicating that the common method deviation was not serious and the data analysis results were reliable.

In addition, to confirm the presence of multicollinearity between variables, collinearity diagnosis was performed. The results show that the inflation factor (VIF) values of all variances are far less than the critical value of 10, and the tolerance is greater than 0.1. Therefore, there is no multicollinearity problem in the model (Chennamaneni et al., 2016).

3.2. Preliminary analysis

Table 1 presents descriptive statistics and correlation analysis results of demographic variables and each observation variable. Therefore, in

the survey results with a sample size of 1,417, the variables of school climate, achievement motivation, learning adaptability, and teacher support were all positively and significantly correlated with one another, with the correlation coefficients ranging from 0.475 to 0.765. The age of left-behind children was negatively correlated with school climate, achievement motivation, learning adaptability, and teacher support. This result shows that the perceived school climate and teacher support could decrease with the increase in children's age. This is mainly because left-behind children become mentally mature and their independence increases as they grow old, and their dependence on the school environment and school teachers will decrease. In addition, as children advance in grade, they face more life and physical problems. Multiple reasons, such as heavy homework burden, fierce competition among classmates, strict requirements of teachers, and extra attention to academic performance (Chaudhuri et al., 2022; Granziera et al., 2022; Kong and Lin, 2022), will lead to low attention of left-behind children to teachers. At the same time, as left-behind children get older, their learning adaptability and achievement motivation may also decrease. The reason could be that left-behind children in lower grades have easier academic tasks and less learning pressure, which enables them to maintain a positive attitude in life and study, thus promoting the development of learning adaptability and achievement motivation. Due to the significant correlation between age and school climate, learning adaptability, and achievement motivation, age was controlled in the subsequent moderating effect analysis. Although there is no significant correlation between gender and the variables of school climate, learning adaptability, and achievement motivation in the current correlation analysis, the variable of gender can have a certain impact on achievement motivation in previous studies (Kumari and Sangwan, 2021). Therefore, the gender of left-behind children was also controlled in the follow-up examination.

3.3. Moderated mediation model testing

As some assumptions in the model involve mediating variables and moderating variables, this study used model 8 in the SPSS 24.0 macro program PROCESS version 3.5 to conduct conditional process analysis to verify whether teacher support mediates the relationship between school climate and left-behind children's achievement motivation and the relationship between school climate and academic adjustment (Table 2). In order to ensure the reliability of analysis results and avoid problems in coefficient interpretation, the school climate and teacher support variables involved in the interaction item were set as mean-centered (Castro-González et al., 2019). The results showed that school climate had a positive impact on the learning adaptability of left-behind children ($a1 = 0.338$, $p < 0.001$), and the variable of learning adaptability also had a positive impact on the achievement motivation of left-behind children ($b = 0.317$, $p < 0.001$), substantiating H2 and H3. School climate had a direct influence on achievement motivation ($c1 = 0.126$, $p < 0.001$), which indicated that part of the influence of school climate on achievement motivation of left-behind children was not controlled by the learning adaptability of left-behind children, thus supporting H1. Therefore, in the influencing model of achievement motivation of rural left-behind children, school climate can directly affect achievement motivation on the one hand, and indirectly through the mediating variable learning adaptability on the other hand. That is, learning adaptability as a mediating variable holds. In addition, in the model with learning adaptability (M) as the dependent variable, the product interaction term between school climate and teacher support as the independent variable had a significant positive effect on the learning adaptability of left-behind children ($a2 = 0.153$, $p < 0.001$). It can be seen that teacher support moderates learning adaptability through school climate, substantiating H5. Moreover, teacher support as a moderating variable also moderates the relationship between school climate and achievement motivation ($c2 = 0.061$, $p < 0.001$), which supports H4. In order to more intuitively show the moderating effect of teacher support, this study defined the mean of the teacher support variable score, plus one standard deviation of the data as high teacher support data, and the sample mean minus one standard deviation of the data as low teacher support data. Thus, a simple slope effect diagram with different degrees of teacher support was obtained as shown in Figures 2, 3. Figure 2 shows that teacher support moderates the effect of school climate on left-behind children's achievement motivation, with the effect of school climate on their achievement motivation growing along with the increase of teacher support. Figure 3 shows that school climate has a positive predictive effect on achievement motivation for students who perceive low-level teacher support; For students who perceive high-level teacher support, school climate still has a positive predictive effect on the development of achievement motivation, but the predictive effect is larger, which indicates that good teacher support can enhance the development of achievement motivation of left-behind children. As for

TABLE 2 Model coefficients for conditional process analysis.

Antecedents	*M* (Learning adaptability)			*Y* (Achievement motivation)		
	Coeff.	SE	*p*	Coeff.	SE	*p*
Constant	4.131	0.099	0.000	2.718	0.125	0.000
School climate	0.338^{a1}	0.033	0.000	0.126^{c1}	0.029	0.000
Teacher support	0.463	0.038	0.000	-	-	-
Learning adaptability	-	-	-	0.317^{b}	0.023	0.000
School climate × Teacher support	0.153^{a2}	0.030	0.000	0.061^{c2}	0.025	0.016
Gender	0.054	0.027	0.043	0.005	0.023	0.832
Age	−0.015	0.007	0.040	−0.010	0.006	0.109
	$R^2 = 0.431$, $F(5, 1{,}411) = 214.028$, $p < 0.001$			$R^2 = 0.350$, $F(6, 1{,}410) = 126.629$, $p < 0.001$		

^{a1}represents the effect value of school climate on learning adaptability; ^{a2}represents the effect value of school climate and teacher support in the learning adaptability model; ^{b}represents the effect value of learning adaptability on achievement motivation; ^{c1}represents the effect value of school climate on achievement motivation; ^{c2}indicates the interaction between school climate and teacher support on achievement motivation.

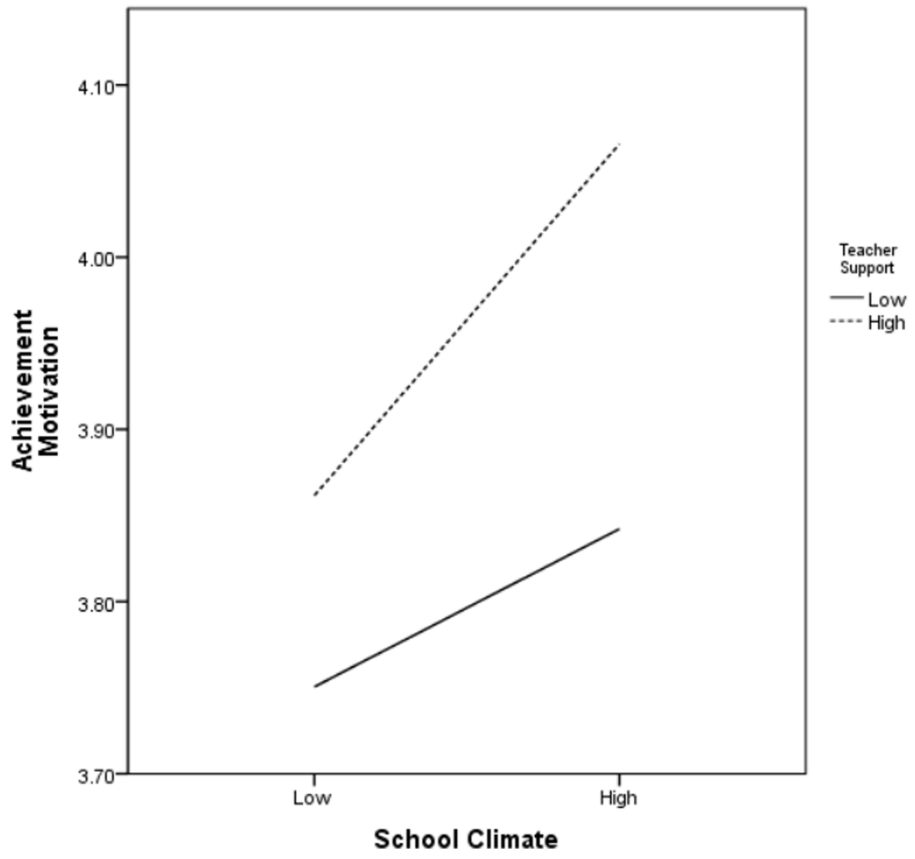


FIGURE 2
Moderating effects of teacher support on school climate and achievement motivation.

the control variables, the gender and age of the control variables had a significant influence on the learning adaptability of the dependent variable in the learning adaptability model ($p < 0.05$). Gender had a significant positive effect on learning adaptability, while age had a significant negative effect on learning adaptability.

To verify the interaction between school climate and teacher support in the moderating variable model, this study adopted the point-selection method and the Johnson-Neyman method to test the simple slope (see Table 3; Figures 4, 5). Table 3 shows the direct and indirect effects of school climate on achievement motivation when the conditioning variables are set to different values. According to the statistical results, the amount of direct effect of school climate on achievement motivation varies with the value of the moderating variable. In addition, Table 3 lists the results of the direct and indirect impact analysis for the 10th, 25th, 50th, 75th, and 90th percentile values, as well as the upper and lower limits of these effect confidence intervals. When the value of teacher support changed from the 10th percentile to the 90th percentile, the direct effect value changed from 0.072 to 0.160 and the indirect effect value changed from 0.064 to 0.134. Therefore, the higher the level of teacher support perceived by students, the greater the direct and indirect impact of school climate on achievement motivation. According to the analysis results of conditional indirect effects of school climate on achievement motivation in Table 3, when different values of teacher support are selected, the confidence interval did not contain zero, indicating that the indirect effects of school climate on achievement motivation were significantly positive, therefore, further supporting H2. However, this effect was not constant, and it was affected by the value of teacher support. This was consistent with the hypothesis that the higher the teacher support reflected by H5, the stronger the influence of school climate on achievement motivation, providing further supports to the mediating effect and the moderating effect. In addition, Table 3 supported the significant direct impact of school climate on achievement motivation. Therefore, the better the left-behind children's perception of school climate was, the stronger their learning adaptability and achievement motivation would be. The ripple effect was even stronger for left-behind children who received more support from teachers. Figure 3 shows that when teacher support was outside the range of [0.090, 3.137], the simple slope line met the criterion of significance. At the same time, according to Figure 3, it can be found that the confidence interval of the simple slope did not contain zero and the slope was greater than zero, further supporting H4 that with the improvement of teacher support, the influence of school climate on learning adaptability was stronger and stronger. As shown in Figures 4, 5, the confidence intervals for the simple slopes of the two plots do not contain zero and have a slope greater than zero, further supporting H4 and H5 that the role of school climate in influencing achievement motivation increases as teacher support increases and the effect of school climate on learning adaptability becomes stronger.

4. Discussion

As a preliminary exploration of achievement motivation of left-behind children aged 9–17 in mainland China, this study was the

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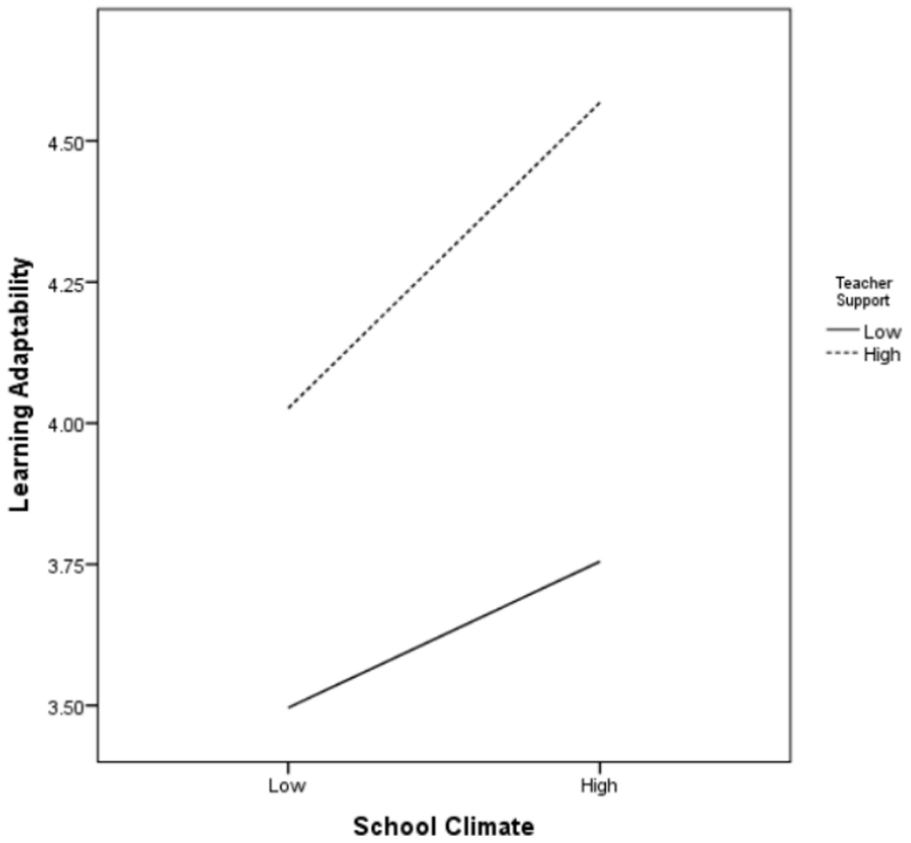


FIGURE 3
Moderating effects of teacher support on school climate and learning adaptability.

TABLE 3 The direct and indirect effects of school climate on achievement motivation.

Moderator (teacher support)[a]	Effect	BootSE	CI
Conditional indirect effects of school climate on achievement motivation			
−0.882	0.064	0.025	[0.023, 0.120]
−0.438	0.086	0.019	[0.053, 0.127]
0.229	0.118	0.016	[0.088, 0.150]
0.562	0.134	0.018	[0.098, 0.170]
0.562	0.134	0.018	[0.098, 0.170]
Conditional direct effects of school climate on achievement motivation			
−0.882	0.072	0.038	[−0.002, 0.146]
−0.438	0.099	0.032	[0.037, 0.161]
0.229	0.140	0.029	[0.082, 0.197]
0.562	0.160	0.032	[0.098, 0.222]
0.562	0.160	0.032	[0.098, 0.222]
Index of moderated mediation			
	Index	BootSE	CI
	0.049	0.021	[0.006, 0.081]

[a]denotes values for the 10th, 25th, 50th, 75th, and 90th percentiles.

first to document the mediating effect of learning adaptability in the association between school climate and achievement motivation, as well as the moderating role of teacher support in this relation. Firstly, we found that the school climate of left-behind children in China had a significant positive impact on their achievement motivation. In the model, the relationship between the school climate and achievement motivation was affected by learning adaptability. Secondly, this study explored the dual moderating role of teacher support in the model. The results indicated that teacher support had a moderating effect between school climate and students' achievement motivation and between school climate and students' learning adjustment. We discussed each of our research questions in the following sections.

4.1. The mediating role of learning adaptability

We first tested the association between left-behind children's perceived school climate and achievement motivation. Consistent with our expectations, left-behind children's perceived school climate significantly predicted their achievement motivation. This finding was consistent with the findings of the available studies (Anderson, 1982; Alonso-Tapia and Ruiz-Díaz, 2022). We then examined the mediating effect of learning adaptability in this relation. Learning adaptability played a significant mediating role between the school climate and achievement motivation. According to the self-determination theory (Deci and Ryan, 2000b), human beings are positive organisms with innate tendencies for personal growth and the pursuit of happiness. This tendency is reflected in three basic psychological needs: autonomy, competence, and relatedness. The

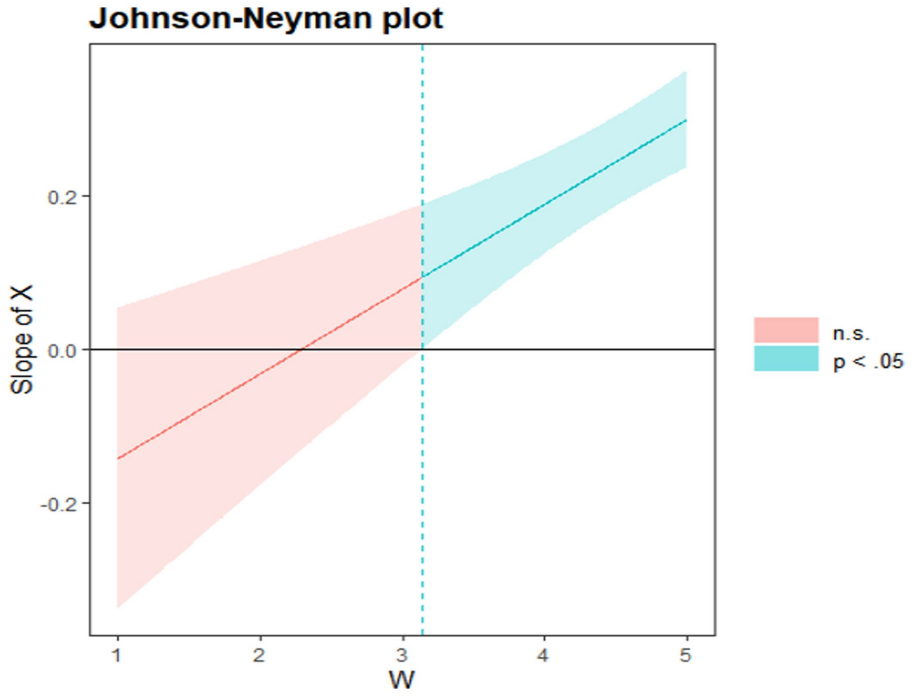


FIGURE 4
The moderating role of teacher support in the relationship between school climate and achievement motivation. *X* is the dependent variable school climate; *W* is the moderating variable teacher support.

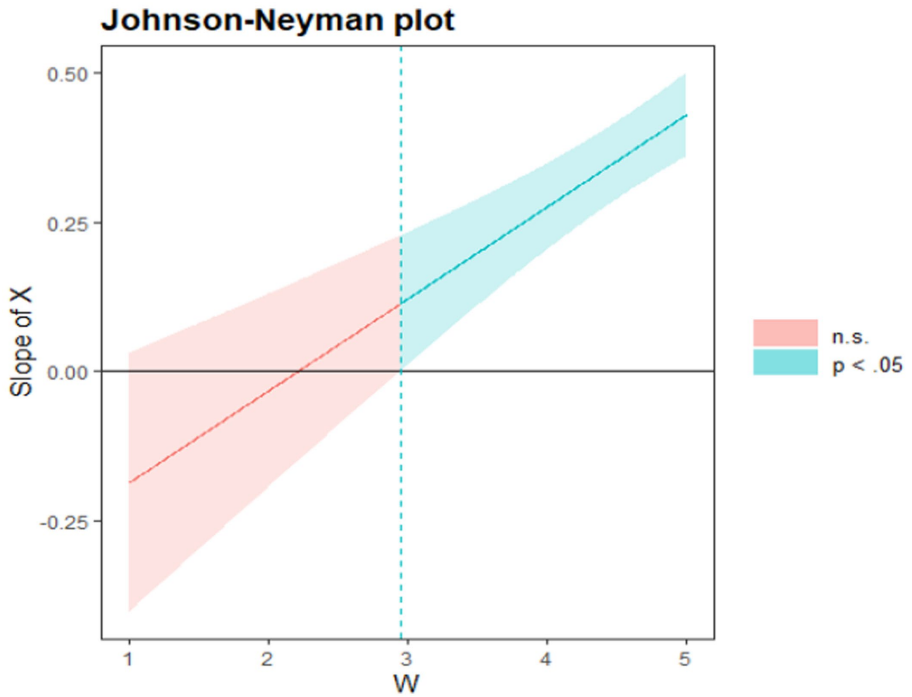


FIGURE 5
The moderating role of teacher support between school climate and learning adaptability. *X* is the dependent variable school climate; *W* is the moderating variable teacher support.

satisfaction of the three basic psychological needs of adolescents, autonomy, ability, and relationship, will promote the generation of their development behaviors. For left-behind children, a school climate characterized by high-quality learning resources, positive teacher-student relationships, and mutual aid to classmates could help students meet their basic needs (Tapia-Fonllem et al., 2020).

Eventually, it will further encourage students to produce positive emotions to study and stimulate their achievement motivation, and prompt their desire for academic success.

Specifically, this study found that school climate had a positive predictive effect on left-behind children's learning adaptability; In other words, when the school climate of left-behind children is better, their learning adaptability is higher. The results support the self-determination theory that the external learning environment can help children develop adaptive behaviors when it meets their internal psychological needs. Studies (Hunt, 1975; Jones et al., 2020) have shown that when there is a positive student-teacher relationship and a teaching climate that stimulates students' interest, students are more likely to find a sense of belonging to the school environment and can participate more actively in learning and develop emotional and social skills (Leurent et al., 2021). For left-behind children, the school environment and children's social relations in school become the main sources of their needs for a sense of belonging and a sense of achievement because their parents are away all year round. When children perceive that the school climate matches their needs, it will affect their understanding of themselves and the formation of their attitudes, thus improving their learning adaptability (Lara and Saracostti, 2019).

In the mediation model of learning adaptability, we discovered that learning adaptability was positively correlated with achievement motivation of left-behind children, and that learning adaptability had obvious predictive power and significant influence on students' achievement motivation. Learning adaptability has been reported to play an important role in educational settings, predicting higher classroom participation, higher academic achievement, and higher life satisfaction (Collie et al., 2017; Burns et al., 2018). The results of this study further proved that learning adaptability is a key factor influencing the achievement motivation of left-behind children. On the one hand, the emergence of this research conclusion is related to the successful experience of left-behind children. Children with strong learning adaptability are more able to overcome difficulties in the learning process, make various adaptive activities adjust the learning process, and then obtain successful experiences. The acquisition of successful experiences can help children build confidence and increase their expectations of success (Grund et al., 2022). On the other hand, this conclusion may also be related to the left-behind environment of left-behind children. Family poverty contributes to the resilience of left-behind children's life and learning attitudes. They hope to get out of their current predicament and change their future by improving their education levels. As a result, they tend to show a strong motivation to achieve in learning.

4.2. The moderating role of teacher support

This study found that, after controlling for age and gender, teacher support had a significant moderating effect on the relationship between school climate and achievement motivation and on the relationship between school climate and learning adjustment. Meanwhile, when the intensity of teacher support increases, the effect of school climate on the achievement motivation of left-behind children increases, as does the effect of school climate on children's adjustment to learning. Specifically, school climate had a stronger effect on achievement motivation and learning adjustment in left-behind children who experienced high levels of teacher support than left-behind children who experienced low levels of teacher support.

An in-depth analysis of the research results shows that the moderating effect of teacher support in the mediation model is consistent with the risk and resilience framework, and the protective factors may weaken the adverse effects of risk factors (Suárez-Orozco et al., 2018). In other words, when faced with a low-level school climate, higher teacher support can help left-behind children offset the impact of a bad school climate on their achievement motivation. When facing a higher-level of school climate, higher teacher support can improve the development of achievement motivation of left-behind children based on meeting their needs for autonomy. The reason lies in that teachers, as important guides in the growth of left-behind children are important subjects of responsibility in school education. Due to the alienation phenomenon of the parent–child relationship of left-behind children caused by their parents working outside, it is easy to cause the loss of family function. As the main contact object of left-behind children, school teachers can replace their parents' responsibilities to a certain extent. Teachers' support and encouragement to children in learning can help children form good learning habits and maintain good learning attitudes in the learning process, thus promoting the development of achievement motivation of left-behind children (Lee and Simpkins, 2021; Pap et al., 2021).

In the hypothesized model, the moderating point of teacher support played a role in the first half of the mediation effect, that is, the relationship between school climate and left-behind children's learning adaptability depends on the level of teacher support. According to the protective-protective model (Christiansen and Evans, 2005), the predictive power of one protector factor on the outcome may vary with the level of the other. In the current study, the protective factors are school climate and teacher support, and the outcome variable is learning adaptability, that is, the predictive effect of school climate on learning adaptability will change with the level of teacher support. For left-behind children, the perceived high level of teacher support can buffer the negative impact of adverse family factors on their non-cognitive ability (Lei and Li, 2020), thus having a positive impact on their learning life, mental health, and personal development, enabling them to maintain a good learning attitude and promote the development of their learning ability. In addition, control variables were set up to eliminate the interference of gender and age of left-behind children in the model. The results show that, based on controlling gender and age, there is a significant moderating effect between school climate and learning adaptability of left-behind children. As an important responsibility subject in the social support system for left-behind children, teachers' supporting role can adjust the learning adaptability of left-behind children to promote the development of their achievement motivation. Left-behind children's perceived teacher support will have different effects on their learning adaptability and achievement motivation. When left-behind children perceive a high level of teacher support, they are more willing to seek help from teachers when they encounter difficulties and obstacles in life or learning, to solve problems, and promote personal achievements and development.

5. Contribution and implications

This study has the following contributions. First of all, this study concentrates the current research attention on the group of left-behind children and enriches the research category of achievement motivation. Achievement motivation is not only related to students in higher

education, but it is also closely related to left-behind children who are primary recipients of benefits associated with the cultivation of achievement motivation. Acknowledging the importance of achievement motivation research on left-behind children is an important prerequisite for the future study of the influence mechanism of achievement motivation. Secondly, this study explores achievement motivation, school climate, learning adaptability, teacher support status quo, and their relationship among left-behind children, and makes an in-depth analysis of the mechanism of learning adaptability and teacher support between left-behind children's perceived school climate and achievement motivation. This can provide empirical support for future research on the underlying mediating and moderating mechanisms between achievement motivation and the school climate, of left-behind children.

This study carries important implications for the cultivation of achievement motivation of left-behind children. Firstly, this finding suggests that a positive school climate can improve children's learning adaptability and thus promote achievement motivation of left-behind children. Therefore, schools should pay attention to the construction of a strong learning atmosphere, the establishment of a harmonious relationship between teachers and students, and the effective supply of rich learning resources to help left-behind children establish a healthy learning attitude and master more learning abilities. Secondly, this finding indicates that more supportive help provided by teachers for left-behind children will help children better benefit from the school environment. Therefore, teachers should provide more supportive feedback and emotional attention to left-behind children, and help them correct their learning attitudes, improve their learning abilities, and form good learning habits. Thirdly, as the subject of school education with professional knowledge such as psychology and career planning, school consultants should give full play to their professional advantages. School counselors can use the skills and tools of psychological counseling to provide left-behind children with individual counseling services in learning, psychology and other aspects, discover the problems behind children's external behavior and guide students to change their behavior habits. In addition, school counselors can design career planning activities, provide professional services for children, and help left-behind children establish a better self-awareness, find out what jobs they are more suitable for and what jobs they will do in the future, so as to stimulate the awareness of self-reliance among left-behind children. Fourthly, the learning adaptability of left-behind children can promote the development of their achievement motivation. Thus, left-behind children should not lose their learning enthusiasm and thus reduce their achievement motivation in the absence of their parents. In addition, left-behind children should have a clear understanding of themselves, establish a correct view of learning, discover the fun in learning, and improve their learning ability and enthusiasm.

6. Limitations and future research

However, the current study has several major limitations. Firstly, this study adopts a cross-sectional study, which makes it difficult to derive the causal relationship between variables. In future studies, longitudinal studies can be used to provide more powerful arguments to demonstrate the influence of school climate on the achievement motivation of left-behind children. Secondly, the measurement of school climate, teacher support, learning adaptability, and achievement motivation were all self-reported data, limited by recall bias and social expectations. Future research should collect various data types, such as surveys and interviews of teachers and parents of left-behind children, and collect relevant information about left-behind children from side to increase the reliability of results. The observation method can provide more objective and real data to reveal the school environment and behavior of children, while the interview method can provide researchers with in-depth information about the school atmosphere and achievement motivation of left-behind children. Finally, this study only investigated the left-behind children in one province in western China, whose behavioral characteristics and school status may be different from those in other parts of China and other countries, thus limiting the generalizability of the research results. Therefore, future research can consider adding different samples of left-behind children. At the same time, this study investigates the learning atmosphere as an overall dimension, and it can also consider investigating the influence of different school atmospheres on the achievement motivation of left-behind children.

7. Conclusion

To sum up, this study investigated the moderating mediation model of the relationship between left-behind children's perception of school climate and their achievement motivation. Our findings identified the underlying mechanisms behind this relationship (i.e., mediating learning adaptability and moderating teacher support), which contributes to our understanding of the key processes by which a positive school climate prompts achievement motivation in left-behind children. Learning adaptability can serve as a potential intermediary to making good school climate work, which in turn promotes achievement motivation. A focus on children's learning adaptability will bring additional nuances to children's perception of the link between school climate and achievement motivation. In addition, our findings indicated that teacher support moderates the direct relationship between school climate and learning adaptability, and left-behind children with high perceived teacher support had higher learning adaptability than left-behind children with low perceived teacher support. Finally, under a certain school climate, children with high perceived teacher support had a higher positive impact on achievement motivation through improving their learning adaptability than left-behind children with low perceived teacher support. Therefore, the findings of this study have considerable implications for the development and improvement of achievement motivation of left-behind children.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by The Ethics Committee of Qufu University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

KZ designed the study, helped with data collection, and analyzed the data. NC and GL designed the study, analysed the data, and wrote the manuscript. ZL and XW helped with data analysis and edited the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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School engagement profiles in Chilean secondary students

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School engagement is considered a key variable in promoting educational trajectories. Previous research shows that maintaining high levels of school engagement is fundamental, given its association with multiple academic results and lower-risk behaviors. This article aims to show how school engagement profiles (based on the behavioral, affective, and cognitive subdimensions) relate to academic achievement (math and language), contextual factors (family, teachers, and peer support), and gender. This study involved 527 students enrolled in the 1st year of secondary education in public schools in Chile. All students came from vulnerable schools. Our study used cluster analysis to identify students' profiles. We identified the existence of three different profiles of school engagement (high, medium, and low) considering the three subdimensions of school engagement (behavioral, affective and cognitive). Secondly, ANOVA analysis showed differences in language and math academic achievement scores between the profiles, where higher engagement students showed higher academic performance in language and math. These findings are consistent with previous studies showing that contextual factors strongly influence school engagement and better behavioral engagement in female than male students. It will discuss the pertinence of person-centered approaches focusing on combinations of variables within students rather than taking each variable as the focal point when analyzing goals. These techniques are a favorable methodological alternative to investigate why some students have better results than others instead of just ranking students by their performance. It will conclude with some future lines of research and practical implications.

KEYWORDS

school engagement, profiles, academic achievement, family, peers, teachers, gender, secondary school

Introduction

School Engagement (SE) is defined as the participation of the student in their educational process (Saracostti et al., 2019). SE is a multidimensional construct composed of affective, cognitive, and behavioral dimensions (Lara et al., 2021). Lara et al. (2018) and Saracostti et al. (2019, 2022) define affective engagement as the emotional response towards the learning process and the school, characterized by feeling part of a school community and involved. Behavioral engagement is related to participation in academic activities, attendance, and social interactions, whether at home, in face-to-face or online school. Thirdly, the cognitive dimension is linked to the awareness and willingness to build learning, the interest in using different deep learning strategies, and the effort to develop learning skills.

The measurement of SE has been a reliable indicator of the degree to which students participate in daily educational activities, being important to maintain SE levels as high as possible, given its association with multiple academic outcomes and academic performance (Lei et al., 2018; Wang et al., 2019; Chambers and Michelson, 2020; Canet-Juric et al., 2021).

When students are engaged, they see learning as meaningful, are motivated, and show commitment to their learning and future. SE is considered a key variable in the promotion of educational trajectories. This variable gained more attention than attendance after the pandemic of COVID 19 when being online was not the most effective proxy to assess which students were on and off track with their studies. After the pandemic, schools need a better measure of school accountability. Additionally, SE goes beyond attendance, task completion, or compliance with adult directives. When students are engaged, they feel a sense of belonging and safety and experience success. Thus, they want to attend school (Miranda-Zapata et al., 2018). Moreover, it is essential to maintain levels of SE as high as possible, given its association with multiple academic results and lower-risk behaviors. School disengagement relates to the initiation of substance use, conduct problems, violence, school dropout, and delinquency (Li et al., 2011; Lam et al., 2014; Høigaard et al., 2015; Lei et al., 2018; Canet-Juric et al., 2021). Contrarily SE is a protective factor contributing to academic and overall success since it is linked to students' positive mental health, well-being outcomes, and healthy behaviors (Griffiths et al., 2012; Fredricks et al., 2019). Thus, it may mitigate the pandemic and post-pandemic stress among students, Thus, it may contribute to mitigate pandemic and post-pandemic stress among students.

SE is influenced by contextual factors (*CF*), and that greater knowledge about these will help to develop interventions in favor of CE. Among those factors on which the school can intervene, unlike the structural factors that are little modifiable in the short and medium term, are: (1) family support; (2) peer support, and (3) teacher support (Lara et al., 2021; Navarro et al., 2021; Sotomayor et al., 2021). Family support is the perception of help in the learning process in case of problems and the motivation and interest families provide to students. Peer support refers to students' perceptions of interpersonal interactions, concern, and trust with their peers. Finally, the third factor refers to the perceived support and motivation to learn provided by the teaching team in academic aspects and when the students have personal problems. Since external factors influence SE, current approaches conceive it as a highly malleable state (Fernández-Zabala et al., 2016; Ansong et al., 2017; Saracostti et al., 2019; Lara et al., 2021; Navarro et al., 2021).

These *CF* make sense from the ecological model (Bronfenbrenner and Morris, 2006) for which the dynamics and relationships that occur in and between the most immediate systems of children, such as family and school, have a significant impact on their development. Consequently, social support from family, peers, and teachers stand out as the main factors related to SE to prevent school dropout and contribute to the adjustment of adolescent students and positive educational trajectories (Fredricks et al., 2016; Fernández-Lasarte et al., 2019; Lara et al., 2021; Miranda-Zapata et al., 2021; Saracostti et al., 2021).

This conceptualization of SE and *CF* does not place the focus exclusively on the characteristics and abilities of students, focusing on them all the responsibility for their educational process; to also encompass those family and school contextual elements that contribute decisively to their configuration (Fredricks et al., 2004). In this sense, the context would become essential in building engagement. This conception of SE as a malleable process is highly relevant, opening the possibility of implementing interventions and changes that schools may promote (Lam et al., 2014; Fredricks et al., 2016). In this way, schools can offer a more optimistic alternative to achieve positive results by focusing on those variables on which they can exert some effect (Appleton et al., 2006).

In the case of Chile, the studies on the subject revealed the mediating role played by the SE concerning the influence of *CF* on students' academic performance and attendance (Miranda-Zapata et al., 2018, 2021). Thus, the measurement of SE and *CF* can provide relevant clues to schools to timely observe these variables and make informed and contextualized decisions. Although in Ibero-America, the concern for SE and the need to have diagnostic, monitoring, and evaluation systems have been installed progressively, progress toward intervention strategies in this area is still very incipient (De-Toro et al., 2021). Unlike Anglo-Saxon countries (Vansteenkiste et al., 2009; Xie et al., 2020), where there are studies to identify profiles of engaged students considering behavioral, affective, and cognitive dimensions, in Chile and Ibero-America there is no research that allow us to identify which profiles are associated with these variables. This information could guide students better and support the decision at the public policy and school level (Fredricks et al., 2019).

Additionally, researchers (Fredricks et al., 2004; Lam et al., 2014; Wilcox et al., 2018) have examined gender differences in SE

and academic performance in school. Results reported that girls usually have higher levels of SE. These studies highlight the importance of understanding the multiple factors influencing engagement, including gender, to provide targeted promotion and intervention strategies.

To advance in this area, researchers (Fredricks et al., 2019) suggest person-centered analytic techniques that allow us to examine "the possibility that students may not be uniformly engaged across all dimensions, but rather, that there are subgroups of students characterized by unique clusters of engagement" (Bae et al., 2020, p: 2). Thus, focusing on the combinations of variables rather than taking a single one as the focal point may be helpful since this kind of analysis can be used to develop programs that are relevant to the needs of students who may present different engagement or disengagement profiles (Fredricks et al., 2019). According to such interest, this article aims to analyze how different school engagement profiles (based on the behavioral, affective, and cognitive components) relate to academic achievement (math and language), contextual factors (family, teachers, and peers), and sex through non-parametric analysis techniques such as unsupervised neural network clusters belonging to machine learning.

Materials and methods

Participants

This study involved 527 students enrolled in the 1st year of secondary education from 11 public schools, aged between 14.2 and 17.6 years (M = 15.3, SD = 0.68), 54.1% being female students ($n = 285$) and 45.9% male students ($n = 242$). According to the School Vulnerability Index calculated annually by the National School Aid and Scholarship Board, all students came from schools with a high level of school vulnerability. This index took into consideration family socioeconomic context, access to the health system, housing quality, and parents' educational level, among other factors (Saracostti et al., 2022).

Instruments

School Engagement Questionnaire: a self-report instrument composed of 29 items that measure three subdimensions of SE: affective (10 items, e.g., "I feel that the school cares about me"), cognitive (12 items, e.g., "for me it is important to understand the assignments and subjects well"), and behavioral [7 items, e.g., "I leave the classroom without asking permission (or I leave the online classes)"], with a response scale from 1 (never or almost never) to 5 (always or almost always). In this article, we use the version adapted and validated for the context of virtual, face-to-face, or hybrid classes in the Chilean educational system caused by the Covid-19 pandemic (Lara et al., 2022), which maintains the same number of items as the same content and presents the same factorial structure of three correlated factors as the original version (Lara et al., 2018). The results of the confirmatory factor analysis showed a good fit of the data to the three-factor (affective, behavioral, and cognitive) correlated model ($\chi^2 = 964.314$; df = 374; RMSEA = 0.052/CI = 0.048–0.056; CFI = 0.925; TLI = 0.919) as well as reliability analyses showed adequate internal consistency of the entire scale ($\alpha = 0.907$) and its component dimensions ($\alpha = 0.859$ for affective dimension, $\alpha = 0.718$ for behavioral dimension and $\alpha = 0.885$ for cognitive dimension).

Contextual Factors Questionnaire: an instrument composed of 18 items that measure the three primary *CF* that influence SE: family [3 items, e.g., ". I talk to my family about what I do at school (or in online classes)"], teachers (8 items, e.g., "I get along with my teachers"), and peers (7 items, e.g., "My classmates support me and care about me"), with a response scale from 1 (never or almost never) to 5 (always or almost always). In this article, we use the version adapted and validated for the context of remote, face-to-face, or hybrid classes in the Chilean education system caused by covid-19 (Lara et al., 2022), which maintains the same number of items with the same content and presents the same factorial structure of three correlated factors as the original version (Navarro et al., 2021). The results of the confirmatory factor analysis showed a good fit of the data to the three-factor (family, teacher and peer support) correlated model ($\chi^2 = 414.047$; df = 132; RMSEA = 0.061/CI = 0.054–0.067; CFI = 0.963; TLI = 0.957) as well as reliability analyses showed adequate internal consistency of the entire scale ($\alpha = 0.917$) and its component dimensions ($\alpha = 0.753$ for family dimension, $\alpha = 0.881$ for teacher dimension and $\alpha = 0.898$ for peer dimension).

Academic performance in math and language: Students' academic achievement was evaluated through the final average grade obtained at the end of the school year in math and language, recorded on a scale from 1 (minimum achievement) to 7 (maximum achievement). It will consider maths and language since most research agrees on interpreting academic performance through achievements in mathematics and language, highlighting the importance of both areas for involvement in society. Mathematical thinking train children in strategies that are essential in everyday life, more with the increase in technology and digitization. While language and communication are the other leading tools to understand the world, relate to others, be part of a cultural community, and develop critical and reflective thinking (Archambault et al., 2009; Graves and Brown Wright, 2011; Boonk et al., 2018; Fung et al., 2018; Masrai and Milton, 2018; Pace et al., 2019).

Procedures

This study is part of a more comprehensive research project titled "Modeling of school engagement, social, family and school contextual factors and socio-educational trajectories of children and adolescents: from the international scientific literature to a

longitudinal study in the Chilean context" (ANID/FONDECYT 1210172). Previous research results are available.[1]

This is a longitudinal study focused on investigating and analyzing the meanings that children and adolescents in Chilean schools construct about a predictive model of trajectories of SE (cognitive, behavioral, and affective subdimension), *CF* (family, peers and teachers support) and socio-educational achievements (academic performance, permanence, approval of subjects, attendance, others) over time. Differences according to gender and educational cycle (primary and high schools) have been explored.

The sampling method was non-probabilistic expert judgment, selecting schools and students with similar characteristics. The participating schools were contacted through the leading researcher or the research team and invited to participate voluntarily. All the contacted schools decided to participate in the study. The data collection was carried out virtually and collectively during school hours. In this way, members of the research team duly trained for this purpose made the necessary explanations and answered the students' questions through the virtual platforms they used to attend their virtual classes. Once the questionnaires were explained, the students completed them through an online platform developed for this purpose (De-Toro et al., 2021; Saracostti et al., 2022), with an approximate duration between 30 and 40 min.

This study has the approval of the ethics committees of the Universidad de Valparaíso. In order to participate in this study, the participants had to sign an informed assent and have the signed informed consent of their legal representatives.

Data analysis

The statistical analyses were applied to variables with different minimum and maximum ranges, since they corresponded to the sum of different numbers of items with Likert-type responses of 1 to 6 points, which also did not have a normal distribution, so nonparametric methods were selected, such as the Kohonen (1982) unsupervised neural network cluster (SOM), and the number of clusters was validated using the Bayesian information criterion (BIC). To compare the clusters, the Kruskal Wallis test and the Dwass-Steel-Critchlow-Fligner (DSCF) *post-hoc* test were applied, which corrects the alpha error of multiple pairwise comparisons.

Results

School engagement profiles

Cluster analyzes showed that optimal solution was grouping the participants into three clusters, which were named according to the School Engagement level, in: High-level, Medium and Low SE (Figure 1). The number of clusters was evaluated by assessing the variability within and between clusters and considering the comparative results for discussion purposes with the results of other publications on this subject.

Since the distribution of the profiles was found not to approximate the normal distribution, researchers calculated a nonparametric one-way Kruskal-Wallis ANOVA and the effect size η2 on the standardized scores of the three subscales of SE with the clusters as comparison factors. The Kruskal-Wallis and Welch's comparative tests were evaluated and presented the same conclusions of statistical significance ($p \leq 0.01$), which allowed us to conclude that variability did not generate differences in the conclusions of the tests.

The results showed that all the subscales differed significantly depending on the cluster, presenting an effect size greater than 0.14, considered large (Cohen, 1988) in all the comparisons of the SE subscales: affective engagement: $\chi^2(2) = 289$, $p < 0.001$, $\eta^2 = 0.549$; cognitive engagement: $\chi^2(2) = 339$, $p < 0.001$, $\eta^2 = 0.645$; behavioral engagement: $\chi^2(2) = 242$, $p < 0.001$, $\eta^2 = 0.460$. Descriptive statistics are presented in Table 1.

The analysis of the effect of clusters on the family, teacher and peer scales was considered through the statistical significance analysis of clusters pairs comparison tests.

The differences post-hoc test Dwass-Steel-Critchlow-Fligner pairwise comparisons (DSCF; Steel, 1960) of the SE and *CF* between the clusters are presented in Table 2.

The comparison of the affective, cognitive, and behavioral factors showed a total differentiation between the clusters according to the SE, with statistically significant differences $p \leq 0.05$ in all the factors.

Based on these differences and scores, the first cluster was labeled high-level SE, representing 237 students (45.0%) who scored above the mean on all subscales (0.476 to 0.851 standard deviations). The second cluster was called medium SE, including 194 students (36.8%) with scores around the mean on the school engagement scales (from −0.546 to 0.260 standard deviations). The third cluster was low SE, including 96 students (18.2%) who scored below average on all school engagement subscales (de −0.987 a − 1.7 standard deviations).

Differences among SE profiles

The results of the Kruskal-Wallis ANOVA between the clusters according to levels of SE showed that there were highly significant differences ($p \leq 0.001$) in all the variables studied (family, teachers and peer support, as well as in academic performance in mathematics and language), although with different effect sizes: family support factor [$\chi^2(2) = 155.8$, $p < 0.001$, $\eta^2 = 0.296$]; teacher's support factor [$\chi^2(2) = 228.5$, $p < 0.001$, $\eta^2 = 0.434$]; peers [$\chi^2(2) = 98.8$, $p < 0.001$, $\eta^2 = 0.188$]; academic performance in language [$\chi^2(2) = 53.2$, $p < 0.001$, $\eta^2 = 0.101$]; and in mathematics [$\chi^2(2) = 48.1$, $p < 0.001$, $\eta^2 = 0.091$].

1 https://compromisoescolar.com/recursos/material-de-estudios

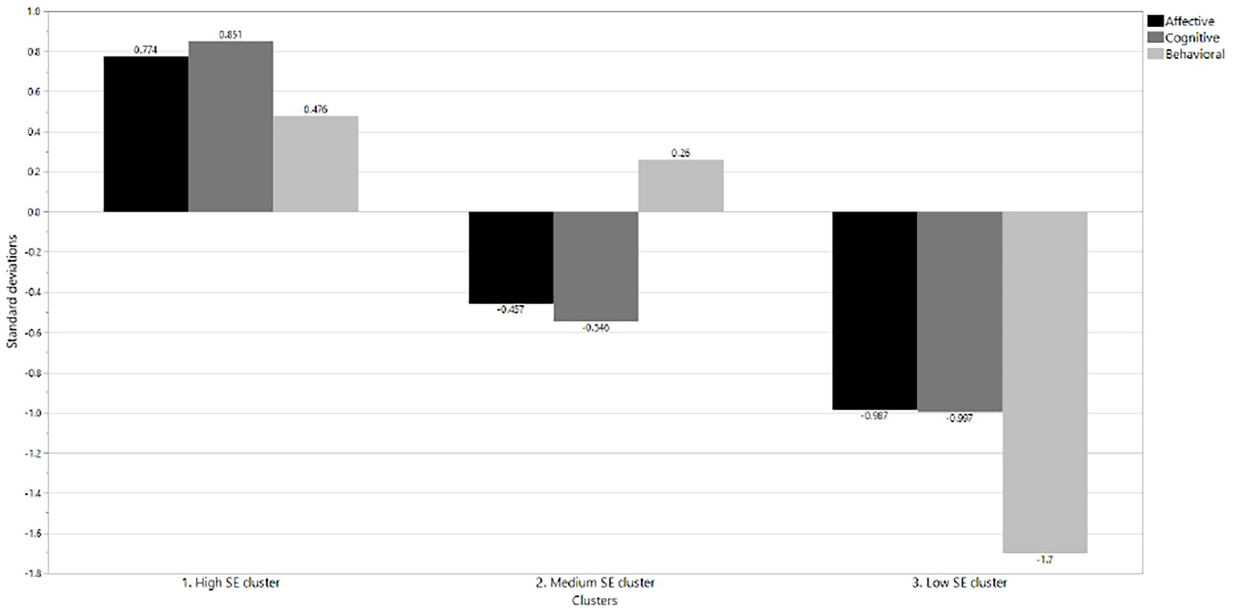


FIGURE 1
School engagement profiles.

TABLE 1 Descriptive statistics for dimensions of SE by levels.

	High SE mean (SD)	Medium SE mean (SD)	Low SE mean (SD)
SE affective	4.32 (0.41)	3.30 (0.68)	2.86 (0.69)
SE cognitive	4.23 (0.42)	3.12 (0.58)	2.77 (0.53)
SE behavioral	4.75 (0.31)	4.62 (0.33)	3.45 (0.47)

As can be seen in Table 3, concerning the distribution of *CF*, it is observed that the high-level SE cluster scored higher in the family support factor (M = 4.16, SD = 0.88) than the ones in the middle SE cluster (M = 3.12, SD = 1.05), and the low SE cluster (M = 2.78, SD = 0.84).

In addition, it is observed that the cluster with high-level SE scored higher in the teacher's support factor (M = 4.43, SD = 0.5) than ones in the middle SE cluster (M = 3.61, SD = 0.77), and the low (M = 2.82, SD = 0.74). The results are similar in relation to achievement in mathematics. Also, high-level SE cluster scored higher in the peer support factor (M = 3.54, SD = 0.96) than the ones in the middle SE cluster (M = 2.67, SD = 1.01) and the low (M = 2.54, SD = 0.86).

Regarding academic performance, the high-level SE cluster shows greater achievement in language (M = 5.79, SD = 0.76) than the middle SE cluster (M = 5.44, SD = 0.86), and the low (M = 5.13, SD = 0.72). In addition, the high-level SE cluster shows a higher achievement in mathematics (M = 5.96, SD = 0.75) than in the middle SE cluster (M = 5.63, SD = 0.8) and the low (M = 5.32, SD = 0.77).

Concerning the distribution of the proportion based on sex, the high-level and middle SE clusters have a higher proportion of female students than male students but do not show significant differences between them [$\chi^2(1) = 1.779$, $p = 0.182$]. On the other hand, the low SE cluster has a higher proportion of adolescents and significant differences with the high-level SE cluster [$\chi^2(1) = 7.767$, $p = 0.005$] but not with the middle SE cluster [$\chi^2(1) = 2.770$, $p = 0.096$].

Discussion

From the results presented, we can conclude the existence of three different profiles of SE (high-level, medium, and low) considering the main subdimension of SE (cognitive, affective, and behavioral). Secondly, results showed differences in language and math academic achievement scores between the SE profiles, where high-level SE students showed higher academic performance in language and math. These findings are consistent with previous research (Lei et al., 2018), supporting the importance of school engagement for academic achievement. Similarly, Yuwen and Yanping (2021) discuss the relationship between school engagement and the learning effect in virtual classes, showing associations between more behavioral engagement and the learning effect; specifically, their analysis shows that the more behavioral engagement, the more positive impact on the learning effect.

Additionally, results also showed differences in the support students received from their families, peers, and teachers. In this way, our results showed that high-level SE students reported more support from these three contexts. These findings align with previous studies highlighting the importance of family, peers, and teachers as the critical contexts for SE

TABLE 2 Comparison of the sums of the SE and *CF* scales between pairs of cluster levels.

	High – medium		High – low		Medium – low	
	W	*p*-W	W	*p*-W	W	*p*-W
Affective	20.53	0.001	18.24	0.001	7.54	0.001
Cognitive	22.75	0.001	19.16	0.001	18.78	0.001
Behavioral	7.34	0.001	19.92	0.001	18.78	0.001
Family	14.31	0.001	14.74	0.001	3.82	0.001
Teachers	15.56	0.001	17.89	0.001	10.85	0.001
Peers	11.90	0.001	11.35	0.001	1.02	0.751

TABLE 3 Descriptive statistics for contextual factors, academic performance and sex by SE levels.

	High SE mean (SD)	Medium SE Mean (SD)	Low SE mean (SD)
Contextual factors			
Family	4.16 (0.88)	3.12 (1.05)	2.78 (0.84)
Teachers	4.43 (0.50)	3.61 (0.77)	2.82 (0.74)
Peers	3.54 (0.96)	2.67 (1.01)	2.54 (0.86)
Academic performance			
Language	5.79 (0.76)	5.44 (0.86)	5.13 (0.72)
Mathematics	5.96 (0.75)	5.63 (0.80)	5.32 (0.77)
Sex	*n* (%)	*n* (%)	*n* (%)
Female students	141 (59.49)	103 (53.09)	41 (42.71)
Male students	96 (40.51)	91 (46.91)	55 (57.29)

(Winter, 2013; Fernández-Zabala et al., 2016; Miranda-Zapata et al., 2018; Navarro et al., 2021). For example, the high-level SE cluster scored higher in the family factor, teachers, and peers than in the middle and low SE. Consistently, Roundfield et al. (2018) show that *CF* and, in particular, peer support affect the three dimensions of SE, while the family mainly affects adolescents' behavioral and cognitive engagement. In addition, Quin et al. (2018) highlight that family, teachers and peers strongly influence some academic and emotional indicators of SE. Fernández-Zabala et al. (2016) identified significant correlation rates between *CF* (family support, teachers support, and peers support) and SE. Finally, Kiefer et al. (2015) concluded that teachers' and peers' support positively affects the academic motivation of adolescents, SE, and school belonging. In addition, they found significant relationships between teachers' support (autonomy, structure, and participation), peer support (academic and emotional), and adjustment (motivation, commitment, and belonging).

These results show that person-centered techniques, such as cluster or profile analysis, are a favorable methodological alternative to investigate why some students have better results than others, instead of just ranking students by their performance (Bulgarelli et al., 2020). A person-centered approach focuses on particular combinations of motivational variables within individuals or groups of students rather than taking each variable as the focal point (Regueiro et al., 2018) when analyzing goals. Thus, research findings of person-centered analysis can enhance the development of more personalized strategies and provide teachers with more tools to improve educational trajectories.

Another scope of this study is to include the gender perspective, considering that the absence of the gender perspective in educational research may lead to inaccurate conclusions and suggestions for both school leaders and educational policymakers (Ovseiko et al., 2016). Regarding gender differences, our results show that there are more girls with high-level of SE and more male students with low SE, with no differences regarding the medium cluster. These findings are consistent with previous studies that show that girls were more behaviorally engaged than male students (Havik and Westergård, 2020).

In the same vein, Wilcox et al. (2018) examine the relationship between gender and SE and found that for male students, grade level is significantly associated with SE, but it is not a significant variable for girls, while for female students, anxiety is significantly associated with SE but it is not a significant variable for male students. They concluded that considering the social and relational nature of SE, a focus on contextual factors highlighted in this article, and a profound understanding of the differences between boys' and girls' engagement, is essential to develop effective interventions and improve practices and outcomes for students.

On the other hand, studies (Fredricks et al., 2019) show that SE decreases as one moves on to secondary education. Thus, it is interesting to carry out longitudinal studies to investigate how SE profiles change throughout the educational trajectory. In addition to that, more research is needed to examine how these profiles relate to academic adjustment and achievement in higher education. Studies in this area (van Rooij et al., 2017) revealed that behavioral and cognitive subdimensions are related to better adjustment and performance in higher education.

Fredricks et al. (2019) also identified from a literature review three profiles of students with low school engagement (1) behaviorally disengaged, (2) emotionally disengaged, and (3) cognitively and emotionally disengaged students. These results provides clues that not only students with behavioral problems are more likely to present risk behaviors in their educational trajectories, but also those students with emotional problems with their schools. Thus, future lines of research should look more closely at those with low school engagement to help schools comprehensively identify and reflect on why students are losing school engagement and design more relevant interventions.

Other promising lines link SE profiles and achievement in specific areas, such as sciences (Bae et al., 2020), which would be interesting to observe in the country based on the gender variable, taking into account the existing gaps in the participation of women in science and research. Finally, in order to enhance the identification of guidelines for the intervention and improvement of educational processes future research should consider other *CF* such as educational practice and school support services.

Among the study's limitations, we must point out the intentionality of the sample. In this sense, the data obtained has the bias of coming only from contexts of high social vulnerability, which is why it would be necessary to analyze whether profiles change in more diverse contexts. In addition, the data was taken during a pandemic, when a group of students was no longer participating in virtual classes due to the consequences that the closure of schools brought to education at an international level. This socio-sanitary crisis also implied costs to families, in peer support, and in the same teachers worried about their students and their own families (Kuric Kardelis et al., 2021; OECD, 2021). Therefore, the challenge remains to investigate how these profiles behave over time now that face-to-face classes have resumed.

As shown, the degree of SE and *CF* is a critical element in students' academic achievements, especially during secondary school, highlighting the need to generate scientific evidence from the Chilean context. Some practical implications of this study are that the measures of SE and *CF* (Lara et al., 2022) allow taking decisions about strategies to promote school engagement according the different profiles. Results from our study corroborate that SE can contribute, as in other cultural contexts, to implement policies to promote it. These scientifically validated indicators may give schools clues about what decisions to make to improve students' educational trajectories (Bravo-Sanzana et al., 2021). However, collecting data on these indicators to prevent school dropouts is not enough. It is required to have robust technical components connected to a network of interventions in order to detect, but also help students who need support in their educational trajectories (De-Toro et al., 2021).

Future lines of research could investigate the implications of these different profiles in other patterns of development processes and psychological adjustment, along with looking more deeply at the *CF*. It is necessary to consider the different profiles and not just study students' goals, as good behavior or performance, independently. For instance, Engels et al. (2019) identified how status profiles were related to their peer group and their relationship with SE, with the most popular students having the lowest levels of behavioral engagement.

Data availability statement

The datasets generated and analysed during the current study are not publicly available due the fact that they constitute an excerpt of research in progress but are available from the corresponding author on reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of the Universidad de Valparaíso and the Chilean National Commission for Scientific and Technological Research. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

XT, MS, and LL drafted the manuscript, contributed to the interpretation of the data, and provided important critical revisions. XT, MS, and EM-Z developed the study concept, the study design, and arrange the data collection. HM, LL, and EM-Z made the statistical analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Effects of academic self-regulation on procrastination, academic stress and anxiety, resilience and academic performance in a sample of Spanish secondary school students

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Introduction: One of the biggest challenges facing students today is procrastination, which is closely related to stress, anxiety and, in the most severe cases, depression. The aim of the present study is to analyze the influence of academic self-regulation on procrastination, academic anxiety and stress, academic resilience and academic performance.

Method: The sample consisted of 991 high school students aged between 16 and 19 years (M =17.25; SD=3.45). A structural equation model was used to analyze the relationship between the study variables.

Results: Analyzes showed that academic self-regulation negatively predicted procrastination. In turn, procrastination positively predicted academic stress and anxiety. However, resilience exerted a protective influence by being positively related to academic stress and anxiety. Finally, resilience positively predicted academic performance, whereas stress and anxiety negatively predicted academic performance.

Conclusion: Thus, the importance of generating strategies for students to learn to self-regulate in academic contexts, manage emotions, foster motivation and develop strategies to help them overcome the vicissitudes they face is emphasized.

KEYWORDS

procrastination, stress, anxiety, resilience, academic performance

Introduction

Post-compulsory secondary education is often experienced by students as a very stressful and demanding period, as it is decisive for their future academic aspirations (Banks and Smyth, 2015; Pascoe et al., 2020). In addition, the content that is usually worked on in this period is more complex than in compulsory secondary school (Govaerts and Grégoire, 2004). This level of coping puts stress on students and limits their academic decision-making, sometimes leading to maladaptive academic behaviors related to avoidance (Deb et al., 2015). In this way, students often display behaviors to voluntarily postpone activities and/or exams, either because others guarantee immediate

achievement, inadequate information processing or fear of failure (Ziegler and Opdenakker, 2018). This leads to academic and personal problems as immediate completion of activities and study becomes difficult (Ziegler and Opdenakker, 2018). Therefore, it is key for students throughout their academic life to develop a range of academic strategies that actively contribute toward their learning goals and to be metacognitively aware, planful and strategic (Teng et al., 2021). Thus, the present study aims to analyze the effect of academic self-regulation on procrastination, resilience, academic stress and anxiety, and academic performance.

Academic self-regulation

The construction of learning responds to an intentional and conscious activity aimed at achieving a meaningful construction for the student who learns, we therefore speak of strategic behavior and, accordingly, of strategic learning. This learning, in order to be such, must be reflective and aimed at the autonomy of the person, self-direction (Trigueros-Ramos et al., 2019). This requires an active process for students to define their learning goals, trying to know, control, regulate their cognitions, motivations and actions to achieve these goals (Inzlicht et al., 2021).

For this self-regulation process to be successful, it is necessary to effectively use certain skills or strategies of metacognition or self-knowledge that allow a certain emotional understanding and cognitive resources used in the learning process, defining and questioning goals, as well as planning and evaluating the teaching process (Panadero and Alonso-Tapia, 2014). Therefore, it would be a multilevel, interactive and self-directed process, whose origin is located at the social level (Boekaerts et al., 2005).

Although numerous studies have focused on the effects of self-regulated learning, finding that it has a positive influence on the ability to learn how to learn (Wibrowski et al., 2017), self-efficacy (Kandemir, 2014) and in addition, students with high self-regulation skills were also found to make greater use of metacognitive and repetition strategies, as opposed to procrastination (Wolters et al., 2017). However, studies that have analyzed the effect of academic self-regulation have mainly been related to positive or negative factors but have not explored the relationship between these variables as mediated by a negative factor.

Procrastination

Procrastination is a theoretical construct that explains intentional and unjustified procrastination from a behavioral, cognitive and emotional approach. It involves procrastinating one or several activities, either at the beginning, development or conclusion of them and carrying out another or other unnecessary activities that prevent the completion of the original activity (Glick and Orsillo, 2015; Bolivar et al., 2016). Procrastination involves the individual in the presence of a sense of guilt and discomfort for the very fact of delaying and subsequent relief when the pending activity is executed, usually at the 'last moment' (Moreta et al., 2018). In the context of education, studies on the prevalence of procrastination indicate that at least 20% of the young population acknowledges having procrastinatory behaviors (Harriott and Ferrari, 1996), with this percentage in Spanish-speaking countries being 14% (Ferrari et al., 2007). Adolescence and young adulthood are the period of greatest susceptibility to procrastinatory behaviors, with the figure being found to skyrocket, reaching up to 95% of adolescents (Steel, 2010) and between 80 and 95% of university students to develop this behavior, as well as the desire to reduce it (Muñoz-Olano and Hurtado-Parrado, 2017; Codina et al., 2020).

Procrastination does not refer to the failure to complete a task, but to the experience of procrastination and last-minute completion, although non-completion may occur (Pardo et al., 2014). This, of course, affects with a diminished sense of well-being. It results in stress, difficulties in following instructions (Milgram et al., 1992), unpunctuality (Pestana et al., 2020), poor school performance (Kim and Seo, 2015), personality problems (Park and Sperling, 2012). However, studies on procrastination in education are mostly descriptive and unidirectional. Therefore, it is necessary to analyze the role of academic procrastination as a mediator of learning processes and to take into account its influence on negative and positive factors focused on students' learning processes.

Stress and anxiety

Academic stress and anxiety can be defined as a relationship between the student and the demands of the academic environment, which is perceived by the former as threatening and endangers their well-being (Trigueros et al., 2020a). Perceived demanding demands (e.g., exams, a competitive context, proximity to deadlines.) can affect students' performance, as well as their physical and mental health, generating an imbalance that leads them to resort to different coping strategies to restore it (Watson and Watson, 2016). Although academic stress and anxiety reaches its peak during the university stage (Peer et al., 2015), it is not exclusive to this period, and also manifests itself in the other stages of schooling. In this sense, studies focused on the post-compulsory stage are still quite scarce compared to the rest of the educational stages (Trigueros et al., 2020b).

Stress and anxiety have been positively associated with depression, poor academic performance (Karaman and Watson, 2017), school dropout (Pascoe et al., 2020) and even sleep quality (Wunsch et al., 2017). Conversely, it has been found that students who respond adaptively to academic stress tend toward self-care, emotional regulation and show more self-efficacy (Watson and Watson, 2016). On the other hand, it is also important to take into account the effect of anxiety in exams or assessment situations, since the emotional reaction triggered in these contexts, characterized by uncertainty and tension, can provoke physiological and behavioral changes (Trigueros et al., 2020b). Thus, the pressure of exams and activities could be considered as potentially threatening as it could interfere with their future academic goals and add pressure from family or social environment (Deb et al., 2015).

Resilience

In recent years, there has been a growing interest in the study of academic resilience, especially in terms of how to enhance it given its clear advantages in terms of social, academic and personal skills in the face of adverse situations (Allen and Eklund, 2019). In general terms, a resilient student is one who, despite having disadvantageous social or personal conditions, obtains a clearly higher performance than expected, that is, one who is able to adjust adaptively to the demands of the environment (Trigueros et al., 2020c). However, resilience is not a linear construct in which an event causes a personal maladjustment in the

individual, without considering other pathways. Moreover, emotions can affect the process of adaptation and coping (Tudor and Spray, 2017). This is essential given the importance of emotions in protecting individuals' behaviors, and several studies have shown that people value emotions as facilitators of the development of resilience capacity (Ahmed et al., 2018).

Studies related to resilience have shown that this construct is related to academic performance, as a protective factor against negative emotions, motivation and internal well-being. Despite these studies, academic resilience is a recent construct and there are important gaps on how it can be affected by students' cognitive characteristics and decisions (Cassidy, 2016).

Objectives and hypotheses

Based on the above, the aim of the present study is to analyze the influence of academic self-regulation on procrastination, academic anxiety and stress, academic resilience and academic performance. These relationships will be analyzed through a structural equation model where the protective influence of resilience against stress, procrastination and anxiety will be observed. The hypothesis put forward in the study is as follows: (H1) academic self-regulation will negatively predict procrastination; (H2) procrastination will positively predict academic stress and anxiety; (H3) academic resilience will negatively predict academic stress and anxiety, on the contrary, it will positively predict academic performance; (H4) academic stress and anxiety will negatively predict academic performance.

Methods

Participants

The sample consisted of 991 high school students (563 boys and 428 girls) aged between 16 and 19 years ($M = 17.25$; SD = 3.45). These participants belonged to several public schools in the province of Almeria (Spain), siguiendo un maestro no probabilistico inferencial ya que no todos los centros educativos mostraron su conformidad para que los estudiantes participaran en el estudio. Participation was voluntary, and they did not receive any incentive for their collaboration.

The G*Power programe was used to calculate the sample size and check the statistical power of the study. For all calculations an $\alpha = 0.05$ and a statistical power $(1 - \beta) = 0.80$ was considered. The algorithm of O'Brien and Shieh (1999) was used.

Measurements

Academic Self-Regulation. The self-regulated learning questionnaire by Torre (2007) was used. This questionnaire consists of 20 items represented by four factors: active metacognitive awareness (6 items; e.g. "When I start to study I am clear about when and why I should study in one way and when and why I should use a different strategy"), control and verification by the student (7 items; e.g. "When I am studying a subject, I try to identify things and concepts that I do not understand well"), effort and effort (7 items; e.g. "When I am studying a subject, I try to identify things and concepts that I do not understand well"). "When I am studying a subject, I try to identify things and concepts that I do not understand well"), daily effort in completing tasks (4 items; e.g. "After class, at home, I check my notes to make sure that I understand the information and that everything is in order," and active processing during class (3 items; e.g. "During class, I frequently check if I am understanding what the teacher is explaining"). The scale is Likert-type, with responses ranging from 1 (nothing to do with me) to 5 (I am like that).

The Irrational Procrastination Scale (IPS) by Steel (2010) was used, specifically the Spanish version (Guilera et al., 2018) composed of 9 items with 5 response options on a Likert-type scale (1 = never; 5 = very often) that assess the frequency with which irrational delay in tasks occurs as a result of procrastination ("My life would be better if I had done some activities or tasks earlier"). This tool has adequate psychometric properties (Alpha coefficient above 0.90), indicating adequate internal consistency.

Academic Stress. The Spanish version (Espejo et al., 2011) validated from the Student Stress Inventory (SSI; Fimian et al., 1989) was used. The SSI is composed of a total of 22 items divided into three factors: physiological (6 items), (e.g., "I have itching all over my body") emotional (10 items) (e.g., "I feel overwhelmed") and behavioral (6 items) (e.g., "I neglect my friends") with Likert-type response options ranging from not at all (1) to strongly agree (5). The internal consistency alpha coefficient values found are 0.79 for the emotional manifestations factor, 0.62 for physiological manifestations and 0.66 for behavioral manifestations, so it has an appropriate internal consistency.

Academic Resilience. The Spanish version of Trigueros et al. (2020) was used, validated from the Academic Resilience Scale of Cassidy (2016). The scale consists of 30 items divided into three factors: reflexivity and adaptive help-seeking (9 items; e.g. "I would seek support from my family and friends"), perseverance (14 items; "I would use the situation to motivate myself"; "I would not change my long-term goals and ambitions") and, finally, negative affect and emotional response (7 items; "I would start to think that my chances of success at university were low"; "I would probably get depressed"). The scale is Likert-type, with responses ranging from 1 (Likely) to 5 (Unlikely). The results of the internal consistency analysis showed reliability values above 0.80.

Academic Anxiety. The Spanish version of Sesé et al. (2010) validated from The Test Anxiety Inventory (Spielberger, 1980) was used. The scale is composed of 30 items, distributed in 4 factors: emotionality (8 items; e.g. "I feel anxious"), worry (10 items; e.g. "I worry about the exam grade"), interference (6 items; e.g. "I think about anything and I get distracted") and lack of confidence (6 items; e.g. "I trust my ability"). The scale is Likert-type, with responses ranging from 1 (almost never) to 4 (almost always).

Academic Performance. In order to analyze the performance of secondary school students, the average grade of all subjects at the end of the academic year was taken into consideration. In this sense, the grades were distributed as follows: 5 (outstanding), 4 (outstanding), 3 (good), 2 (pass) and 1 (fail).

Procedure

The present study is endorsed by the scientific bioethics committee of the University of Almeria (Reference: UAL/BIO 213/2020). Once approval was obtained, a member of the research group contacted the management teams of several schools to request their collaboration, explaining the objectives of the study beforehand. Subsequently, those

students whose schools agreed to participate in the study were informed of the objectives. They were given an informed consent form to be signed by their parents/legal guardians if they wished to participate in the study, and after this process a total of 991 students took part. The questionnaires were completed by the students first thing in the morning on an individual basis and in writing, emphasizing that the answers would be anonymous and confidential. A member of the research group was present to answer any questions they might have. The questionnaires took around 30 min to complete.

Data analysis

Several analyzes were carried out in this study: descriptive statistical analysis (mean, standard deviation and Pearson's bivariate correlations), reliability analysis through Cronbach's alpha and a structural equation model to analyze the predictive relationships established in Figure 1. For the various statistical analyzes carried out in this study, the SPSS v25 and AMOS v20 statistical packages were used.

Prior to SEM analysis, the normality of the data was analyzed using the kurtosis values of the individual variables (Stevens, 2009). Kurtosis values greater than 3.00 may indicate that a variable is not normally distributed (Westfall and Henning, 2013). For the structural equation model, the maximum likelihood method was used, together with a Bootstrapping of 6,000 interactions. The fit indices taken into account for the CFAs and structural equation model were the indices established by Hair Jr et al. (2017) and Hair et al. (2006): $\chi 2/df$, with values between 2 and 3; Comparative Fit Index (CFI), Incremental Fit Index (IFI), Tucker Lewis Index (TLI), with values above 0.95; Root Mean Square Error of Approximation (RMSEA, 95% confidence interval), with values below 0.06; Standardized Root Mean Square Residual (SRMR), with values below 0.08. However, according to Marsh et al. (2004), these indices should be taken into account with some caution as they are restrictive if the model is very complex.

Results

Preliminary analysis

Table 1 shows the mean, standard deviation and bivariate correlations. The correlations reflected a positive valence between related factors such as self-regulation, resilience and academic performance, and on the other hand between stress, anxiety and procrastination. In contrast, the correlation was negative between the two groups. In addition, Table 2 shows the reliability analyzes with all scores above 0.80 and kurtosis values were not greater than 3.

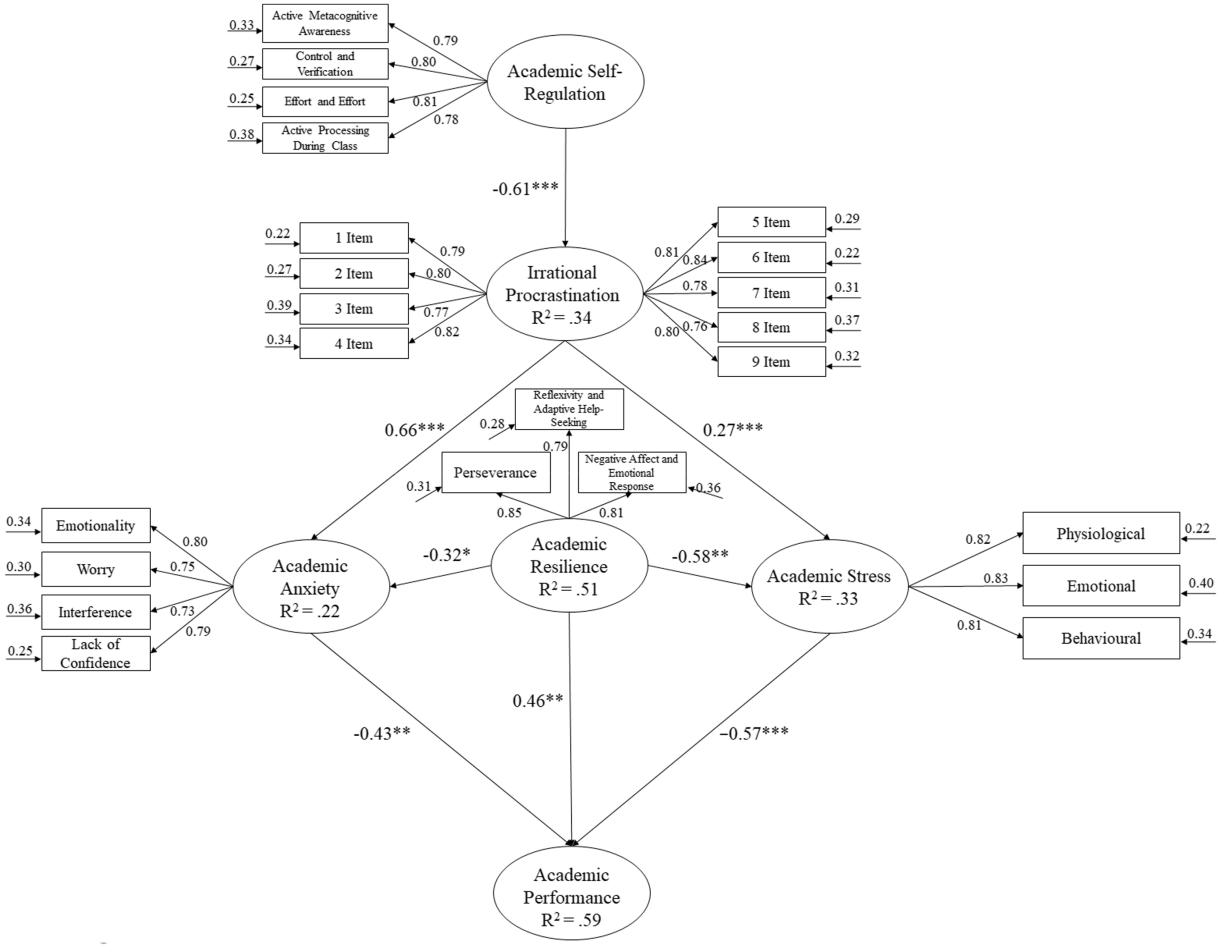


FIGURE 1
Structural equation model showing the relationships between variables. *p<0.05; **p<0.01; ***p<0.001.

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Structural equation model

Before testing the hypothesized model, a confirmatory factor analysis was conducted for each of the scales used. The data revealed (Table 3) that each of the scales had acceptable fit indices, taking into account the fit indices described by Hair et al. (2006).

Once the CFAs were conducted, the hypothesized model of predictive relationships was tested on secondary school students (Figure 1), which revealed the following fit indices: $\chi 2$ (371. N = 991) = 894.63, $p < 0.001$; $\chi 2/df = 2.41$; CFI = 0.96; IFI = 0.96; TLI = 0.96 RMSEA = 0.053 (95% CI = 0.052–0.059); SRMR = 0.041.

The relationships obtained between the different factors comprising the model are described as follows:

(*H1*) Academic self-regulation was negatively related to irrational procrastination ($\beta = -0.61$, $p < 0.001$).

(*H2*) Irrational procrastination was positively related to academic anxiety ($\beta = 0.66$, $p < 0.001$) and academic stress ($\beta = 0.27$, $p < 0.001$).

(*H3*) Academic Resilience was negatively related to academic anxiety ($\beta = -0.32$, $p < 0.005$) and academic stress ($\beta = -0.58$, $p < 0.01$).

(*H4*) Academic performance was negatively predicted by academic anxiety ($\beta = -0.43$, $p < 0.01$) and academic stress ($\beta = -0.57$, $p < 0.001$), on the other hand, academic performance was positively predicted by academic resilience ($\beta = 0.46$, $p < 0.001$).

TABLE 1 Distribution of students by school.

	Boys	Girls	Total
1. High School "*A*"	135	117	252
2. High School "*B*"	147	90	237
3. High School "*C*"	126	111	237
4. High School "*D*"	155	110	265

For ethical considerations, the names of the high schools have not been added.

Discussion

The aim of this study was to analyze students' behaviors related to academic self-regulation, procrastination, stress, anxiety and academic resilience. These factors were taken into account as determinants toward the predictability of academic performance.

Results have shown that academic self-regulation negatively predicts young people's procrastination. These results are related to previous studies. In this regard, a study by Durán (2017) found a low negative correlation between academic self-regulation and procrastination in 290 psychology students. Similarly, the study by Bedoya (2017), who reported similar results in a sample of 196 first-year vocational students. Likewise, it has been found that those students with high academic performance showed a high capacity for self-regulation and the use of metacognitive and repetition strategies, which are contrary to procrastination (Wolters et al., 2017).

Furthermore, the results showed that procrastination was positively related to academic stress and anxiety. These results are clearly similar to the study by Vahedi et al. (2012), who found that those students with higher levels of procrastination also had higher levels of academic anxiety, based on a sample of 246 students. Similarly, the study conducted by Pardo et al. (2014), with 100 psychology students from Colombian universities, confirmed that the greater the procrastination, the greater the predicted emotional response of anxiety. In short, it has been consistently shown that procrastination may be associated with factors such as anxiety in the academic environment, in learning and with tension or stress before the next academic tasks are due (Chan, 2011; Clariana et al., 2011). Procrastination has been found to ultimately lead to deterioration or failure in academic skills (Li et al., 2020), as well as stress and physical health (Qian and Fuqiang, 2018), which could ultimately lead to school dropout, hence the importance of working on the prevention of such behaviors.

Finally, resilience would exert a protective role with respect to stress and anxiety, variables with which it is negatively related. In this sense, previous research is along the same lines, finding that those primary and secondary school students with high levels of resilience successfully managed stressful situations (Johnston-Wilder et al., 2014) or the study

TABLE 2 Descriptive analyzes, internal consistency, kurtosis and bivariate correlations.

Factors	*M*	SD	α	*k*	1	2	3	4	5	6
1. Self-Regulation Academic	3.77	1.33	0.84	1.12		−0.39***	−0.45**	0.31***	−0.52***	0.62***
2. Procrastination	2.45	1.44	0.83	0.78			0.47***	−0.38**	0.51***	−0.42**
3. Academic Anxiety	2.12	1.38	0.82	1.20				−0.68***	0.71***	−0.37***
4. Academic Resilience	4.01	0.77	0.85	0.87					0.75***	0.55***
5. Academic Stress	1.96	1.22	0.80	0.83						−0.54**
6. Academic Performance	2.69	1.07	-	1.55						

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. α = Cronbach's Alpha; *k* = Kurtosis.

TABLE 3 Confirmatory factor analysis of the scales.

Scales	$\chi 2/df$	CFI	IFI	TLI	RMSEA	SRMR
Academic self-regulation	2.44	0.95	0.94	0.95	0.058	0.043
Irrational procrastination scale	2.55	0.97	0.97	0.97	0.050	0.038
Student stress inventory	2.52	0.96	0.95	0.96	0.057	0.050
Academic resilience scale	2.98	0.94	0.94	0.94	0.059	0.049
Academic anxiety	2.77	0.95	0.95	0.95	0.052	0.044

by Trigueros et al. (2020b), in which it was found that university students with high levels of resilience reported less anxiety before exams. It also seems that academic challenges and challenges would be key in the resilience-building process (Van Hoek et al., 2019). These results are consistent with previous studies indicating that under stressful conditions, the lack and effective use of resilience skills may be revealed (Reich et al., 2010), or, in other words, that stress is negatively associated with resilience (Wilks and Spivey, 2010). It has also been found that more resilient individuals are able to recover earlier from adverse psychoemotional reactions to stress, and are better able to cope with adversity, while showing greater engagement and responsiveness to positive everyday events (Ang et al., 2022).

In turn, the direct role of these three variables (resilience, stress and academic anxiety) on performance has been studied. Resilience, as discussed above, would play a positive role on performance, whereas stress and anxiety would have a negative impact on performance. The proposed model could have important implications for improving academic performance. In this regard, previous research analyzing protective factors for school failure, as well as the impact of risk predictors, found that therapies such as mindfulness reduced students' stress levels and anxiety (Oblitas et al., 2019), learning to perceive one's resources to manage adverse situations (Datu and Yuen, 2018) and the use of resilience-related strategies that promote active coping with problems (e.g., problem solving or positive reinterpretation). Thus, the results of this study highlight the importance of promoting resilience in educational settings as it contributes to students' well-being and quality of life (Seligman and Csikszentmihalyi, 2000). For the effective development of resilience in the individual, he or she must manage the adversity factors related to social disintegration, negative thinking and the absence of effective participation in the events present in his or her life.

The results of the study have a number of implications that we consider to be of interest for the improvement of teaching practice. Firstly, it has been pointed out that it is advisable to promote self-regulation processes in students, and there is a broad consensus among researchers that this can be worked on through repeated instruction and practice in multiple and different contexts. For example, following the proposals of Zimmerman et al. (1996) and Zimmerman and Schunk (2001), it would be desirable to foster psychological processes closely related to self-regulation, such as motivation, goal setting, strategy use and reflection. Following their proposal, through a training model structured in 5 weeks, it is intended that the teacher promotes self-regulatory strategies such as planning and task management, understanding and synthesis of content, writing, note-taking and exam preparation. Self-regulated learners are aware of the role of their activity and personal involvement in their learning process and results, adjusting and monitoring their work, as they are aware of their abilities and skills. In this way, academic self-regulation forms autonomous, independent and self-directed learners (Robson et al., 2020).

On the other hand, it is necessary to analyze what factors might account for procrastination. It may be the case that students intend to finish homework on time, but lack motivation due to dislike or difficulty of the task. Also, sometimes procrastination behavior is reinforced by academic success, which encourages future work-under-pressure behavior. In this sense, the teacher should identify difficulties and encourage the use of strategies such as setting daily goals, planning and establishing a routine, selecting a distraction-free environment that invites concentration, the importance of self-reinforcement and group study. Avoiding procrastination is also about avoiding the stress and anxiety that can be caused by not having enough time to complete an assignment. In this sense, Yu et al. (2021), suggest the need to train teachers in the practice of innovative cognitive learning strategies, encourage decision-making in students, promoting support strategies that promote emotional balance, eliminating fears, as well as, to carry out coexistence between teachers and students that promote an increase in self-esteem.

With regard to academic resilience, the need to incorporate elements focused on emotional regulation, helping to respond to stress, anxiety or other negative emotions, is pointed out. It could be a good initiative to include cross-curricular programes on emotional learning and management and mindfulness.

However, there are a number of limitations to be taken into account: firstly, this is a relational study, which implies the absence of manipulation of variables, so that the causal relationship between the factors studied could go in both directions, and not only in the one indicated in the proposed model. In this sense, it would be interesting to replicate this study using a longitudinal methodology that would allow us to confirm the proposed relationships and the specific weight of each variable in subsequent academic performance. It is also convenient to take into consideration the small sample size and the non-random sampling, so it would be interesting to observe what happens in a larger sample obtained by random sampling. Nevertheless, despite the limitations mentioned above, the model seems to show good robustness and generalisability.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: We do not have the permission of the participants to disclose the database. Requests to access these datasets should be directed to RT, rtr088@ual.es.

Ethics statement

The studies involving human participants were reviewed and approved by REF: UAL/BIO 213/2020. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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How do Chinese students effectively convey emotions through the discussion forums in the LMOOCs?

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KEYWORDS

LMOOCs, sentiment analysis, content analysis, discussion forum, interaction, data collection, data analysis

1. Introduction

Massive Open Online Courses (MOOCs) have received continuing academic attention in recent years due to their significant impact on higher education (Pappano, 2012; Galán et al., 2019). Among them, language MOOCs (LMOOCs) have now become an emerging research interest in the field (Bárcena and Martín-Monje, 2014). Plentiful empirical studies have generated abundant findings, which enable us to better understand the benefits and limitations (e.g., Peral, 2019; Bartalesi-Graf et al., 2022) as well as the teaching models and design (e.g., Appel and Pujolà, 2021; Luo and Ye, 2021). However, crucial as emotions are in the learning context (Rowe et al., 2015; Gil-Madrona, 2020), to date few empirical studies have been conducted to closely examine the latent emotions of LMOOC students. Particularly in the post-pandemic years with the surging popularity of online courses, further research is badly needed (Chacón-Beltrán and Echitchi, 2021).

Recently, Peng and Jiang (2022) published their article entitled *Mining opinions on LMOOCs: Sentiment and content analyses of Chinese students' comments in discussion forums* (hereinafter it is referred to as "the article"), the first sentiment and content analyses of comments in the LMOOC discussion forums. This study has contributed timely responses to the growing body of research. Specifically, by investigating the comments of the 60 LMOOCs in China, the article reveals that the majority of comments examined are positive, and five major themes are summarized and examined closely to probe into students' subtle emotions and attitudes. As far as we are concerned, the article is rigorous and convincing, which enables us to better understand the emotions and opinions of Chinese LMOOC students and beyond. Illuminating and Inspirational as it is, there seems to be room for further consideration. Thus, we would like to comment on this article to evaluate online engagement and web-based course design for the purpose of promoting more future relevant research studies.

Before starting the analysis and discussion, we find it necessary to review two key concepts in the article, i.e., sentiment analysis and content analysis, to help the reader better understand the article. First, sentiment analysis, or opinion mining, is a type of natural language processing that involves the extraction of people's opinions of and sentiments toward given topics, products, issues, and persons (Liu, 2020). Sentiment analysis includes such tasks as aspect and entity extraction, sentiment classification, sentiment summarization and search (Li and Hovy, 2015), and typically it examines the polarity and strength of the sentiment in terms of its positive, neutral, or negative nature (Poria et al., 2018), and

this can be carried out at the document, sentence or aspect level (Liu, 2020). Although the aspect extraction is crucial (Tubishat et al., 2018), sentence and document analyses are also useful (Birjali et al., 2021). Therefore, more often than not, two or more levels of analyses are conducted to achieve better performance (Mai and Le, 2021). Sentiment analysis, with its great theoretical and practical value, is widely applied to mine opinions, analyze emotions and extract information from social media and beyond. However, there are still some challenges for sentiment analysis such as sarcasm detection (Ravi and Ravi, 2017) and implicit aspect extraction (Birjali et al., 2021).

Second, content analysis is a research method to make systematic and reliable interpretations of the content of text data (Drisko and Maschi, 2015). Three major trends can be identified in content analysis. To begin with, contemporary content analysis tends to go far beyond the *manifest content*, or the surface structure of the data (Berg and Lune, 2016) that is explicit or easily noticeable, and focuses on the *latent content*, or implied information hidden in the text, ranging from the cognitive judgments to emotional feelings (Riff et al., 2005). Furthermore, content analysis can be conducted both qualitatively and quantitatively. While quantitatively oriented content analysis emphasizes reliability, validity and objectivity, qualitatively oriented content analysis focuses on replicability, validity and transparency (Drisko and Maschi, 2015). As Lacy et al. (2015) pointed out, issues such as sampling and reliability may pose great challenges to content analysis, and we should be especially careful in handling them. In addition, content analysis can be combined with other types of analysis to generate an integrated methodology (Neuendorf, 2012), as contemporary content analysis faces a wider context with larger volumes of data (Krippendorff, 2018).

To the best of our knowledge, the article combines sentiment analysis with content analysis to examine student comments in the discussion forums in major Chinese LMOOCs, which arouses our keen interest in making comments. To guide our study, we raise two research questions as follows:

RQ 1: To what extent is the data collection suitable for this study?
RQ 2: In what way did the article analyze the data to address the research questions raised?

To answer the above two research questions, we adopt the embedded analysis method (Creswell and Poth, 2018), which serves as an important tool to focus on a specific question. Instead of analyzing the article holistically, we mainly concentrate on the key issues and specific aspects of the article, which has the advantage of examining the particular phenomenon in operational detail (Yin, 2009). Thus, guided by the two research questions, we are going to focus on the data collection and data analysis within the article, and then spot common and divergent opinions that transcend the article. In the following sections, we first briefly summarize the article, then discuss its pros and cons, and finally conclude with implications and suggestions for further studies.

2. The study

Aiming to explore Chinese students' opinions and sentiments in online learning, the article conducted sentiment and content analyses to examine Chinese students' comments in LMOOC discussion forums. By adopting both quantitative and qualitative methods, the article investigates Chinese students' perceptions and needs regarding LMOOC learning.

Specifically, with regard to data collection, the article selected student comments from 60 LMOOCs in China based on the existing research project covering 30 high-quality LMOOCs accredited by the Ministry of Education and 30 regular ones. Of the 60 LMOOCs, 56 were provided on iCourse, three on XuetangX, and one on Treenity, and all 60 were related to English for general or specific purposes. These courses were typically xMOOCs, which are mainly syllabus-based (Hew et al., 2018) while interactions are not highly expected (Motzo and Proudfoot, 2017). Student comments on these courses were gathered in the time span from September 2020 to March 2021. After the data cleansing by removing emoticons and other irrelevant information, altogether 22,368 comment entries were obtained for analysis.

Concerning data analysis, the article adopted sentiment and content analyses to answer the four research questions. First, with the software ROST CM6, the article computed the sentiment scores of each LMOOC, including the scores of each comment entry, of each student and of all the students, to identify the distribution of student sentiment (i.e., positive, neutral, and negative) in their comments. Second, with the combination of the Python package SnowNLP and IBM SPSS Statistics V22, the article examined the correlation between student sentiment and course rating to test the validity of the analytical results. To complement the above two steps of sentiment analysis and further investigate latent opinions in student comments, the article next conducted two steps of content analysis. Third, the article used JMP Pro 16 software to further identify the major themes of students' comments in clusters through rounds of observations. Last, assisted by NVivo 12, content analysis of latent concerns and opinions from the LMOOC students was conducted to obtain empirical evidence to inform LMOOC implementation. Thus, different research tools were used to progressively probe into students' sentiments and concerns.

Regarding the major findings, first, it was revealed that Chinese students' online comments were predominantly positive, that is, 20,988 out of 22,368. Furthermore, the positive correlation between student sentiment and course rating demonstrated that students with positive sentiments were more likely to rate higher for the course. Following that, the article spotted five major themes (i.e., attitudes toward the LMOOCs, comments on the LMOOCs, evaluation of LMOOC instruction and instructors, learning outcomes, and suggestions), and further frequency counts of the codes also revealed that the majority of the codes were positive, consistent with the above sentiment analysis. Moreover, the article identified four categories of students' negative comments (i.e., course content, lecture videos, assignments and tests, and platforms) and five types of students' suggestions (i.e., suggestions for instructors, for LMOOC design, for video design, for assignments and tests, for platforms). Intriguingly, it was discerned that students might use euphemistic expressions and

buzz words to circumvent the negative feedback, which could possibly be explained by the mandatory nature of the discussion forum for students. Overall, the study has implications for LMOOC teachers to improve their online instruction and for LMOOC developers to update the course design, particularly in relation to the means of tailoring the course content and teaching styles to students' needs.

3. Discussion

3.1. Data collection

Regarding data collection, the article analyzed the comment entries in the discussion forums in 60 LMOOCs in China to mine students' sentiments and opinions. On the one hand, the data collected by the article are basically inclusive and valid and serve the research purpose well. To enhance the reliability and validity of the study, the article, after two rounds of data cleansing, collected inclusively 22,368 comments for analysis from 60 LMOOCs, which covers 30 high-quality ones and 30 regular ones. According to Creswell and Poth (2018), sample size is important for the reliability and validity of studies, and it is well established that larger sample sizes tend to be more stable (Kretzschmar and Gignac, 2019). Thus, by taking different variables into consideration, we believe that the data collected in the article are basically reliable and valid.

On the other hand, there seems to be room to refine the data so as to better address the research questions. Firstly, it remains unclear as to why the courses under analysis are delivered mainly in English and 56 courses out of 60 are taken from iCourse. This, in our opinion, can possibly be attributed to the relatively easy access to the data by analyzing English MOOCs on iCourse. As China boasts the largest number of English learners in the world (He and Li, 2021) and iCourse is the largest MOOC platform in China (Wu and Chen, 2021), the choice of an overwhelming number of English MOOCs from iCourse would make data collection more easily accessible and feasible. However, this lack of data diversity could affect its reliability, as data heterogeneity is integral to the validity of analysis (Pitard, 2019). Therefore, it is necessary to diversify the data sources to ensure the depth and width of the data as far as possible (Kretzschmar and Gignac, 2019). In fact, as languages other than English are not compulsory in China, MOOCs of other languages might cater mainly to beginners and interactions seem almost inevitable (Furnborough, 2012). Thus, for a better understanding of the LMOOCs at large, the inclusion of LMOOCs other than English for analysis might bring forth intriguing results in future studies. Besides, to ensure the inclusion of the most representative LMOOCs in the study (Lohr, 2022), we suggest that diverse platforms (e.g., UMOOCs, a platform devoted to language learning) be taken into consideration. In this way, it is possible to balance the comprehensiveness and representativeness of the data so as to enhance its reliability and validity.

Secondly, we doubt the selection of course types in the article, as all the courses under scrutiny fell into the category of xMOOCs. As is known to us, xMOOCs are typically lacking in interactions (Motzo and Proudfoot, 2017). However, as LMOOCs are skill-based and socially-oriented in nature (Martín-Monje et al., 2018; Bartalesi-Graf et al., 2022), the choice of xMOOCs as the single type of courses for analysis might not fit the interaction-based research perfectly. Therefore, for the sake of comprehensiveness, we think some other types of LMOOCs should be selected in future studies to better answer the research questions. For instance, cMOOCs, which are based on a connectivist approach with emphasis on social learning and learner autonomy (Downes, 2012), might be suitable for this study to probe into student sentiment in the course of interactions. Hence, we hold that the hybrid use of xMOOC-type and cMOOC-type LMOOCs for analysis is essential (García-Peñalvo et al., 2017) and would more effectively and systematically resolve the research questions.

Thirdly, we are also skeptical of the use of student comments in the discussion forums as the only source of data. As student engagement patterns in LMOOCs vary (Martín-Monje et al., 2018), the channels for students to express feelings also differ. Among all these channels, previous studies have shown that online comments may not truly reflect their genuine feelings (Chen and Pain, 2017; Kim et al., 2021), partly because students tend to include some necessary and sufficient information about themselves in MOOCs (Zubkov and Morozova, 2017), and partly because the mandatory nature of the comments could leave students' passive or even irrelevant comments unavoidable (Peng and Jiang, 2022). Therefore, to better understand students' psychological states such as emotions and motivations in the course of online engagement (Fririksdóttir, 2021; Wright and Furneaux, 2021), the sole use of the comment in the discussion forum may not be sufficient. As far as we are concerned, student comments on Weibo (the Chinese equivalent of Twitter), an encompassing platform for expressing views freely, are the ideal supplementary data sources for sentiment analysis of online courses (Zhou, 2020) to enhance the reliability of data.

All in all, given the great importance of data collection (Sapsford and Jupp, 2006), we appeal that future studies should give weight to the design before collection. As far as we are concerned, multiple factors should be taken into account in the course of data collection for the sake of data saturation (Merriam and Tisdell, 2015). Therefore, if possible, we may diversify the data sources and enrich the types of data to ensure the reliability and validity of the research (Kretzschmar and Gignac, 2019).

3.2. Data analysis

Concerning data analysis, the article used sentiment and content analyses with an array of tools to reveal the sentiment polarity and identify key themes and sentiments of the comments. In general, we find the sentiment analysis relatively thorough and convincing, with student comments scrutinized and student emotions mined step by step. Moreover, we also notice that content analysis was used in the article to complement sentiment analysis to enhance validity (Neuendorf, 2012; Drisko and Maschi, 2015). However, we hold that there is still room to dig deeper for future studies.

First, the analysis of the article centered around the emotional polarity of student comment, which is a typical way of sentiment analysis (Poria et al., 2018). However, as is stated above, students'

online engagement involves cognitive, emotional, and behavioral dimensions, and is a complex process challenging to pin down (Riff et al., 2005). For Evans (2002), emotions may also be cultural, anthropological or even scientific, which makes it elusive to capture. Therefore, for an in-depth data analysis we believe it is necessary to transcend the traditional positive-negative dichotomy of sentiment polarity and probe into the diverse variables and subtle meanings in their sentiments and opinions. In fact, while Poria et al. (2018) proposed multimodal sentiment analysis, Belli (2018) applied this multimodal approach to analyze how participants manage their negative emotions during online learning, both of which provide us with possible ways to consider different variables of emotions and detect their heterogeneity (Gil-Madrona and Díaz, 2012; Gil-Madrona and Martínez, 2016). Besides, to warn against the danger of "dark glasses" which might hide our true emotions (Anolli et al., 2002), we should be particularly careful in the detection of some ironical or euphemistic expressions and the implicit aspect in the comments (Ravi and Ravi, 2017; Birjali et al., 2021). This disguise of genuine feelings in student comments also brings forth another interesting topic for further research, that is, emotion management, which is largely under-examined in the learning context (Roberts and Smith, 2002; Goodwin, 2007; Garner, 2010; Belli, 2018). Furthermore, to capture the subtleties of opinions more accurately, we might adopt slightly different sentiment analysis tools and models for different discussion forums, i.e., prescribed discussions, free discussions and Q&A discussions (Yang et al., 2015). For instance, Mukherjee and Liu (2012). JTE Model may be more appropriate for free discussions, while behavioral, graph or probabilistic models might be needed to detect fake or deceptive opinions in the comments (Liu, 2020).

Second, we appreciate that the article analyzed the aspect-level and sentence-level sentiments, since the two levels of analysis together might yield more accurate results and achieve better performance (Mai and Le, 2021). Nevertheless, as sentiment analysis can be carried out at the document, sentence or aspect level (Liu, 2020), it can possibly go further to include the document-level sentiment analysis. Some other scholars also proposed concept-level analysis to complement current domain-dependent sentiment analysis (Bisio et al., 2017). As a matter of fact, the article has eliminated such important information as emoticons from analysis, which makes the document analysis imcomplete. As far as we are concerned, multi-level sentiment analysis can help detect vague semantic links and complicated sentiment information (Ha et al., 2019), hence it is of great significance for comment analysis. Besides, as forum comments abound in extremely short comments with ineffective or irrelevant information (Babori, 2021), further document-level analysis may help cleanse the data noise and enhance its reliability. Therefore, we maintain that more comprehensive further studies can be carried out to detect the subtly different sentiments at different levels.

To sum up, there are many potential productive avenues for future research on the delicate emotional intensities and latent meanings of the comments. On the one hand, we suggest it is necessary to probe further to transcend the positive-negative dichotomy of sentiment polarity and capture the subtle sentiments and opinions in the comments. On the other hand, we suggest further research studies should broaden the scopes of the analysis to get a comprehensive understanding of student sentiments.

4. Conclusion

To summarize, this is generally an in-depth study of the general sentiments and opinions in LMOOC comments by adopting both quantitative and qualitative analysis tools. It reveals that student comments are dominantly positive and can be categorized into five sets of themes. As the first empirical study to investigate students' emotions toward and views of LMOOCs with the combination of sentiment analysis and content analysis, the article has successfully resolved the four research questions, illuminating later studies and future practice in this field. The article might shed light on the future LMOOC design to tailor students' needs, and illuminate further studies to investigate multi-level student sentiments in various contexts. Therefore, we would highly recommend it to scholars interested in the sentiment analysis of LMOOCs, and call for more comprehensive and in-depth exploration in future research.

Author contributions

BC drafted the initial manuscript. XZ helped him select the commented article, provided insights and suggestions during the process of writing and revised the last draft. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Using the fsQCA approach to investigate factors affecting university students' satisfaction with online learning during the COVID-19 pandemic: A case from China

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During the COVID-19 pandemic, higher education institutions have been forced to switch their teaching mode to online education. There has been limited in-depth exploration of the factors affecting students' satisfaction with online learning, and no consensus has been reached among these studies' results. Students' satisfaction is essential for realizing effective online education practices and meaningful to promoting the sustainable development of online courses, and it cannot be fully explained by one single factor. Research exploring the configuration of factors affecting students' satisfaction with online learning has been rare. This study adopted a novel data analysis method, the fuzzy-set Qualitative Comparative Analysis (fsQCA) method, to explore collocations of different factors affecting higher education students' satisfaction with online learning during the COVID-19 pandemic. This research surveyed 357 university students in Mainland China during the second semester of the 2021–2022 academic year using a structured questionnaire. The study identified that when students were satisfied with assignments and had a higher level of internet self-efficacy, or they were satisfied with their instructors and assignments, they were satisfied with online classes. Additionally, internet self-efficacy is indispensable to explaining students' higher level of satisfaction with online learning. This study contributes to our understanding of university students' satisfaction with online learning during the COVID-19 pandemic by using a novel method to explore the configuration of influential factors, and it provides implications for administrators and policymakers in the education field who seek to improve students' satisfaction with online learning.

KEYWORDS

COVID-19, online learning, factors, students' satisfaction, the fsQCA approach

1. Introduction

1.1. Research background

At the end of 2019, Corona Virus Disease 2019 (COVID-19) appeared in China. As the virus spread, the World Health Organization (WHO) designated it a pandemic (WHO, 2020). Since

then, the ongoing pandemic has been seriously disruptive to teaching/learning activities worldwide (Sharma et al., 2020), and nearly 90 percent of the world's students have been influenced (UNESCO, 2020). Under this circumstance, school closures have been implemented at all levels from preschool to higher education (Simsek et al., 2021), and most higher education institutions around the world shut down their campuses in late March 2020 (Wong et al., 2020). As a result, higher education institutions have been forced to switch to an online teaching mode. Online learning did not originate during the COVID-19 pandemic, and higher education students had been exposed to this teaching mode for many years before the unprecedented closure. However, online learning on such a large scale is unprecedented in the history of higher education. Compared with normal online classes, this emergency remote teaching/learning could not be well-planned instructors do not have enough time. An important strand of the education literature has focused on online learning issues during the COVID-19 pandemic, especially issues related to students' online learning.

Research has indicated that online learning has been a must for educational institutions during the pandemic to limit the disruption of education, as online learning is accessible, affordable, and flexible (Faize and Nawaz, 2020). Maqableh and Alia (2021) confirmed that safety and effectiveness are the two most important positive aspects of online learning. By taking an online approach, students and teachers have been less likely to catch the COVID-19 virus. However, the problems of online learning during this special period cannot be ignored. First, from a macro viewpoint, the transition to online learning during the pandemic has aggravated education inequalities. Online learning's dependency on technological devices and the internet cannot be ignored. Accordingly, instructors and students with bad internet connections have been more likely to be excluded from online learning (Adedoyin and Soykan, 2020). Agormedah et al. (2020) also proposed that students' ability to have access to e-learning devices and internet connectivity would determine the success of the students' shift to remote learning. However, students in economic and financial distress are less likely to afford an unlimited and stable internet connection. This result buttressed the study of Adedoyin and Soykan (2020), which found that the online approach was more accessible for advantaged students with access to technology and hindered the participation of disadvantaged learners. Second, from a micro viewpoint, students with access to online learning also have faced challenges such as distraction, workload, technology issues, and inadequate support (Maqableh and Alia, 2021). Similarly, Faize and Nawaz (2020) also reported that students faced challenges such as a lack of resources and internet services and a lack of interaction. Because of these drawbacks to online learning, Mahyoob (2020) found that online learning had failed to allow students to fulfil their expected progress in learning performance, and that most learners were not satisfied with continuing online learning.

There is no denying that online practice is irreplaceable in circumstances such as the COVID-19 pandemic. Still, the problems that impede effective online education should be given more attention, especially those that decrease students' satisfaction with online learning. In the short term, students' satisfaction is really important for realizing effective online education practices (Sharma et al., 2020) and meaningful for promoting the sustainable development of online courses. As of May 2022, the epidemic had lasted for more than 2 years. It is uncertain how long the pandemic period will continue. Students have to prepare for long-term online learning as the epidemic becomes normalized. It is indispensable to investigate the factors influencing students' satisfaction with online learning during the pandemic and to improve the negative aspects of this type of learning. In the long term, this situation will accelerate the transformation of traditional pedagogical approaches and force academic institutions to shift to online teaching and learning (Adedoyin and Soykan, 2020). One day, education activities may shift entirely to online teaching and learning, even if the epidemic is resolved. Students' adoption of online education and their satisfaction with it is essential for the sustainable development of online learning. Therefore, exploring factors behind students' dissatisfaction with online learning and dealing with these factors can further improve education equity in different regions.

1.2. Research gap

Few researchers have realized that some studies should be conducted to investigate students' satisfaction with online learning during the pandemic. There has been limited in-depth exploration of the factors affecting students' satisfaction with online learning, and no consensus has been reached among these studies' results about students' satisfaction. Furthermore, prior studies exploring the configuration of factors influencing students' satisfaction with online learning during the COVID-19 pandemic in particular have been rare. In terms of research method, the existing studies have used fairly similar approaches; they have mostly been quantitative studies using methods such as cross-sectional design (Faize and Nawaz, 2020; Simsek et al., 2021) or structural equation models (Jiang et al., 2021; Kumar et al., 2021). Although some studies have adopted mixed methods (Landrum et al., 2021), it is challenging to find a single studying using a qualitative comparative analysis method. Motivated by these considerations, this research aimed to explore the factors affecting higher education students' satisfaction with online learning during the COVID-19 pandemic using the fuzzy-set Qualitative Comparative Analysis (fsQCA) method. The basic idea of the fsQCA method is to analyze the influence of multiple antecedent variable combinations on result variables using Boolean operation. In recent years, the fsQCA method has gained increasing attention because it can explore the influence of collocations of different conditional variables on specific outcome variables. It focuses on the joint action of multiple influencing factors and provides a variety of combinations of condition variables. According to previous research, student satisfaction with online learning during the pandemic is influenced by multiple factors (Baber, 2020; Faize and Nawaz, 2020; Sharma et al., 2020; Jiang et al., 2021; Maqableh and Alia, 2021; Simsek et al., 2021). Student satisfaction may not be fully explained by individual factors acting alone, and the fsQCA method could explore collocations of different factors influencing student satisfaction. Therefore, this research utilized the fsQCA method to analyze student satisfaction using combinations of various factors.

Additionally, many types of research investigating student satisfaction have been conducted in Asian higher education settings. For example, Almusharraf and Khahro (2020) explored the satisfaction of 283 students from the Kingdom of Saudi Arabia with online learning. Besides, Simsek et al. (2021) investigated students' satisfaction with online education in Turkey. Nevertheless, student satisfaction with online learning during the pandemic needs to get

attention in other Asian countries, especially in countries such as China that have taken positive actions to combat the difficulties with online learning during the COVID-19 pandemic. To be specific, the Ministry of Education of the People's Republic of China (2020a) launched an emergency policy called "Suspending Classes Without Stopping Learning" to ensure that students could continue to study at home through online learning platforms on January 29, 2020. From January 29 to April 3 of that year, 1,454 Chinese universities began their spring semester using online learning platforms. More than 950,000 university teachers offered more than 7,133,000 lectures on online learning platforms (Ministry of Education of the People's Republic of China, 2020b). The Chinese government also took prompt action to guarantee the availability of fast and stable network services to students to make online education successful (Zhang et al., 2020). This research attempted to measure the factors affecting university students' satisfaction with online learning during the COVID-19 pandemic in China using the fsQCA approach to provide implications for administrators and policymakers in the education field. This study also provides possible suggestions arising from the findings, especially for the future development of online learning.

1.3. Research questions

The research questions guiding this study were:

(1) To what extent have Chinese higher education students been satisfied with online learning during the COVID-19 pandemic?
(2) What factors have affected Chinese higher education students' satisfaction with online learning during the pandemic?
(3) How can these students' satisfaction with online learning be improved?

2. Literature review

2.1. Concept of student satisfaction and influencing factors

Satisfaction is the pleasure or disappointment generated by comparing the perceived relationship Satisfaction is the pleasure or disappointment generated by comparing the perceived relationship between performance and expectations (Kotler and Keller, 2011). Student satisfaction can be defined as students' perception of the university experience and the perceived value of education in educational institutions (Astin, 1993). As a short-term attitude, student satisfaction originates from a student's evaluation of their own educational experience (Elliott and Healy, 2001). Considering all factors, Weerasinghe and Fernando (2017) concluded that student satisfaction refers to students' short-term attitude based on their evaluation of their educational experience, services, and facilities.

Researchers have held different views when regarding the factors affecting higher education students' satisfaction. Astin (1993) identified that contact time with teachers and administrators, career consultants, campus life, and relationships with teachers and administrators are important. However, Mai (2005) found that the most influential factors are the overall impression of the school, education quality, teachers' expertise, the quality and availability of technical facilities, and the prospect of career development. Wilkins and Balakrishnan (2013) believed that lecturers' quality, the quality of facilities, and the effective use of technology are important. Additionally, feedback quality, lecturer–student relationship, interaction between students, and availability of learning equipment and learning materials greatly affect student satisfaction (García-Aracil, 2009; Sojkin et al., 2012). It can be seen that students' satisfaction is influenced by multidimensional factors and that influential factors in traditional face-to-face classes are relationships with faculty members, curriculum and instruction, campus life, support services, and facilities (Bolliger and Martindale, 2004). Compared with traditional classes, online courses bring challenges to instructors and students. Therefore, exploring student satisfaction within online settings is worthwhile because technologies have changed students' interaction modes (Kaminski et al., 2009).

2.2. Review of previous literature on online learning students' satisfaction during the COVID-19 pandemic

Various studies have provided useful insights into online learning students' satisfaction during the COVID-19 pandemic (Baber, 2020; Faize and Nawaz, 2020; Sharma et al., 2020; Jiang et al., 2021; Maqableh and Alia, 2021; Simsek et al., 2021). Some studies have focused on students from one country and even from a single higher education institution. Sharma et al. (2020) explored online learning students' satisfaction and its predictors among students at Chitwan Medical College. The results showed that more than half of the students were satisfied with online learning. Learners' characteristics, technological characteristics, instructors' characteristics, management, and coordination were factors significantly related to students' satisfaction with online learning. These researchers also found that gender, Wi-Fi, and other network forms impact learners' online learning satisfaction.

Regarding instructors' characteristics, Sultana and Khan (2019) concluded that teachers' performance significantly influences students' satisfaction with online learning. Gender as an influencing factor has also been pointed out by Simsek et al. (2021), and they revealed that gender, discipline, education level, and grade level could cause changes in online learning students' satisfaction levels during the pandemic. However, gender is a demographic feature that cannot be influenced or changed from the outside to improve the online learning process further. Furthermore, the other variables in Simsek et al.'s (2021) research—discipline, education level, and grade level—are also demographic features. Factors that are demographic features will not be considered in this research.

There have also been studies that have compared students from different backgrounds when exploring student satisfaction levels and the factors affecting them. For example, Jiang et al. (2021) explored online learning satisfaction in higher education by comparing students from two Chinese universities. The findings from this study showed students' computer self-efficacy directly impacted their satisfaction with online learning. In addition, Baber (2020) conducted a cross-country study examining the determinants of undergraduate student satisfaction in South Korea and India. The

study found that interaction, study motivation, course structure, instructor knowledge, and facilitation positively influence student satisfaction. Baber (2020) also found that there is no significant difference in student satisfaction between South Korea and India. Sharma et al.'s (2020) results supported instructor knowledge as a factor influencing student satisfaction. Faize and Nawaz (2020) also pointed out the importance of interaction to students' satisfaction. They measured students' satisfaction levels using Kranzow's (2013) guidelines as a theoretical framework. Kranzow (2013) addressed students' satisfaction through two channels. The first one was faculty–student interaction, which ensures the course content and the technology required to attend online courses are accessible to students. If students have any technical problems, the instructor will assist them in solving them. The second was the interaction between students and their peers. However, Maqableh and Alia (2021) revealed that reduced focus and psychological and administrative issues are also influential factors. This result is different from the findings of other previous literature reviewed in this section. In addition, there are many contradictions in their findings. For example, Maqableh and Alia (2021) found that more than a third of their participants were dissatisfied with their online learning experience. They identified that the respondents were not satisfied that they had more assignments. However, Simsek et al. (2021) found that students' satisfaction level with online learning during the pandemic was moderate.

It can be deduced from the above-listed literature that previous studies have had inconsistent findings regarding the factors influencing student satisfaction with online learning during the COVID-19 pandemic, although there have been some overlapping factors. Besides, no study has considered combinations of various causal factors rather than single factors influencing student satisfaction.

2.3. Conceptual framework

This research explored how the non-demographic variables mentioned in section 2.2 (instructors, assignments, interactions, faculty services, and students' internet self-efficacy) that have been proved to separately impact students' satisfaction with online learning during the COVID-19 pandemic work as configurations. The conceptual framework for this research was based on Astin's (1984) theory of student involvement.

Astin (1984) put forward his student involvement theory while investigating how the environment affects students' learning and development. "Student involvement" refers to students' physical and psychological effort in learning. A highly involved student will devote more time and energy to their studies, actively participate in various school activities, and interact with their classmates, instructors, and other staff. Accordingly, their satisfaction with school life will also improve. Astin's theory has three key points: students' input, environment, and output.

Students' input refers to their potential and characteristics, family background, and academic and interpersonal relationships before the learning process. Environment refers to students' actual experience in educational activities, including management strategies and practices in schools, courses, teaching, peer relations, and campus facilities. Output refers to educational activities' direct and indirect impact, including students' personality, knowledge, skills, attitudes, and behaviors. Astin's theory emphasizes the role of the school environment, and a supportive environment is essential. In addition, it also pays attention to students' non-classroom input. Although high-quality non-classroom experience is not an integral part of the curriculum, it can effectively complement education at school. In this research, students' input factors were assignments and students' internet self-efficacy. In addition, interaction and services provided by faculty were environmental factors. Students' satisfaction with online learning during the COVID-19 pandemic was the result. Under this conceptual framework, the following sections will review instructors, assignments, interactions with instructors and other students, faculty services, and students' internet self-efficacy.

2.3.1. Instructors and student satisfaction

Eom et al. (2006) argued that instructor guidance and knowledge significantly affect student satisfaction. A study in Bangladesh showed that teachers' performance is an essential factor affecting students' satisfaction with online classes (Sultana and Khan, 2019). In a traditional setting, instructors and students can get immediate feedback on the course quality, delivery, and experience (Nambiar, 2020). Therefore, teachers can immediately adjust teaching methods by observing non-verbal cues from students to meet the students' needs. However, instructors have to pay more attention and be more alert in an online class in order to notice what might be easily perceived in a face-to-face classroom. When it comes to the role of teachers in online learning, they have to encourage, guide, and stimulate students' critical thinking rather than using traditional teaching methods (Huynh, 2005). Faize and Nawaz (2020) believed that instructors' leadership is essential to students' satisfaction during the online learning process. Meanwhile, apart from teaching techniques, Elshami et al. (2021) proposed that an excellent instructor in an online environment needs to have stable technical equipment. Thus, as a factor affecting student satisfaction with online courses, instructors have to face the challenges of online learning and upgrade their teaching and technical skills.

2.3.2. Assignment and student satisfaction

Online assessment positively affects student satisfaction with online learning (George, 2020). There are various techniques for online assessment, like online tests, essays, presentations, quizzes, assignments, etc. However, assignments were the most used assessment method during the COVID-19 pandemic (Ebohon et al., 2021; Şenel and Şenel, 2021). Therefore, assignments, as the most popular assessment method, affect students' satisfaction with online learning. Many students pointed out the problems of assignments during the pandemic, such as the workload, instructor feedback, ease of submitting/responding, etc. Students from a university in Abu Dhabi in the United Arab Emirates considered a heavy amount of coursework a negative aspect of their online learning (Hussein et al., 2020). This was supported by the research of Maqableh and Alia (2021), who found that 82.5% of their respondents reported that they had more assignments and that the classwork became homework. Besides, Aristovnik et al. (2020) surveyed 30,383 students in 62 countries about their perception of their coursework. Nearly half (42.6%) of these students reported their workload during the pandemic had increased compared to before. Regarding feedback, Eom and Ashill (2016) concluded that instructor feedback

to students could enhance student satisfaction by improving learner affective responses and increasing their cognitive skills. Students need more interaction and feedback when completing assignments, and they also demand well-defined instructions (Şenel and Şenel, 2021). Thus, assignments are a really important factor to investigate when researching university students' satisfaction with online learning during the COVID-19 pandemic.

2.3.3. Interaction and student satisfaction

In online settings, students may never access physical campus locations and may have difficulty building relationships with faculty and classmates (Bolliger and Martindale, 2004). New technologies have also changed how students interact with teachers and classmates (Kaminski et al., 2009). As for the influence of interaction, Moore (2002) found that the interaction between instructors and learners was the most important factor in student satisfaction. Besides, Vonderwell and Turner (2005) also identified that positive teacher–student interaction is a factor that affects satisfaction levels. Wu et al. (2010) found student and instructor interaction to be significantly positively related to the online learning climate and performance expectations, which in turn contributed to student satisfaction. Both Li et al. (2016) and Price et al. (2016) found interactions (between student and teacher) were positively related to student satisfaction. According to most online learning studies, learner–learner interaction and learner–instructor interaction seem related to student satisfaction (Jung et al., 2002; Bolliger and Martindale, 2004). Therefore, interaction in this research included learner–lecturer and learner–learner interaction.

2.3.4. Faculty services and student satisfaction

Moore and Kearsley (1996) pointed out that administrative support is very helpful to distance learning students. They suggested that students should have a contact person who can help them. This may be because students without technical support may experience severe frustration in an online environment (Hara, 2000). Beyond the importance of students interacting with the teacher, the role of other faculty has also been shown to impact student satisfaction. Most students were satisfied with the prompt response from the concerned faculty and departments about internet issues. Therefore, faculty support, as a factor affecting student satisfaction with online courses, is indispensable.

2.3.5. Internet self-efficacy and student satisfaction

Internet self-efficacy is the belief that one can organize and perform internet-related actions required to complete specified tasks (Eastin and LaRose, 2000). Students have to use reliable equipment and be familiar with the techniques used in their courses to achieve success in online courses (Belanger and Jordan, 1999). Research has shown that students with higher levels of internet self-efficacy have better information search skills (Thompson et al., 2002), which may enhance their confidence in using the internet and solving problems in the learning process. Internet self-efficacy is a critical factor in student satisfaction. Students who are up to date with the appropriate technologies can continue their studies smoothly and with greater satisfaction during online learning (Johnson et al., 2016). In contrast, students who experienced frustration with technology reported lower satisfaction levels (Hara, 2000).

2.4. Summary and research direction

This section reviewed a representative sample of the available literature about student satisfaction and, in particular, student satisfaction with online learning during the COVID-19 pandemic. It can be concluded from the literature that various factors can influence student satisfaction, not only in traditional teaching modes but also in an online setting. Various studies on student satisfaction with online learning have investigated the following factors: instructor interaction, communication, students' ability to control their actions in the learning environment, efficient assessment, and technology (Cole et al., 2014; Dziuban et al., 2015). However, the research thus far has explored student satisfaction during the COVID-19 pandemic on the surface without in-depth analysis. Student satisfaction with online learning during the COVID-19 pandemic may not have been fully explained. Therefore, this research explored the combinations of various causal factors (instructors, assignments, interaction, faculty services, and internet self-efficacy).

3. Materials and methods

This research aimed to explore to what extent Chinese higher education students have been satisfied with online learning during the COVID-19 pandemic and what factors have affected their satisfaction levels. We chose a qualitative method to investigate the factors affecting higher education students' satisfaction with online learning during the COVID-19 pandemic because qualitative methods are widely used in education research (Divan et al., 2017). This study employed a survey that was administered to a group of Chinese students. The survey mainly consisted of a set of 5-point Likert scale questions concerning the students' online experience. I employ self-administered questionnaires to collect empirical data. Moreover, Maguire and Delahunt (2017) claimed that data analysis is the core of the credibility of qualitative research and statistical analyses should be based on the type of data collected and the goals of the survey. The current research investigated the configuration of factors influencing students' satisfaction with online learning. In order to better suit our purpose, we adopted the fsQCA method to analyze our data. In the following subsections, we will describe: (1) the research design, (2) data collection, (3) instrument, and (4) measurements.

3.1. Research design

In order to obtain empirical data for this study, self-administered questionnaires were distributed to Chinese higher education students. We believe that this survey research approach was suitable for the data we wanted to collect and could answer the research questions mainly due the following considerations. First, a questionnaire was easy to implement, and it allowed us to collect data online during the pandemic. Also, the results of the questionnaire were convenient for statistical processing and analysis. Figure 1 shows an image of the research design.

When it came to data analysis, we adopted the fsQCA method, a set-theoretical approach introduced by Ragin (2000) and recently applied increasingly in many fields. The method is intended to analyze the influence of multiple antecedent variable combinations on result

variables using Boolean operations. Additionally, it focuses on the joint action of multiple influencing factors and provides a variety of combinations of condition variables. Unlike other correlation-based quantitative methods, the fsQCA method seeks to establish a logical link between combinations of causal conditions (conjunctural causation) and an outcome, thereby generating rules that summarize the adequacy of all possible combinations of subsets based on causal conditions (or their supplements) and the outcome (Mendel and Korjani, 2012). The fsQCA approach attempts to avoid some limitations of multiple regression. Woodside (2013) proposed that a negative or positive relationship can exist between the two variables. Still, regression analysis does not account for or explain all cases in a dataset, as in any given dataset, not all cases support a negative or positive relationship between the independent and dependent variables (Skarmeas et al., 2014).

In order to overcome the defects of existing research on students' satisfaction, this study adopted the fsQCA method to analyze this construct. Kraus et al. (2018) argued that fsQCA is a method that employs qualitative inquiry with quantitative exploration to explicate complex phenomena by using configuration analysis. It can be concluded from the literature review that various factors can influence student satisfaction with online learning during the pandemic (instructors, assignments, interaction, faculty services, and internet self-efficacy). The fsQCA approach in this research could identify all necessary and sufficient conditions that lead to student satisfaction with online learning.

3.2. Data collection and research sample

This research utilized a survey administered to university students from 10 colleges and universities in Mainland China during the second semester of the 2021–2022 academic year. In May 2022, the anonymous questionnaire was distributed *via* an online survey system (Wenjuanxing). The snowball method of sampling was used for recruitment: We gave each participant a discount coupon when they shared the questionnaire link with their classmates—the coupon was an incentive. Snowball sampling is suitable for sampling members of a special population segment. In our research, we needed to collect data from Chinese university students. It was really hard for us to get enough data through sending questionnaires to students because of the school closures during the pandemic. In such a case, snowball sampling was the best sampling method for us to choose.

In total, 424 questionnaires were collected, of which 67 were invalid (including 49 samples in which the same option was chosen continuously, five in which the responses were logically contradictory, 10 samples obtained from postgraduates, and three that were self-test samples); finally, there were 357 valid samples. Table 1 shows the demographic characteristics of the valid samples. As one can see, 48.7% (174) of participants were male, and 51.3% (183) were female. As the participants were higher education students, the age of almost 71.4% (255) of them was between 19 and 24 years old, 18.8% (67) of them were under 18 years old, and about 9.8% (35) of them were between 25 and 30 years old. At the same time, all participants were undergraduate students. Regarding the residential area where these students lived, the number (148) of those who lived in an urban area was nearly the same as that of those from a smaller town (142). Additionally, 18.8% (67) of these respondents were from rural areas.

3.3. Instrument

The questionnaire consisted of four domains: demographic information, academic background, perceptions of online learning from

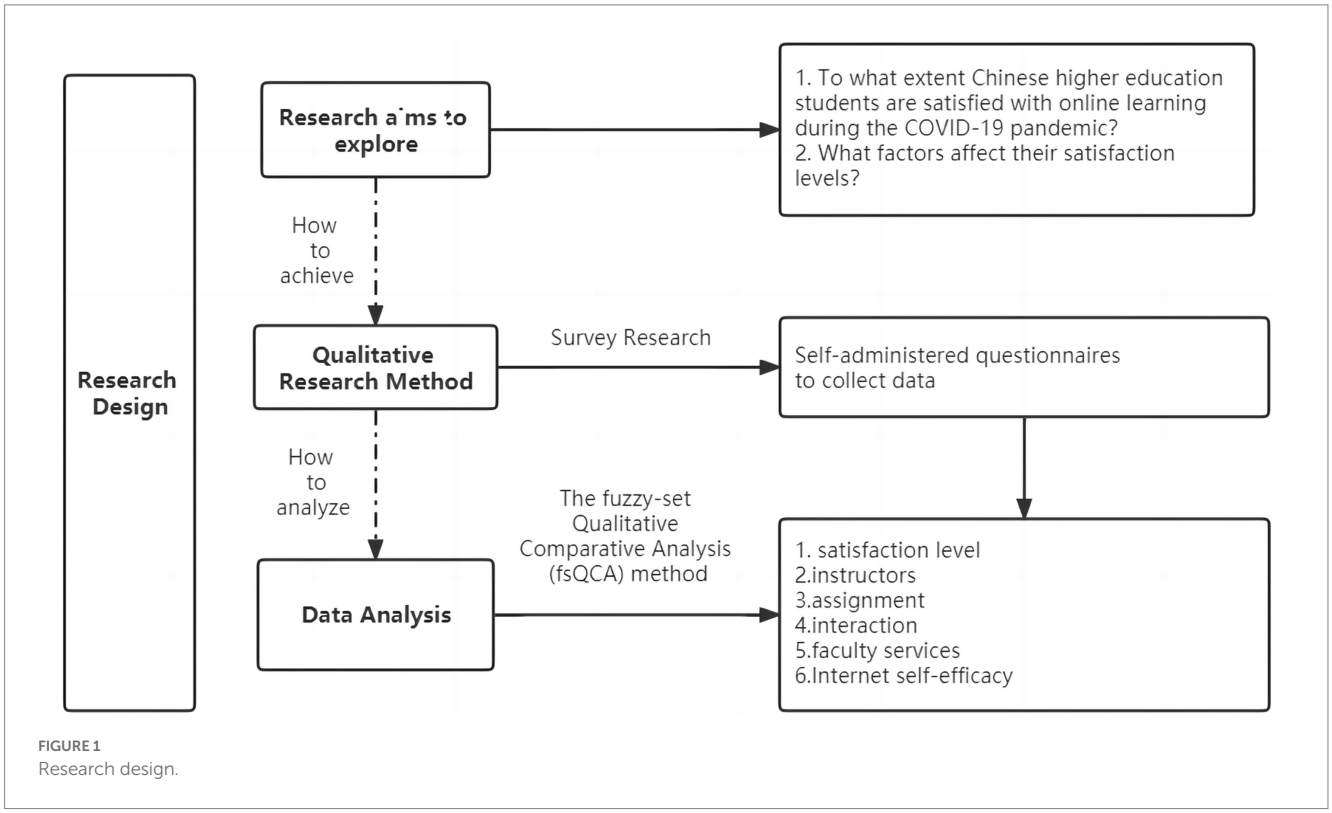


FIGURE 1
Research design.

the learners' perspectives, and satisfaction with online learning. The first 11 questions included in the first part of the survey were intended for understanding the respondents' demographic information. Then, there were multiple-choice questions for learning about participants' academic background (seven items). In the third part, six questions revealed whether the students were able to participate in face-to-face classes that semester and their difficulties with online learning. Finally, six questions were used to identify their satisfaction with online learning. Each item in the last domain was rated on a 5-point Likert scale (1: *strongly disagree*, 2: *disagree*, 3: *neutral*, 4: *agree*, 5: *strongly agree*). Before issuing the questionnaire, we invited three higher education students from different disciplines (who were not included in the final analysis) to pretest the questionnaire.

3.3.1. Variable selection

Configuration analysis mainly studies how variables work together to influence the result. Variable selection is really important.

The existing methods of constructing configurations are the inducive method and the deductive method. The inducive method requires researchers to judge and extract relevant conditional variables based on existing knowledge and research conclusions. In contrast, the deductive method is based on a theoretical framework or theory containing configuration conditions. As described in the conceptual framework in 2.3, Astin's (1984) theory emphasizes that highly involved students tend to be more satisfied with school life. Under the conceptual framework, instructors, assignments, interaction, faculty services, and students' internet self-efficacy were condition variables in this research. Instructor guidance, knowledge, and performance significantly affect student satisfaction. During the pandemic, instructors have had to upgrade their teaching and technical skills to adopt the online teaching mode. The instructor as a condition variable was abbreviated as SS. Regarding assignments, the workload, ease of upload, and feedback on assignments were really important to the investigation of university students' satisfaction with online learning during the pandemic. Assignments were abbreviated as AS in this research. As for interaction, learner–learner interaction and learner–instructor interaction are predictive of student satisfaction. IT was the abbreviation for interaction in this research. Likewise, faculty services are helpful to distance learning students and influence their satisfaction. Internet self-efficacy is also a critical factor in student satisfaction. Students with higher internet self-efficacy tend to be more satisfied with online learning. FS and IS were the abbreviations for faculty services and internet self-efficacy in this study. As discussed above, we used the fsQCA approach to investigate these factors affecting university students' satisfaction with online learning during the COVID-19 pandemic. Therefore, the outcome variable was student satisfaction with online learning during the pandemic. The condition and outcome variables and their abbreviations are listed in Table 2.

TABLE 1 Demographic characteristics of students.

Characteristics	Frequency	Percentage (%)
Gender		
Male	174	48.7%
Female	183	51.3%
Age of students		
Under 18	67	18.8%
19–24 years	255	71.4%
25–30 years	35	9.8%
Level of study		
Freshman	93	26.1%
Sophomore	88	24.6%
Junior	106	29.7%
Senior	70	19.6%
Residential area		
Urban	148	41.4%
Town	142	39.8%
Rural	67	18.8%

3.3.2. Pre-processing

To meet the Boolean logic of qualitative comparative analysis, it was necessary to calibrate the data according to relevant standards before the analysis to make the results interpretable. Therefore, it was essential to transform the variables' values from the numerical sample data from the 5-point Likert scale to fuzzy-membership scores over the consistency between 0 and 1 (Woodside et al., 2011). This study solved this problem using the direct method (see Ragin, 2009) and drew on researcher-specified threshold qualitative anchors to determine full membership (Maximum Threshold), the crossover point, and full non-membership (Minimum Threshold). Evaluation of the three qualitative anchors for each variable came from Andrews et al. (2016) and involved the identification of the 5th percentile (Minimum Threshold), 95th percentile (Maximum Threshold), and 50th percentile (crossover point) values. First, the average of each item was taken as the initial data for each variable. Secondly, three anchor points needed to be identified: the full membership value (1), crossover point (0.5), and full non-membership value (0). The membership degree of the calibrated set was between 0 and 1. The calibration anchor points of each variable are shown in the following Table 3. The minimum threshold, crossover point, and maximum threshold of student satisfaction were 1.8, 4.0, and 4.6, respectively. The minimum threshold and the crossover point of the five condition variables (Instructors, Assignment, Interaction, Faculty services, and internet self-efficacy) were the same (2.2 and 4.0). The maximum threshold of these condition variables were 4.6, 4.7, 4.5 4.6, and 4.6, respectively.

This research used fsQCA3.0 software to analyze the configurations of factors within 357 samples affecting higher education students' satisfaction with online learning during the COVID-19 pandemic in China. The operation of fsQCA include three steps:

TABLE 2 Condition variable and outcome variable.

Type	Name	Abbreviation
Outcome variable	Student Satisfaction	SS
Condition variable	Instructor	IN
	Assignment	AS
	Interaction	IT
	Faculty services	FS
	Internet self-efficacy	IS

- The necessity analysis of single-condition variables
- The construction of the truth table
- Configuration analysis

The outcomes of the fuzzy-set analysis were represented by special software symbols. Specifically, black circles (●) meant the presence of a condition, while crossed-out circles (⊗) denoted its absence (Fiss, 2011). Large circles marked the core elements of a configuration, and the peripheral elements were marked with small circles. In addition, blank spaces indicated a do-not-care situation in which the causal condition may be either present or absent. Consistency measured the degree to which each condition variable was a subset of the outcome variable, and coverage measured the empirical relevance of a consistent subset (Ragin, 2006; Mendel and Korjani, 2012).

3.4. Measurements

In this study, the variables were measured using a 5-point Likert scale, and each variable was measured using the average score of the corresponding items on the scale. SPSS 25.0 was used to analyze the reliability and validity of the scale items. Table 4 shows the reliability and validity of the scale. First, the Cronbach's coefficients of all six scales were greater than 0.8, indicating that the scale questionnaire had good reliability. Secondly, the KMO values of these scales were more than 0.8, and the cumulative variance contribution rates were more than 60%, indicating that the scale questionnaire had good content validity. In general, the factor loading of each item was above 0.5, the combined reliability (CR) of each item was greater than 0.6, and the average extraction variance (AVE) was greater than 0.5, indicating that the questionnaire had good convergent validity. In conclusion, the scale had good reliability and validity and could be used for further research.

4. Results and findings

4.1. To what extent are Chinese higher education students satisfied with online learning during the pandemic?

According to Table 5, 31.4% of these students preferred online learning to the face-to-face learning mode, and 23.2% strongly agreed that they preferred online learning. As for the continuation of online learning, 33.3% of the respondents agreed with it, and 21.9% strongly agreed. It can be inferred from the data that more than half of these respondents held a positive attitude toward the continuation of online learning in the future. This calls on universities to pay attention to student satisfaction with online learning and improve online learning from all aspects gradually.

Table 5 shows the extent to which Chinese higher education students were satisfied with online learning during the pandemic. Each item was rated using a 5-point Likert scale (1: *strongly disagree*, 2: *disagree*, 3: *neutral*, 4: *agree*, 5: *strongly agree*). As can be seen from the table, the average point of students' satisfaction with online learning was 3.66, which is between *neutral* and *agree*. It can be inferred from the data that many participants were not satisfied with online learning during the pandemic. However, nearly 36.4% of the respondents reported that they were satisfied with online learning, and 26.9% strongly agreed with that statement. In order to know the reasons why the remaining Chinese higher education students were not satisfied with online learning, our questionnaire included a multiple-choice question that asked respondents to identify the problems they faced during the online process. In Figure 2, one can see that deferred examination and graduation were what students cared about most (43.7%). This is a reminder that universities need to arrange examinations and graduation reasonably.

Additionally, universities should give students clear instructions and explain planning about examinations and graduation to avoid students' concerns. Lower self-control ability and interaction with students and teachers were the second and third problems that students were concerned about (38.7 and 37.2%, respectively). Surprisingly, 35.3% of the respondents believed that the value for money of online courses was not high because the tuition for them was the same as for face-to-face courses. Students were also troubled by the informal learning environment and low learning efficiency (31.4 and 24.1%). These two problems can be solved effectively through students' efforts, such as by finding a comfortable place to learn and planning their tasks to avoid procrastination and distraction. However, quality of online classes was the problem that students cared about least (7.8%). These results show that not only should universities provide technical support to students, but also teachers should improve the classroom atmosphere to help students concentrate.

TABLE 3 Description of anchor point threshold of FuzAS set.

Variable	Minimum threshold	Crossover point	Maximum threshold
Student satisfaction (SS)	1.8	4.0	4.6
Instructors (IN)	2.2	4.0	4.6
Assignment (AS)	2.2	4.0	4.7
Interaction (IT)	2.2	4.0	4.5
Faculty services (FS)	2.2	4.0	4.6
Internet self-efficacy (IS)	2.2	4.0	4.6

4.2. The necessity analysis of single condition variable

Unlike the traditional regression method, fsQCA does not pay attention to the influence of a single variable on the results but focuses on the necessary conditions or sufficient condition combinations that lead to the outcome variables. As mentioned in 3.3, the operation of fsQCA includes three steps. After the above calibration, we used fsQCA to perform the necessity test of single-condition variables, and the results are shown in the Table 6. The analysis results of necessity are reflected in consistency and coverage. Consistency measures the degree to which each condition variable is a subset of the outcome variable. Coverage measures the coverage of each condition variable to the outcome variable degree. Both values are between 0 and 1. Generally speaking, when the consistency is greater than 0.9, this condition variable can be considered a necessary condition for the results.

It can be seen that the consistency of Instructors (IN), Assignment (AS), Interaction (IT), Faculty services (FS), and internet self-efficacy (IS) were all less than 0.9, which was not enough for any of them to constitute a necessary condition that affected Chinese university

TABLE 4 Reliability and validity analysis table.

Variable	Item	Factor loading	Cronbach's	KMO	CR	Cumulative variance (%)	AVE
Student satisfaction	1	0.829	0.901	0.881	0.901	71.672	0.646
	2	0.77					
	3	0.793					
	4	0.799					
	5	0.826					
Instructors	1	0.745	0.881	0.81	0.886	68.649	0.608
	2	0.791					
	3	0.791					
	4	0.793					
	5	0.778					
Assignment	1	0.797	0.916	0.916	0.914	70.046	0.641
	2	0.806					
	3	0.809					
	4	0.774					
	5	0.81					
	6	0.763					
Interaction	1	0.793	0.901	0.898	0.901	66.916	0.603
	2	0.762					
	3	0.797					
	4	0.763					
	5	0.82					
	6	0.733					
Faculty services	1	0.805	0.893	0.874	0.893	70.081	0.627
	2	0.79					
	3	0.808					
	4	0.788					
	5	0.776					
Internet self-efficacy	1	0.793	0.894	0.877	0.895	70.371	0.63
	2	0.797					
	3	0.813					
	4	0.805					
	5	0.78					

students' satisfaction with online learning during the pandemic. This indicates that these variables would weakly explain the outcome variables independently. Therefore, it was necessary to analyze further the configurations of these condition variables and their impact on the outcome variables.

4.3. Configuration analysis results

This research used fsQCA3.0 software to analyze the configurations with 357 samples who responded about higher education students' satisfaction with online learning during the COVID-19 pandemic in China. The consistency threshold, PRI consistency, and case threshold were set to 0.8, 0.876, and 9, respectively. Finally, we obtained three solutions: a complex solution, a parsimonious solution, and an intermediate solution. In addition to the differences in complexity, the three solutions were also different in terms of their enlightenment and universality. To be specific, the complex solution was the most comprehensive, but its universality was poor, resulting in a lack of applicability and generalizability of the conclusion. The parsimonious solution was the simplest one. Still, it lost more information in the process of omission, so the enlightenment of the conclusion was weak and might have been contrary to the actual situation. The explanatory power of the intermediate solution was between the former two. Generally, it represented the combination of the theoretical basis of the research with the analysis results. Therefore, it had strong enlightenment and universality. In general, the intermediate solution determines the final configuration result. Additionally, the intermediate solution and the parsimonious solution jointly determine the core conditions and peripheral conditions in the configuration. Fiss defined the conditions

TABLE 5 Whether Chinese higher education students were satisfied with online learning during the COVID-19 pandemic.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average	Standard deviation
You are satisfied with online learning during the pandemic.	19 (5.3%)	47 (13.2%)	65 (18.2%)	130 (36.4%)	96 (26.9%)	3.66	1.16
You prefer the online learning mode to the face-to-face mode.	22 (6.2%)	43 (12.0%)	97 (27.2%)	112 (31.4%)	83 (23.2%)	3.54	1.15
You believe that online learning is more efficient.	18 (5.0%)	44 (12.3%)	74 (20.7%)	127 (35.6%)	94 (26.4%)	3.66	1.14
Online learning is more helpful to improve your academic performance.	21 (5.9%)	44 (12.3%)	114 (31.9%)	107 (30.0%)	71 (19.9%)	3.46	1.12
You hope to continue online learning mode in the future.	28 (7.8%)	46 (12.9%)	86 (24.1%)	119 (33.3%)	78 (21.9%)	3.48	1.19

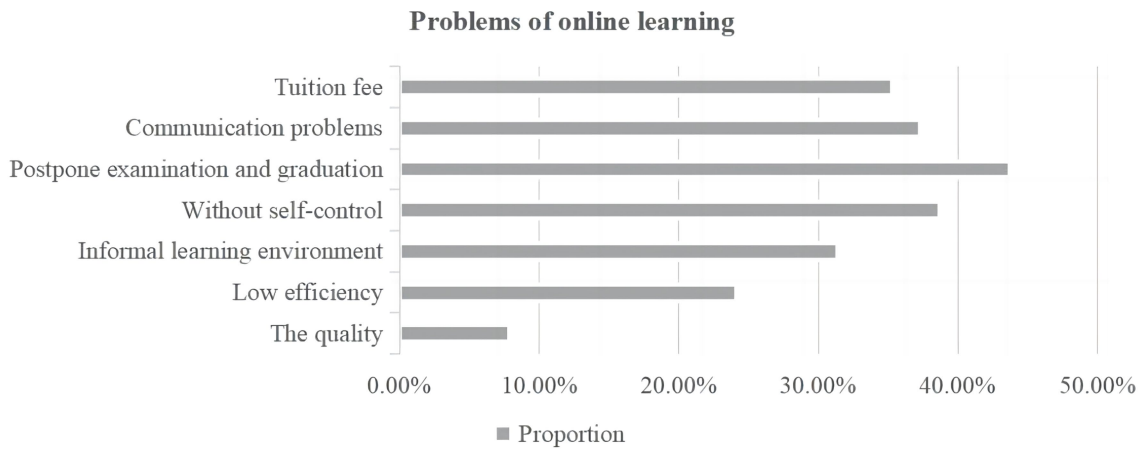


FIGURE 2
Concerns of online learning.

that appear in both a parsimonious solution and an intermediate solution as the core conditions and the conditions that appear in the intermediate solution but are excluded from the parsimonious solution as the secondary conditions.

In the complex solution, we got five path solutions. The solution coverage and solution consistency were 0.685704 and 0.844349, respectively. As for the parsimonious solution, there were three path solutions, and the solution coverage and solution consistency were 0.741548 and 0.802272, respectively. In addition, there were five paths in the intermediate solution. The complex solution, parsimonious solution, and intermediate solution of this research are listed in Table 7.

4.4. Results and analysis

Outcomes of the fuzzy-set analysis for students' satisfaction with online learning during the pandemic are presented in Table 7. There were five configurations with which Chinese higher education students could achieve satisfaction with online learning during the COVID-19 pandemic. The overall consistency of these five configurations was higher than 0.8 (0.844349), which indicated that these five configurations fully explained satisfaction with online learning during the pandemic. The coverage of the solution was 0.685704, which means that these five configurations accounted for nearly 69% of the satisfaction with online learning during the pandemic among Chinese higher education students. Table 8 presents each configuration that constituted high satisfaction with online learning during the pandemic in fsQCA. Each configuration will be explained and discussed in detail in the following parts.

4.4.1. Assignment plus internet self-efficacy

Solutions 1–3 reflected combinations of the presence of assignment with internet self-efficacy, which allowed higher students' satisfaction levels with online learning during the COVID-19 pandemic to occur. To be specific, Solution 1 showed that students' satisfaction with assignments and higher internet self-efficacy, combined with relative satisfaction with the instructor and interaction, would lead to university students' satisfaction with online learning, regardless of their level of satisfaction with faculty service. Likewise, the combination of satisfaction with assignments and higher internet self-efficacy, with relative satisfaction with the instructor and faculty service, would lead to university students' satisfaction with online learning, regardless of their level of satisfaction with interaction (Solution 2). Solution 3 showed that, with the combination of the presence of assignments and

TABLE 6 Necessity test of single condition variable.

Condition Variable	Consistency	Coverage
IN	0.762077	0.786288
~IN	0.593070	0.602955
AS	0.761752	0.775622
~AS	0.579092	0.596574
IT	0.787629	0.726426
~IT	0.527079	0.606842
FS	0.775688	0.716961
~FS	0.534550	0.613788
IS	0.752706	0.759129
~IS	0.578023	0.601309

"~" Represents "negation."

internet self-efficacy, interaction and faculty services were peripheral conditions, and students would be satisfied with online learning regardless of their satisfaction level with the instructor.

Assignments and internet self-efficacy were the strongest factors affecting university students' satisfaction with online learning during the COVID-19 pandemic, which confirms the findings of Jiang et al. (2021), Maqableh and Alia (2021), and Şenel and Şenel (2021). In terms of assignments as an influencing factor, on the one hand, the workload of assignments significantly affected students' satisfaction with online learning. On the other hand, feedback on assignments was also important. Maqableh and Alia (2021) found that most students in their research were not satisfied with their increased number of assignments compared with traditional learning. There are multiple reasons for this increased number of assignments. During the COVID-19 pandemic, assignments became an important assessment method, which led students to have more assignments, and classwork became homework. Besides, teachers get limited feedback from students during online classes. Therefore, during online learning, assignments become one of the important means for teachers to understand students' learning process. Teachers therefore request students to complete homework on more complex subjects, which puts extra pressure on the students. Additionally, students need more interaction and feedback when completing assignments. The influence of internet self-efficacy on student satisfaction with online learning during the COVID-19 pandemic was supported in the present study. However, there has been little research investigating internet self-efficacy and student satisfaction with online learning during COVID-19. Jiang et al. (2021) concluded that computer self-efficacy directly impacted Chinese university students' satisfaction with online learning platforms. Kuo et al. (2013) also proposed that internet-self-efficacy was a good predictor of student satisfaction with online education. This study's result, however, was contrary to that of Robles (2006), who found that internet self-efficacy was not an important factor in student satisfaction.

4.4.2. Instructor plus assignment

In Solution 4, the combination of instructors with assignments in the absence of faculty service led to university students' high satisfaction levels in online learning. Interaction and internet self-efficacy in Solution 4 were peripheral elements.

As for the instructor as a core factor in the present study, this result is in line with Fatani's survey (Fatani, 2020). This survey investigated student satisfaction with online courses during the pandemic and pointed out that instructors' teaching quality positively impacted student satisfaction. Baber (2020) also found that instructor knowledge positively influences student satisfaction, supporting Sharma et al. (2020). Sharma et al. (2020) explored satisfaction with online learning and its predictors among students. They concluded that instructors' characteristics, management, and coordination by faculty are significantly related to student satisfaction. Landrum et al. (2021) also pointed out that the faculty's role impacted student satisfaction beyond the teacher's interaction. However, as for faculty service, contrary to the study of Sharma et al. (2020) and Landrum et al. (2021), this study found that even lower satisfaction levels of faculty services could lead to student satisfaction with online learning. The low estimated value of faculty service in this research might be due to the following reason: Students who have never met problems and have never needed to be assisted might think that the role of faculty is not significant to them since they have had to operate the learning system independently online. This result therefore requires further research to verify whether faculty service is a factor affecting university students' satisfaction with online learning during the pandemic.

Assignment as an important factor has been discussed in 4.4.1. The following part of this section will discuss interaction as a peripheral factor in Solution 4. The result showed that interaction was not a critical factor, and relative satisfaction with interaction would lead to university students' satisfaction with online learning. This result is inconsistent with that of Faize and Nawaz (2020), who pointed out the importance of interaction in student satisfaction with online learning. However, this result is in line with that of Landrum et al. (2021). They concluded that the amount of interaction with faculty and students is unimportant, but what is important is whether this interaction is expected and fits with the online experience. This differs from previous research about satisfaction with online learning before the pandemic. For example, Vonderwell and Turner (2005) identified active student–teacher interactions as affecting satisfaction levels.

4.4.3. Internet self-efficacy subtract faculty services

In Solution 5, the absence of faculty services and the presence of internet self-efficacy were core elements determining students' satisfaction levels in online learning during the COVID-19 pandemic. At the same time, instructor, assignment, and interaction were peripheral elements.

The absence of faculty services has been discussed in 4.4.2, and internet self-efficacy as an influencing factor has been discussed in 4.4.1. Internet self-efficacy was a core factor in Solution 5 that determined Chinese university students' satisfaction with online learning during the pandemic.

5. Discussion

Due to the COVID-19 pandemic, higher education institutions around the world have faced near-total closures. Most educational institutions worldwide have offered online courses in the past 2 years. Under the ongoing pandemic, China has adopted a strict segregation policy to manage higher education institutions. Therefore, face-to-face

TABLE 7 Complex solution, parsimonious solution, and intermediate solution.

Item	Path of solutions	Raw coverage	Unique coverage	Consistency
Complex solution	IN*AS*IT*IS	0.51365	0.01826	0.897513
	IN*AS*FS*IS	0.48352	0.01886	0.890411
	AS*IT*FS*IS	0.50778	0.047	0.872046
	IN*AS* ~ IT* ~ FS* ~ IS	0.29764	0.04305	0.888975
	~IN* ~ AS*IT* ~ FS*IS	0.2887	0.035	0.885292
Solution coverage: 0.685704				
Solution consistency: 0.844349				
Parsimonious Solution	~FS*IS	0.41227	0.05903	0.814841
	AS*IS	0.62817	0.27492	0.846636
	IN*AS* ~ FS	0.3851	0.05435	0.870203
Solution coverage: 0.741548				
Solution consistency: 0.802272				
Intermediate Solution	IN*AS*IT*IS	0.51365	0.01826	0.89751
	IN*AS*FS*IS	0.48352	0.01886	0.89041
	AS*IT*FS*IS	0.50778	0.047	0.87205
	IN*AS* ~ IT* ~ FS* ~ IS	0.29764	0.04305	0.88898
	~IN* ~ AS*IT* ~ FS*IS	0.2887	0.035	0.88529
Solution coverage: 0.685704				
Solution consistency: 0.844349				

"*" Represents "plus."

TABLE 8 Configurations with high satisfaction in fsQCA.

Condition variable	Satisfied with online learning during COVID-19 pandemic				
	Solution 1	Solution 2	Solution 3	Solution 4	Solution 5
IN	•	•		●	⊗
AS	●	●	●	●	⊗
IT	•		•	⊗	•
FS		•	•	⊗	⊗
IS	●	●	●	⊗	●
Raw coverage	0.513654	0.483522	0.507775	0.297642	0.288697
Unique coverage	0.0182617	0.0188579	0.0469952	0.0430468	0.0350017
Consistency	0.897513	0.890411	0.872046	0.888975	0.885292
Solution coverage: 0.685704					
Solution consistency: 0.844349					

education has been replaced by an online mode in most Chinese universities. Higher education institutions regard student satisfaction as one of the main factors determining the quality of online courses (Yukselturk and Yildirim, 2008). Students' satisfaction is really important to the sustainable development of online learning in the future.

This research was an effort to investigate the configuration of factors affecting university students' satisfaction with online learning during the COVID-19 pandemic. Current research has focused on whether any single factor has affected university students' satisfaction with online learning during the COVID-19 pandemic using quantitative methods such as regression analysis or qualitative methods (Baber, 2020; Faize and Nawaz, 2020; Sharma et al., 2020; Jiang et al., 2021; Maqableh and Alia, 2021; Simsek et al., 2021). However, no previous study has performed an in-depth exploration of the configuration of factors affecting students' satisfaction with online learning during COVID-19. This research adopted the fsQCA method to analyze the data collected from 357 university students in Mainland China during the second semester of the 2021–2022 academic year.

The research findings showed that the average degree to which students were satisfied with learning during the pandemic was 3.64, which was between *neutral* and *agree*. It can be inferred from the data that the participants were not, overall, satisfied with online learning

during the pandemic. This result is different from those in previous literature. For example, Sharma et al. (2020) found that more than half of students were satisfied with online learning. Furthermore, Simsek et al. (2021) identified that students' satisfaction level with online learning during the pandemic was moderate. Further, this study identified five configurations that led to a higher level of university students' satisfaction with online learning during the COVID-19 pandemic. Solutions 1–3 showed that assignments combined with internet self-efficacy would lead to satisfaction with online learning. Previous studies only proposed that students had a heavy number of assignments during the pandemic (Aristovnik et al., 2020; Hussein et al., 2020), but they did not explore the influence of assignments on students' satisfaction. In addition, there has been little research investigating internet self-efficacy and student satisfaction with online learning during COVID-19. Jiang et al. (2021) proposed that computer self-efficacy directly impacted Chinese students' satisfaction with online learning platforms rather than with online learning itself. Compared with previous research, this current study revealed that students are satisfied with online learning when they are satisfied with assignments and internet self-efficacy at the same time. In Solution 4, the combination of the instructor with assignments was the core factor. This finding buttresses the study of Sultana and Khan (2019), who found that teachers' performance is an essential factor affecting students' satisfaction with online classes. However, Faize and Nawaz (2020) believed that instructors' leadership, but not instructors themselves, has been essential to students' satisfaction during the online learning process. Compared with previous research, this current study revealed that students are satisfied with online learning when they are satisfied with instructors and assignments at the same time. In addition, internet self-efficacy was indispensable in Solution 5 to explain the higher level of satisfaction with online learning. However, other factors that were the most influential factors on student satisfaction in previous research, such as interaction and faculty service, were not important in this research.

In order to answer the third research question (How can higher education students' satisfaction with online learning be improved?), we received inspiration from the research findings. For the instructors, online teaching is a complicated transition process. Wasserman et al. (2020) argued that even good teachers fail to deliver quality instruction in an online setting. Instructors also face challenges in the transition process. Therefore, higher institutions must provide instructors with comprehensive training (technical tools, resources, psychological support). When the instructors can provide quality online courses and sufficient support to students, the students' satisfaction level with online learning will improve. Regarding assignments, instructors have to control the workload of assignments. Some simple and unnecessary appointments should be appropriately deleted. Besides, students need instant feedback and guidance from their instructors. Teachers should respond to students' projects and give personalized advice. Regarding internet self-efficacy, it may be helpful for higher education institutions to provide appropriate training in internet skills and online course system operation to improve students' internet self-efficacy.

6. Conclusion

It can be concluded from the results that students were not, overall, satisfied with online learning during the pandemic. Additionally, it can be seen that assignments combined with internet self-efficacy will lead to satisfaction with online learning. Furthermore, the combination of the instructor with assignments was the core factor. Internet self-efficacy is also indispensable to explaining higher levels of satisfaction with online learning. However, other factors that were the most influential factors on student satisfaction in previous research, such as interaction and faculty service, were not important in this research.

Although universities were forced to switch to online education during the COVID-19 pandemic, the pandemic has accelerated the development of online teaching. However, universities and teachers may not be fully prepared for this transition. Students who have adapted to the traditional teaching mode inevitably have difficulty in adapting to online courses. Therefore, it is necessary to study students' satisfaction and the factors influencing it. This study contributes to our understanding of university students' satisfaction with online learning during the COVID-19 pandemic. A limitation of this study is that we did not consider the influence of students' major and their levels. Students from majors requiring practical operation and experiments might be less satisfied with online courses. Another limitation is that we did not explore why interaction was not important to students' satisfaction in this study. A further study could compare the satisfaction of different major students from different levels and could conduct interviews with participants to further verify the influencing factors.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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How to promote the social–emotional competence of rural left-behind children? An empirical study based on propensity score matching

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Social–emotional competence (SEC) played an important role in promoting the physical and mental development of children, but there exist huge gaps in SEC development between rural left-behind children. This study used propensity score matching (PSM) to investigate 578 rural children about the effects of being left behind as well as individual characteristics and teacher support on their development of SEC. The results showed that being left behind had significant negative effects on the SEC of rural children. The development of SEC varies among left-behind children of different genders and length of left-behind duration. Teacher support had a significant moderating effect on the influence path of SEC, which could effectively mitigate the negative effects of left-behind children. Therefore, this study played an implicative role in studying the development of left-behind children's SEC. The government and society should provide adequate cultural capital by completing the support system for compensating the lack of cultural capital. Schools and teachers should pay more attention to the development of left-behind children's SEC through curriculum development and performance evaluation to create a positive atmosphere. Parents should promote SEC development for left-behind children by improving their communication and family parenting styles.

KEYWORDS

left-behind children, social–emotional competence, teaching support, propensity score matching, in rural

1. Introduction

Labor migration had become a common phenomenon in the world, with parents seeking to reduce family poverty and increase their income by working outside, which may prevent some parents from bringing their children with them at the stage of compulsory education becoming left-behind children (Li et al., 2015; Hu et al., 2020). The World Children's Fund defined left-behind children as all children who experience unequal treatment in health, education, and welfare (Antia et al., 2020). According to Fan et al. (2010), left-behind children were defined as those under the age of 16 years whose both parents had been away for work for 6 months or more, or one of whose parents stayed at home while was unable to take care of them.

The number of left-behind children was quite large worldwide, with Asia being the main gathering place for left-behind children and more than 12 million left-behind children in the compulsory education age group in China. According to the survey report (On the Road to School, 2018), 96% of left-behind children in rural areas were guarded by their grandparents and 4% are under the guardianship of other relatives and friends.

It was difficult for parents to accompany and guide left-behind children timely as they were separated from them for a long time, which may result in the insufficient social and emotional development of left-behind children. According to Denham et al. and Wang et al., social–emotional competence (SEC) referred to the knowledge, attitudes, and skills that an individual acquires and effectively regulates emotions. SEC included self-awareness, self-management, social awareness, interpersonal skills, and responsible decision-making (Denham et al., 2003; Wang et al., 2017). SEC was considered a multi-level comprehensive concept, which avoided interpreting "sociality" as the ability to adapt to society and "emotion" as a personal emotional trait.

The research showed that the SEC has an important role in students' study and life and could positively predict students' academic achievement (Rhoades et al., 2011), attitude (Schonert-Reichl, 2019), and behavior (Yang et al., 2019). At the same time, SEC was supposed to be associated with parental involvement and parenting styles (Kwon et al., 2013), being affected by parental care and companionship to a large degree, implying that lack of parental care negatively impacted child development (Antman, 2012). However, there were few studies on children's SEC, which had not been paid enough attention to. The difference in SEC between left-behind children and non-left-behind children, as well as the possible compensation path, needs to be further explored. This study raised the following research questions:

1. What were the impacts of left-behind experience on children's SEC?
2. How do family factors affect children's SEC?
3. What was the compensation path to provide positive assistance for rural left-behind children's SEC?

To this end, this study summarized the literature reviews on the SEC of left-behind children and put forward hypotheses in the next section. According to the internationally recognized SEC questionnaire, a sample investigation was conducted among the rural left-behind children to explore the relationship between the research variables in Section 3. The propensity score matching (PSM) method was used to present the analysis results in Section 4, which eliminates the endogenous problem caused by the selection bias. The results of this study are discussed in Section 5, and the implications are put forward in Section 6.

2. Literature review and research hypothesis

Some previous research results showed that the SEC of rural left-behind children in China was in a weak position (Cadsby et al., 2020; Wang et al., 2020; Gu, 2022). Qian et al. (2021) used the score-matching method to analyze the tracking survey data on China's education and found that, despite overcoming the endogenous situation of parents choosing to go out to work, the peer relationship of left-behind children was significantly weaker than that of non-left-behind children. The previous study also found that being left behind could significantly increase children's negative emotions and negatively affect their sense of self-efficacy (Zhang et al., 2019). Cui and Xu (2021) analyzed the tracking survey data of families and found that parents' going out had a significant impact on the non-cognitive ability of left-behind children. Specifically, the score of left-behind children in emotional stability and openness of performance was lower than that of non-left-behind children. Based on the qualitative study method of interventionism, Xiao and Liu (2022) interviewed teachers, parents, and other family members of left-behind children and found that the left-behind children lacked family cultural capital support, which affected children's adaptability and overall performance in school. Wang et al. (2019) investigated 2,996 fourth-and fifth-grade students in western China and found that the left-behind was one of the important reasons for the backward development of the SEC. A few other studies have found that, however, left-behind children in the development of the SEC were not significant (Peng and Dai, 2019).

According to the theories of social development such as social cognitive development theory represented by Jean Piaget (Barrouillet, 2015) and social learning theory represented by Bandura (1999), family environment, parental companionship, and parent–child relationship were considered to play vital roles in children's development, which naturally leads to the disadvantageous position of the growth of left-behind children. According to the family stress theory (Patterson and Garwick, 1994), the parents of left-behind children were often faced with high and persistent pressure such as low income, child-rearing, and career development. Family care stress and work stress significantly positively predicted violence between migrant couples with especially family care stress being more likely to evolve into marital conflict (Perry-Jenkins and Gerstel, 2020). Moreover, poor parent relationships will exert a significant negative effect on children's social behavior and SEC (Richmond and Stocker, 2008), which made left-behind children suffer from the direct and indirect effects of family pressure. In addition, some studies suggested that the increase in family income had a positive effect on the stability of family and marriage (Arnold and Beelmann, 2019), which could make up for the negative effect of the separation of parents and children. However, comparing different groups of children aged 3–15 years, including migrant children, left-behind children, and rural and urban children in non-migrant families, Lu et al. (2019) found that the increase in *per capita* income of left-behind families could not offset the negative effects of left-behind families on children. On the contrary, the research by Tang et al. (2018) further indicated that the improvement in economic conditions would have a negative impact on left-behind children who lack certain guidance and constraints. To sum up, the development of children's SEC needed a good family atmosphere, parent–child relationships, which had a larger functional space in the development of children (Li and Qiu, 2016). SEC was developed within the context of a responsive and sensitive parent–child relationship (Lengua et al., 2007). Therefore, compared with non-left-behind children, the SEC development of left-behind children was more likely to be the direct sufferer of family structure dismemberment and shallow emotional support.

In addition to the influence of family on the development of children's SEC, some research emphasized the important role of the school. Jeon et al. (2019) conducted three-level multi-level analyses

and found that teachers, as key participants in children's development and an important guide in life-learning behaviors, play an increasingly important role in children's development. A study by Soriano-Ayala and Cala (2017), on the impact of SEC on adolescents in Spain, found that schools play an important role in the development of adolescents' SEC development. Collie (2022), using survey data from some secondary school students in Australia, further analyzed and found that positive teacher support was an important predictor of SEC and contributes to the development of children. Especially for the left-behind children, after the modulation of the teacher support, the differences between the left-behind children and the non-left-behind children in the aspects of emotion and behavior disappeared (Fan et al., 2010). Therefore, we believed that teacher support was indispensable in the development of children.

From the aforementioned literature reviews, some general conclusions about the development of left-behind children's SEC and its influencing mechanism have been drawn in the existing studies. Previous studies also had the following problems: first, studies on left-behind children focused more on a single dimension, such as parent–child attachment, peer relationship, and emotional development, but few of them used the SEC scale in the investigation and analysis. Second, some previous studies failed to take sample selection bias into account. The difference between left-behind children and non-left-behind children was not only reflected in the left-behind status but also reflected in other factors such as family capital. Some children may also be in a weak position in the development of the SEC even if their parents do not go out for work. If simple linear regression was directly used to compare the difference in SEC between left-behind children and non-left-behind children, the results may be biased. Third, existing studies have only considered it from the perspective of the family and lacked taking teacher support as a moderator variable to explore the moderating effect of teacher support on the development of children's SEC. Therefore, based on the existing literature and the purpose of this study, the following assumptions were made in this study:

> *H1*: Left-behind experience had a significant negative impact on children's SEC.
>
> *H1a*: Teacher support could effectively mitigate the negative impact of left-behind children's SEC development.
>
> *H2*: Family social, economic, and cultural capital positively affected left-behind children's SEC significantly.

Drawing from the earlier assumptions, a conceptual model is plotted in Figure 1.

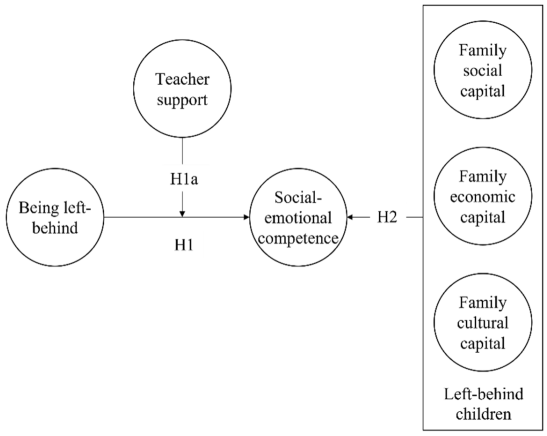


FIGURE 1
Conceptual framework of left-behind children SEC.

3. Research methods

3.1. Data sources

In this study, Hunan and Shandong provinces were randomly selected as the sources of the study group for this article among the provinces in China because they have a large number of migrant workers. As large labor-exporting provinces, Hunan and Shandong have a relatively large sample of left-behind children, and the samples were typical. A total of 578 valid questionnaires were obtained after eliminating invalid questionnaires such as missing values, abnormal values, conflicts between left-behind status and left-behind time, and samples of one or both parents who had passed away.

3.2. Instrument

3.2.1. Dependent variable: Social–emotional competence

This study is adapted from the Delaware SEC scale (Mantz et al., 2018), which had 12 items and adopts a 4-point scoring method, on a scale of 1–4, indicating "Not at all like me," "Not very like me," "A little like me," and "Very like me." "I blame others when I get into trouble" was a reverse scoring, the other items were all positive scoring, and the higher the score the children get, the higher the children's SEC. The questionnaire had been used in previous studies on rural children in China, with good reliability and validity. Cronbach's alpha of this study was 0.769. The results of confirmatory factor analysis showed that all the indexes fit well, as shown: $\chi^2/df = 1.499$, RMSEA = 0.029, IFI = 0.983, TLI = 0.974, and CFI = 0.983.

3.2.2. Independent variable: being left behind

Left-behind children refer to minors with rural household registration under the age of 16 years whose parents were out for work, or one of them was out for work and the other was incapable of guardianship and the left-behind children cannot live with their parents normally (Fan et al., 2010). Referring to this definition, this article defined the rural primary school students whose parents worked outside or were left at home as the left-behind children and assigned a value of 1. If both parents were at home or one of them was away from home and the other had guardianship ability, this study defined such rural primary school students as non-left-behind children, with a value of 0.

3.2.3. Moderator variable: Teacher support

This study selected the teacher support questionnaire compiled by van de Pol et al. (2022) based on the growth experience and needs of left-behind children. There are teachers who will take an active interest in your emotional and academic state. "Teachers will listen to your thoughts and feelings," "Teachers will talk to you about why things happen when you do something wrong and tell you the right ideas and practices," "Teachers will actively take care of your school situation and offer guidance," "Teachers will get help when you ask for help when you have learning problems," "Teachers will encourage you when you encounter difficulties or setbacks," and "Teachers will praise you when you do well," using a 5-point scoring system, from 1 to 5, which meant "Strongly disagree," "Disagree," "Indeterminate," "Strongly agree," and "Agree." The statistical correlation test showed that Cronbach's alpha of this study was 0.761. The results of confirmatory factor analysis showed that $\chi^2/df = 1.378$, RMSEA = 0.026, IFI = 0.998, TLI = 0.995, and CFI = 0.998, and all the indexes fit well.

3.2.4. Control variables

Based on the existing research, we took gender, grade, parents' education, parents' occupation type, and family economic condition as control variables. The occupations of parents were divided into two categories: elite occupations, which included managers of government agencies, institutions, and companies, as well as professional and technical personnel such as scientists, engineers, doctors, teachers, and information technology practitioners, and the rest of the occupations were classified as non-elite occupations. The family economic situation adopted five points, 1–5, which indicate "very rich," "relatively rich," "general," "relatively poor," and "very poor."

3.3. Study design

When estimating the effect of left-behind experience on children's SEC, the ideal method was to randomly assign the subjects to left-behind families or ordinary families in an experimental framework; thus, any difference in the outcome of children's development can be attributed to the left-behind experience, or we could use a quasi-experimental study to test the difference in the results. In the absence of experiments or quasi-experiments, if covariates could be included in all the causes of left-behind children, the true impact of left-behind children could be estimated through statistical control of the children's family background, but we could not capture all the factors that led to the consequences of being left behind. The propensity score matching (PSM) method alleviated this dilemma. We created a counterfactual group that was similar in observable characteristics to the experimental group to simulate randomization (Austin and Fine, 2019). The reason was that (a) it could assist in causal inference and correct for potential selection bias in the study, (b) the sample could meet the basic requirements for causal inference, and (c) the treatment effects obtained were close to the laboratory design.

The PSM model regressed the binary variables (left-behind children or not) and fitted a propensity value (PS value) for each sample, which represented the probability that a given sample was left-behind children, and the left-behind children and non-left-behind children were matched according to their propensity values. Its calculation formula is shown in (1), where X is the matching variable, i is the sample, and Z is left-behind children or the opposite (1 is left-behind children and 0 is non-left-behind children).

$$PS(X_i) = P_r(Z_i = 1|X_i) \quad (1)$$

In theory, there was no significant difference between left-behind children and non-left-behind children after the data balance. The only difference was whether they have left-behind experience. Therefore, the average treatment effect on the treated (ATT) could be calculated. Its calculation formula is shown in (2), where n1 represents the sample size of left-behind children, i and j represent indicators of the sample order of left-behind children and non-left-behind children, respectively, and i and j represent the weights of repeated matched control group samples.

$$ATT = 1/n^1 \sum_i \left[\left(y_i | Z_i = 1 \right) \right] - \sum_i \acute{E}_{i,j} \left(y_i | Z_i = 0 \right) \quad (2)$$

4. The results of the study

4.1. Descriptive statistical results

Descriptive statistics (Table 1) showed that there were 146 left-behind children (25.26%), among which boys accounted for 57%. There were 432 non–left-behind children (74.74%), among which boys accounted for 51%. In the father elite occupation variables, left-behind children accounted for 13% and non-left-behind children accounted for 16%. Mother was the elite occupation of equal proportion between left-behind children and non-left-behind children's groups. The results showed that both left-behind children and non-left-behind children had good scores in SEC, while left-behind children had low scores in their father's elite occupation and teacher's support.

TABLE 1 Descriptive statistics of main variables.

Variable name	Full samples		Left-behind		Non-left-behind	
	M	SD	*M*	SD	*M*	SD
SEC	3.007	0.470	2.918	0.496	3.037	0.435
Boys[(c)]	0.530	—	0.570	—	0.510	—
Grade	1.880	0.632	1.950	0.481	1.860	0.675
Father's elite career[(c)]	0.150	—	0.130	—	0.160	—
Mother's elite career[(c)]	0.130	—	0.130	—	0.130	—
Father's education	2.400	1.269	2.410	1.790	2.400	0.994
Mother's education	2.410	1.011	2.410	0.940	2.410	1.034
Income situation	2.910	0.522	2.870	0.590	2.920	0.497
Stay on time	1.850	1.727	3.120	1.206	—	—
Teacher support	4.220	1.014	4.120	1.032	4.250	1.007
Sample size	578		146		432	

[(c)]The markers were all category variables, sex (female = 0, male = 1), occupation type (non-elite = 0, elite = 1), and the mean term indicates the proportion of this characteristic variable in the sample.

4.2. Benchmark regression result

As shown in Table 2, when the sample selection bias was not considered, the influence coefficient of left-behind on children's SEC tended to decrease as the variables were continuously incorporated into the model. However, being left behind had a significant negative predictive effect on SEC, indicating that the left-behind children had a greater impact on the development of SEC. In addition, the ordinary least square (OLS) regression results also showed that different genders have significant differences in children's SEC. Specifically, the SEC of left-behind boys was lower than that of girls. At the same time, the hindrance effect of mothers' elite occupation on children's SEC changed from significance to insignificance. To ensure the robustness of the regression results, the propensity score matching (PSM) method was used to further test the influence of being left behind on the development of children's SEC, verifying the robustness and reliability of the results.

4.3. PSM robustness test

4.3.1. Common support hypothesis testing

The co-support hypothesis test and the balance test were performed to (a) balance the distribution of variables between the treated and the untreated and (b) ensure the rationality and validity of the PSM score results. Figure 2 was a kernel density (*k*-density) plot of the propensity score (*p*-score) before and after PSM matching. The propensity score density distribution of the treated group and the untreated group showed a more fitting trend after PSM matching. Most of the propensity scores of the two groups were in common support, indicating that the quality of matching was high. The difference between groups in observable eigenvalues was eliminated, which satisfied the common support hypothesis.

4.3.2. The balance test

The results of the balance test in Table 3 showed that the pseudo-R^2 after matching was only 0.007, the LR chi-square decreased from 56.99 to 2.62, the MeanBias decreased from 16.8 to 4.6 and the MedBias decreased from 11.4 to 4.2 ($p = 0.977$). The results showed that the self-selection problem resulted in a significant reduction of estimation bias in the matched sample, and the matching effect and estimation result was good.

4.3.3. Average treatment effect estimation

The nearest neighbor matching method was adopted to estimate the average treatment effect. The results showed that left-behind children had a significant negative impact on SEC. To test the reliability of PSM estimation, the results of radius matching, kernel

TABLE 2 Ordinary least square (OLS) regression results of the effect of being left behind on children's SEC.

Variable	SEC								
Left-behind	−2.62***	−2.44**	−2.44**	−2.44**	−2.33**	−2.34**	−2.28**	−2.29**	−1.84*
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.050)
Boys		−2.57**	−2.58***	−2.60***	−2.65***	−2.66***	−2.63***	−2.63***	−2.64***
		(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Grade			−0.59	−0.61	−0.53	−0.47	−0.55	−0.54	−0.57
			(0.027)	(0.027)	(0.027)	(0.028)	(0.027)	(0.028)	(0.028)
Father's elite career				0.57	1.05	0.89	0.81	0.75	0.70
				(0.054)	(0.055)	(0.056)	(0.056)	(0.056)	(0.056)
Mother's elite career					−2.00**	−1.98**	−1.82*	−1.81	−1.76
					(0.066)	(0.066)	(0.066)	(0.066)	(0.066)
Father's highest education						0.83	1.22	1.19	1.19
						(0.021)	(0.026)	(0.025)	(0.026)
Mother's highest education							−1.00	−1.04	−1.04
							(0.026)	(0.027)	(0.027)
Income situation								−0.44	−0.55
								(0.040)	(0.040)
Stay on time									−0.92
									(0.012)
Region fixed effects	Control	Control	Control	Control	Control	Control	Control	Control	Control
_cons	116.83***	101.18***	48.63***	48.50***	49.20***	36.93***	36.65***	20.92***	20.80***
	(0.026)	(0.030)	(0.064)	(0.064)	(0.063)	(0.083)	(0.085)	(0.151)	(0.154)
N	576	576	576	576	576	576	576	576	576
R^2	0.014	0.025	0.025	0.026	0.035	0.036	0.039	0.039	0.040

(1) In parentheses were standard errors; (2) *, **, and *** were significant at the levels of 10, 5, and 1%, respectively.

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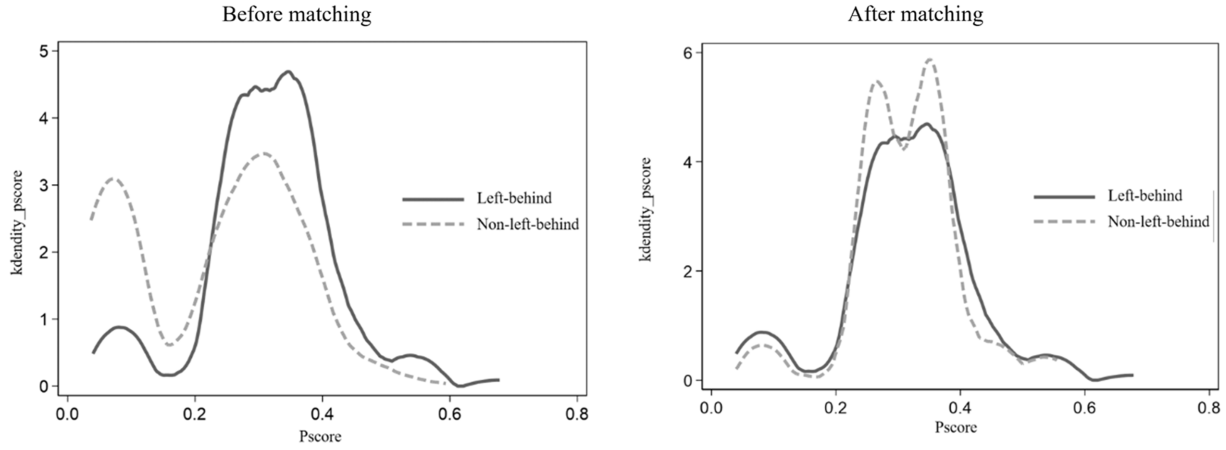


FIGURE 2
Matches the k-density *p*-scores.

TABLE 3 Matched the results of the pre and post-equilibrium joint tests.

Sample	Pseudo R^2	LR chi^2	*P*>chi^2	MeanBias	MedBias
Raw	0.087	56.99	0.000	16.8	11.4
Matched	0.007	2.62	0.977	4.6	4.2

regression matching, and local linear regression matching was further reported in Table 4. Left behind could reduce the scores of children's SEC by 1.88, 2.46, 2.29, and 2.26, respectively. It could be seen that the results of all kinds of matching methods were larger than the estimated coefficients before matching, which indicated that sample selection bias may underestimate the effect of left-behind on children's SEC.

TABLE 4 Processing effect of being left behind on children's SEC.

Matching method	SEC		
	ATT	ATU	ATE
Nearest neighbor matching ($n=1$)	−1.88*	−2.11**	−2.35**
	(0.066)	(0.056)	(0.051)
Radius matching ($r=0.01$)	−2.46**	−2.46**	−2.46**
	(0.046)	(0.046)	(0.046)
Kernel regression matching	−2.29**	−1.84*	−2.07**
	(0.049)	(0.044)	(0.043)
Local linear regression matching	−2.26***	−1.54	−1.85*
	(0.050)	(0.045)	(0.043)

*, ** and *** indicated significant at the 10%, 5% and 1% levels respectively.

4.4. Heterogeneity analysis

4.4.1. The influence of being left behind on the SEC of children of different genders

To further distinguish the gender differences in the impact of left-behind children on SEC, this study redivided the sample by gender. Table 5 shows that the effect of being left behind on children's SEC was especially significant for boys.

TABLE 5 Heterogeneity analysis of the SEC development of left-behind children of different genders (ATT).

©	SEC	
	Boys	Girls
OLS	−1.90*	−0.83
	(0.066)	(0.073)
Nearest neighbor matching ($n=1$)	−1.63*	−1.85*
	(0.092)	(0.093)
Radius matching ($r=0.01$)	−2.22**	−1.12
	(0.065)	(0.072)
Kernel regression matching	−1.76*	−1.19
	(0.073)	(0.069)
Local linear regression matching	−1.85*	−1.10
	(0.071)	(0.075)

Heterogeneity analysis mainly reports ATT values. The standard error in parentheses is based on the standard error of 500 independent samples.

4.4.2. The processing effect of left-behind duration on children's SEC

Taking 1 year of being left behind as the limit reference, this study assigned a value of 0 for less than 1 year as the untreated group and a value of 1 for 1 year or more as the treated group. Through this analysis, we could further understand whether the increase in parents' time out would be more detrimental to the development of left-behind children's SEC. As shown in Table 6, children with more than 1 year of left-behind experience have a weaker SEC.

4.4.3. The processing effect of family capital on left-behind children's SEC

Children left-behind reflected the lack of social, economic, and cultural capital of migrant families. The development of children's SEC was affected by the family capital. Therefore, it was out of practical significance to further explore the impact of family capital on children's SEC. In this study, the family's social, cultural, and economic capital were defined as the parents' highest occupation

TABLE 6 Processing effect of left-behind duration on children's SEC (ATT).

Matching method	SEC
OLS	−2.67**
	(0.089)
Nearest neighbor matching	−2.76***
	(0.131)
Radius matching	−2.86***
	(0.089)
Kernel regression matching	−2.76***
	(0.103)
Local linear regression matching	−2.56***
	(0.104)

** and *** indicated significant at the 5% and 1% levels respectively.

type (non-elite occupation type = 0 and elite occupation type = 1), the parents' highest education level (junior high school and below = 0 and senior high school and above = 1), and the family's economic condition (very poor, relatively poor = 0, very rich, relatively rich, and general = 1).

According to Table 7, the scores of the left-behind children's SEC have internal differences. The family cultural capital had a significant influence on the left-behind children's SEC. On the contrary, the influence of parents' occupation type and family economic condition on the left-behind children's SEC was not significant.

4.5. Adjustment effect test

Data were processed in SPSS, and the results are shown in Table 8. The interaction coefficient between teacher support and whether to stay was significant ($p < 0.05$), indicating that teacher support had a significant negative moderating effect on left-behind children.

5. Conclusion and discussion

Based on the survey data of senior primary school students in Hunan and Shandong provinces, this article constructed a PSM model. Nearest neighbor matching ($n = 1$), radius matching ($R = 0.01$), kernel regression matching, and local linear regression matching were used to analyze the influence effect and internal heterogeneity of left-behind children's SEC, to explore the moderating effect of teacher support between left-behind and SEC.

The findings were as follows: first, being left behind can significantly negatively affect children's SEC development, which was consistent with the findings of Wang et al. (2017). The results were still valid after a variety of matching methods, which verified hypothesis 1. Second, family cultural capital had a significant impact on children's SEC, but family social capital and family economic capital have no significant impact. As Murray-Harvey and Slee (2007) suggested, students' SEC was largely influenced by their families. However, the results of this study differed from those of Karabekiroglu et al. (2013), which showed that household economic capital, such as household income, was an important predictor of social–emotional problems. At the same time, several previous studies have shown (Mac Dermott et al., 2010; Appleton et al., 2012; He et al., 2019) that family social capital, such as the type of parental occupation, significantly affected children's SEC. The possible reason was that previous studies have focused more on pre-schoolers. According to ecosystem theory (Bronfenbrenner, 1979), the development of microsystems of most pre-schoolers were limited to their family. Therefore, it was greatly influenced by the family income and the parents' occupation. As the toddler grows into a school-going child, the scope of his activities continued to expand. As schools, teachers, and peers were integrated into this microsystem, the impact of the family gradually weakened. Therefore, for the students in the upper grades of primary school, the impact of family economic capital on SEC could be weakened. Finally,

TABLE 7 Processing effect of family background on left-behind children's SEC (ATT).

Matching method	SEC		
	Occupation	Economy	Culture
OLS	−0.97	−0.89	2.53**
	(0.098)	(0.090)	(0.082)
Nearest neighbor matching	−1.15	−0.65	1.97**
	(0.124)	(0.122)	(0.097)
Radius matching	−0.39	−0.39	2.33**
	(0.108)	(0.094)	(0.083)
Kernel regression matching	−0.66	−0.53	2.16**
	(0.113)	(0.110)	(0.090)
Local linear regression matching	−0.53	−0.34	2.15**
	(0.112)	(0.108)	(0.089)

*, ** and *** indicated significant at the 10%, 5% and 1% levels respectively.

TABLE 8 The moderating effect of teacher support on the SEC development of left-behind children.

Predictive variables	Model 1	Model 2	Model 3
	β	β	β
Constant	3.118***	3.091***	3.090***
	(0.068)	(0.064)	(0.064)
Gender	−0.115***	−0.104***	−0.110***
	(0.038)	(0.035)	(0.028)
Elite career for mothers	−0.094**	−0.076**	−0.075**
	(0.057)	(0.054)	(0.053)
Whether be left-behind		−0.091**	−0.094**
		(0.041)	(0.040)
Teacher support		0.338***	0.392***
		(0.020)	(0.021)
Whether be left-behind*teacher support			−0.093**
			(0.037)
R^2	0.156	0.385	0.392
Adjust R^2	0.014	0.136	0.141
ΔR^2	0.024**	0.124***	0.006**
ΔF	2.362***	41.430***	3.877**

Only significant control variables were shown in the model. ** and *** indicated significant at the 5% and 1% levels respectively.

through the analysis of the moderating effect of teacher support, it was found that there was a significant correlation between the development of children's SEC and teacher support. Furthermore, teacher support played a moderating role in the development of SEC of left-behind children, which verified hypothesis 3. This was consistent with the results of Alzahrani et al. (2019). In addition to the earlier hypothesis being verified, we also found that the influence of being left behind on children's SEC was especially prominent in boys. The longer the boys are left behind in rural were as the worse the development of children's SEC would be.

The earlier conclusions have the following implications. First, this study found that non-left-behind children's SEC was significantly higher than left-behind children. There was a positive correlation between the time the children were left in rural areas and harm to the development of children's SEC could not be independent of parental support. Parents play an irreplaceable role in children's SEC development. Although some researchers have argued that with the advancement of society and communication technology, the negative effects of parent-child separation on left behind children can be compensated to some extent through video calls and voice calls. For example, the higher the frequency of parent-child communication, the less negative effects children face (Tang et al., 2021).

However, the results of this study showed that left-behind children still have much lower social and emotional competence than non-left-behind children in SEC. The possible reason was that the communication between parents who go out to work and left-behind children was fundamentally different from that of companionship at home. Previous studies have shown that family upbringing can significantly influence the development of children's SEC (Chen et al., 2018). For parents working with lower income, reasonable parenting could benefit their future generations by narrowing the gap with the children of high-income families (Shepherd et al., 2021). This suggested that working parents need to pay more attention to raising their children rather than entrusting their children to the elderly or relatives. It was suggested that parents should adopt an equal and warm family education concept, which could build a bridge of "mutual trust" between parents and children through emotional warmth, encouragement, and support, to create a harmonious and safe atmosphere.

Second, we find that family cultural capital had a significant positive effect on left-behind children's SEC, which was in line with Pierre Bourdieu's theory of cultural capital. Cultural capital, as a kind of invisible capital, was considered to be a factor that can be passed on and implemented in the development of children. Moreover, cultural capital should cover all capital associated with culture and cultural activities rather than be defined simply by the single attribute of parents' educational background. Therefore, we should attach importance to the family's cultural capital construction to actively promote the cultural level of parents. Specific measures can be considered from the following aspects. The government and walks of life should accelerate the construction of high-quality educational infrastructure in rural schools, such as setting up village-run libraries and computer rooms and creating online resource learning spaces. To make up for the lack of family cultural capital, the scope of social service projects could be further expanded. Finally, the combination of government functions and social forces could accumulate long-term cultural capital for rural left-behind children.

For rural primary schools, the curriculum for the development of children's SEC could be set up. Collaborative for Academic, Social, and Emotional Learning (CASEL) had developed relatively mature curriculums, including experience curriculum, pedagogical content knowledge curriculum, and hidden curriculum focusing on the creation of a school atmosphere (Xu et al., 2016). According to CASEL's findings, students who took social–emotional classes showed significant improvements in academic performance, negative behavior, interpersonal relationships, and negative emotions. Children were ultimately guided to form positive moral and social perceptions (Ciotto and Gagnon, 2018; Mahoney et al., 2021). In addition, primary and secondary schools should conduct exchanges and cooperation with professionals in education and psychology at universities, such as inviting experts to offer courses in education and psychology. Meanwhile, some measures could be made for creating a novel, long-term cultural capital, such as carrying out monitoring and evaluation of the development of children's SEC and establishing personal growth files for long-term tracking.

Third, for left-behind children whose parents were unable to take care of them, teacher support was an important factor affecting children's SEC, which was aligned with Humphries et al. (2018). As shown in Figure 3, compared with low teacher support, both left-behind children and non-left-behind children had better scores in the high teacher support system. According to the field theory (Bourdieu, 2005), the development of an individual was influenced by many factors such as physical environment and behaviors. Obtaining high teacher support in schools helped students who had been separated from their parents for

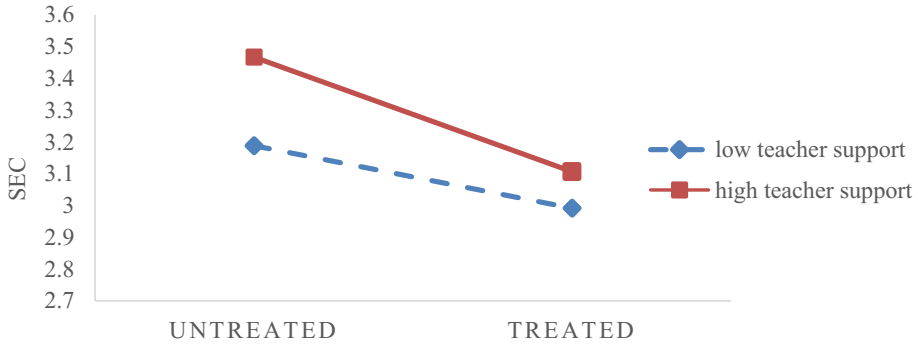


FIGURE 3
Moderating effect of teacher support on the relationship between left-behind and non-left-behind children's SEC.

a long time to acquire new social capital, which could buffer the negative impact of being left behind on the development of children's SEC. For a long time, the social concept of "academic performance first" was deeply rooted in people's thoughts. Teachers pay more attention to children's academic performance, and the lack of due attention to children's SEC development, some left-behind children, fall into a vicious circle of "poor academic performance-low teacher support-weak SEC." It was suggested that teachers should actively pay attention to and find out the problems left-behind children face in their growing up. Students' social–emotional states need to be observed in time to meet students emotional and communication needs. At the same time, teachers should consciously give more support to students, rather than using coercive and command education methods, and promote the positive development of children's SEC. However, since our society was focusing on promotion rates at present, teachers' performance appraisals were geared toward children's grades and promotion rates. This made teachers more likely to follow evaluation tests and unconsciously or forcefully ignore the development of social–emotional abilities of left-behind children. To encourage teachers to actively focus on social–emotional ability development among left-behind children under external objective conditions, it was suggested that non-cognitive ability development indicators, such as students' social–emotional ability, be included in their appraisals and evaluations.

6. Research findings, limitations, and prospects

This study explored the influence mechanism of left-behind children's SEC from four aspects: left-behind and non-left-behind, gender, family cultural capital, and teacher support. The results showed that (1) left-behind children had significant negative effects on SEC; (2) there were significant differences in the development of SEC among children of different genders and the duration of being left behind; (3) family cultural capital had significant positive effects on the SEC of left-behind children; and (4) teacher support had significant moderating effects on the influence path of "left-behind-SEC."

The results of this study enriched the research on the development of children's SEC and provided effective theoretical guidance for future efforts to promote the development of children's SEC. However, there were some limitations. First, the development of children's SEC in this study used a self-report questionnaire, which meant that there may be information bias in the data. Second, the study only collected data on children in some rural areas; thus, the sample coverage could be further expanded. Due to the difference in economic development between the east and the west of China, the regional sources of samples could be increased. Third, this study only analyzed the moderating effect of teacher support, and the mediating variables affecting children's social-affective ability development deserve further investigation. In the future, more mediating variables can be included, and a chain mediating effect can be formed to further analyze the influencing mechanism of children's SEC.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Hangzhou Normal University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

XM: conceptualization, data curation, formal analysis, investigation, methodology, manuscript writing, and supervision. CJ: conceptualization, investigation, supervision, manuscript writing, funding acquisition, and project administration. GS: formal analysis, methodology, and manuscript writing. YZ and XX: investigation, manuscript writing, and review editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The effect of family supportive supervisor behavior on teachers' innovative behavior and thriving at work: A moderated mediation model

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Objective: In today's society, teachers are increasingly focused on the harmonious development of work and family. However, few studies have discussed family supportive supervisor behavior to promote teachers' innovative behaviors and thriving at work. The study explores the mechanisms of family-supportive supervisor behaviors on teachers' innovative behaviors and thriving at work.

Methods: In this study, we adopt a questionnaire-based follow-up study of 409 career married teachers in Northwest China at three time points based on the Work-home Resource Model and Resource Conservation Theory.

Results: The results indicate that family supportive supervisor behavior has a significant positive predictive effect on teachers' innovative behavior and thriving at work, and work-family enrichment mediates between this relationship. In addition, proactive personality moderates the relationship between family-supportive supervisor behavior and work-family enrichment and the mediating role of work-family enrichment.

Conclusion: Prior research has focused more on the impact of job characteristics within the work domain on work innovation behavior and thriving at work, and some studies have explored the impact of family-level factors on teacher behavior, but more often than not, they have been described based on a conflict perspective. This paper explores the positive impact of family-supportive supervisor behavior on teachers' innovative behaviors and thriving at work from a resource flow perspective and identifies its potential boundary conditions. This study extends theoretical research on family-work relationships while providing new grounding and research perspectives for improving teacher work and family enrichment.

KEYWORDS

family-supportive supervisor behavior, work-family enrichment, teacher innovative behavior, thriving at work, proactive personality

Introduction

In recent years, the conflict between teachers' work and family roles has intensified with the rapid economic development and the continuous advancement of Internet technology. To effectively mitigate the adverse effects of this conflict, companies have proposed family support policies such as flexible work schedules and paid leave. However, these policies

have not worked as well as expected. The reason for the less-than-ideal results lies in the lack of deeper and more effective knowledge and communication of the policies' implementation by supervisors. As a result, family supportive supervisor behavior (FSSB), which supports teachers in their family responsibilities, has received widespread attention from administrators and scholars (Crain and Stevens, 2018). The purpose of this supervisor behavior is to balance the teacher's work-family relationship and to achieve a "win-win" situation for both teachers and the organization. Research has shown that FSSB not only stimulates teachers' organizational commitment, performance, and reduces turnover, but also enhances teachers' marital satisfaction, subjective wellbeing, and job satisfaction, as well as their physical and mental health (Olde-Dusseau, 2012; Aryee et al., 2013; Olde-Dusseau et al., 2016; Hammer et al., 2019; Lu et al., 2019; Talukder, 2019; Chen and Zhang, 2020; Liu et al., 2020; Rofcanin et al., 2020; Shi et al., 2020; Luo et al., 2022; Susanto et al., 2022; Ahmed et al., 2023; Kim et al., 2023). In the current context and traditional Chinese culture, does family-supportive supervisor behavior influence the level of thriving at work and teachers' innovative behaviors, allowing employees to "go to work with passion and innovative thinking" and thereby promoting organizational productivity? What factors play a key role in the process? All these problems need to be explored in depth.

Reviewing previous studies, scholars have focused more on the effects of thriving at work and teacher innovation behavior within the work domain, suggesting that thriving at work and teacher innovation behavior is effective in alleviating burnout that occurs at work (Hildenbrand et al., 2018) and enhancing creative performance (Christensen-Salem et al., 2021). In addition, thriving at work and teacher innovative behavior on job satisfaction (Chang and Busser, 2020; Qaiser et al., 2020; Jiang et al., 2021), life satisfaction (Zhai et al., 2020) organization commitment (Porath et al., 2012; Abid et al., 2019) have a positive effect and a negative effect on turnover intentions (Chang and Busser, 2020). In recent years, some scholars have begun to study the positive effects of family domain on thriving at work and teacher innovation behavior, but they are limited to the effects of family domain and family-related policies on thriving at work and teacher innovation behavior, and fewer scholars have focused on the positive effects of family-supportive supervisor behavior on thriving at work and teacher innovation behavior (Carmeli and Russo, 2016).

According to the work-home resource model, individuals are able to achieve simultaneous participation in multiple role activities. When individuals are engaged in work or family roles, they instinctively use the resources generated by the roles to stimulate their potential and then promote their own development, and apply the experience gained while working on other activities (Ten Brummelhuis and Bakker, 2012; Du et al., 2020). That is, there is a positive mutual spillover relationship between work and family (Kopperud et al., 2020; Aw et al., 2021; Deng et al., 2021). Researchers have argued that work-family enrichment, which refers to the beneficial impact of the experiences and resources gained from employees' involvement in work matters on the quality of family life, can best represent the mechanisms inherent in a positive work-family interface (Greenhaus and Powell, 2006; Gopalan et al., 2021; Shen et al., 2022). Resources representing one domain help develop personal resources that drive increased outcomes in another domain (Ten Brummelhuis and Bakker, 2012). Enrichment are formed when individuals accumulate family-supportive work resources that allow individuals to perform better at work. Resource formation is a key driver of the enrichment process because it is an asset that individuals need to draw upon when faced with problems (Wayne et al., 2007). Therefore, if family-supportive supervisor behavior have a positive impact on work flourishing and innovative teacher behavior, work-family enrichment should be a necessary and critical component of this positive effect.

In addition, in the study of organizational behavior, the influence of individual traits of employees deserves attention. At present, researchers mostly focus on the positive role of organizational environmental characteristics between family and work, and seldom discuss the impact of individual proactive personality differences on resource spillover (Hammer et al., 2013; Matthews et al., 2014). Proactive personality is a positive and stable personality trait. Individuals with this trait can always seize the opportunity to change their environment and are willing to take action (Bateman and Crant, 1993; Li et al., 2020; Yi-Feng Chen et al., 2021). Studies have shown that employees with higher levels of proactive personality are less bound to the outside world and feel more motivated by positive events in their lives, and tend to exchange information and share knowledge with others (Horng et al., 2016; Abid et al., 2021). Therefore, proactive personality may play a moderating role in the indirect relationship between family-supportive supervisor behavior and thriving at work and teachers' innovative behavior through work-family enrichment.

Theory and hypothesis

Family supportive supervisor behavior and teachers' innovative behavior

Family supportive supervisor behavior refers to the behaviors exhibited by supervisors to help teachers fulfill their family responsibilities, including emotional concern for teachers' family life, provision of instrumental resources for teachers, readjustment of working hours, and exemplary behaviors exhibited by teachers to balance work-family relationships (Hammer et al., 2013; Yu et al., 2022). According to resource conservation theory, when facing the threat of loss of their own resources, individuals tend to adopt a conservative way to preserve resources and refuse risky activities. Conversely, individuals are psychologically more motivated when resources are available, and they proactively acquire resources and combine them to create greater value. Teachers' innovative behavior is resource-depleting (Zhang and Bartol, 2010; McKersie et al., 2019). The process of innovation from idea generation to implementation requires teachers to invest considerable time, cognitive and emotional resources, and to be prepared for the risks of failure and rejection by their peers (Zhang and Bartol, 2010; Zhou et al., 2022). If schools want teachers to actively participate in innovation, they need to enrich resources for teachers and make them actively participate in innovation.

In summary, based on resource conservation theory, we believe that FSSB promotes teachers' innovative behavior in several ways. First, FSSB can help teachers fulfill their family responsibilities, reduce the drain on teachers' resources from negative events such as work-family conflict and family stress. It enables teachers to

devote themselves to thinking and solving problems creatively in their work (Swanberg et al., 2011; Yu et al., 2022). Secondly, the concern and support shown by supervisors for teachers' family life helps to create a safe working atmosphere, which enables teachers to dare to try new methods and procedures, and then actively innovate (Carmeli and Russo, 2016; Zhining et al., 2020). Thirdly, FSSB helps teachers to live their family life in a flexible way, so that they can meet their family (work) responsibilities without giving up their work (family). This allows teachers to interact not only with supervisors and colleagues, but also with family members in depth, further broadening their horizons resources and improving their innovation (Aleksic et al., 2017; Erdogan et al., 2022). Finally, based on the perspective of social exchange theory, teachers give back behaviors because the organization provides them with valuable resources that meet their needs for resources in their work and life. These behaviors further enhance trust and commitment with the supervisor, who will be willing to provide and supplement the resources needed for the teacher's innovation. According to the principle of reciprocity, teachers will actively engage in innovative behaviors to accomplish their goals in work and life. Accordingly, this paper proposes the following hypothesis.

> Hypothesis 1: Family supportive supervisor behavior has a significant positive affect on teachers' innovative behavior.

Family supportive supervisor behavior and teacher's thriving at work

Thriving at work refers to the positive psychological state of learning and vitality that accompanies the work process (Spreitzer et al., 2005). It not only provides a sense of enjoyment but also leads to productivity. Research shows that teachers and departments that thrive at work perform better and earn more (Roshan and Arulrajah, 2021). At the same time, increasing personal resources (e.g., self-control, positive affective traits, and self-esteem) and work resources (e.g., mini-breaks, leadership support, etc.) can significantly increase teachers' thriving at work. Family-supportive supervisor behavior is a leadership-supportive behavior and an important resource for family support. Therefore, we combine the connotative and structural dimensions of family-supportive supervisor behavior in this paper to illustrate how it motivates teachers to flourish at work along three pathways.

First of all, emotional support and instrumental support in family-supportive supervisor behavior provide teachers with sufficient and effective resources. In order to realize the value-added of existing resources, individuals will take action to accumulate resources and show their due vitality and learning state. As far as vitality is concerned, this behavior can inhibit the loss of teachers' work energy caused by work-family conflict, so that they have sufficient work energy (Jiang et al., 2015; Shi et al., 2019). At the same time, supervisors' understanding of teachers' family needs helps to establish a close and harmonious interactive relationship between teachers and supervisors, which is an important source of teachers' vitality (Spreitzer et al., 2005; Talukder and Galang, 2021). In addition to enhancing teachers' vitality, FSSB can also promote teachers' learning. It is an important part of FSSB to provide teachers with strategies and experiences to coordinate the relationship between work and family. By learning and applying these knowledge and skills, teachers can effectively respond to the demands of work and family, balance them, and thereby feel enhanced and developed.

Secondly, family-supportive supervisor behavior not only provide resources, but also create a pro-family organizational culture and atmosphere. When the basic resource needs of individuals are met, the perceived organizational climate will increase their psychological capital, enhance the mutual trust and commitment between supervisors and teachers, and promote the continuous improvement of exchange relations. Teachers are motivated to "bring their passion to work" in return for their supervisors' efforts.

Thirdly, the innovative work-family management dimension of family-supportive supervisor behavior includes the change of working time, place and mode, which not only embodies flexibility, but also embeds the concept of "win-win." It pays attention to innovation and emphasizes strategy, which can not only balance the work and family of teachers, but also make organizations and individuals mutually beneficial. It has changed the previous situation of focusing only on individual needs and neglecting organizational interests, or tending to solve family conflicts and neglecting work status and performance. Therefore, based on the above contents, this study proposes the following hypotheses:

> Hypothesis 2: FSSB has a significant positive affect on teacher's thriving at work.

The mediating role of work-family enrichment

Work-family enrichment effectively illustrate the intrinsic positive mechanisms of the work-family interface (Heskiau and McCarthy, 2021). According to Greenhaus and Powell (2006), work-family enrichment is the degree to which resources in one role field permeate across borders and promote performance and improve quality of life in another role field. Work-family enrichment includes two dimensions: Work-family enrichment and family-work enrichment (Chan et al., 2020). Work-family enrichment refers to the extent to which work experience and resources can improve the quality of family life, while family-work enrichment refers to the extent to which family experience and resources can improve the quality of work and life (Koekemoer et al., 2020). This article focuses on the effects of family-supportive supervisor behavior provided by organizations on the quality of life of individuals' families, selecting work-family enrichment as the main variable for the study.

In the organization, the supervisor's general support for teachers is mainly reflected in the support and resources given to individual work, but not necessarily including the support for individual family. Moreover, the family-friendly resources derived from work often come from work structures and work processes, such as flexible work time rotation and flexible policy support. In terms of the meaning of family support supervisor behavior,

it includes not only the support given by work, but also the satisfaction of family needs, including the flexible arrangement of working time and schedule, as well as the adjustment according to individual differences in the implementation of family support. It allows teachers to better meet the needs of their families while being able to successfully complete their work assignments. Based on resource conservation theory, the resources provided by the work domain are the basis for work-family enrichment. Therefore, family supportive supervisor behavior, as an important support resource, positively affects teachers' family and work. Hammer et al. (2013) found that family supportive supervisor behavior has a significant negative effect on employees' tendency to leave and work-family conflict, and a significant positive effect on job satisfaction and positive work-family spillover. Meanwhile, family supportive supervisor behavior is more significantly related to the above outcome variables than general supervisor support.

In addition, according to the theory of resource preservation, supervisors provide teachers with support resources to meet their individual needs, which can be applied to the participation of family roles, improve the quality of family and life, and realize the cross-border gains of work to family (Carlson et al., 2019). Individuals who want to experience the continuous gain of work to family need to invest time and energy in the role of work and accumulate resources continuously, which is in line with the resource acquisition spiral in the theory of resource preservation, that is, the initial resource acquisition will lead to more resources later (Kalliath et al., 2020). Timms et al. (2015) shows that when teachers feel the positive impact of work and family, they will be more enthusiastic about their work. Cinamon and Rich (2002) show that those teachers who feel the positive impact of work and family show greater vitality and creativity in their work. The mediating effect of work-family enrichment on the relationship between work support resources and thriving at work and innovation behavior has also been confirmed by relevant studies. Therefore, work-family enrichment is an important link between family-supportive supervisor behavior and teacher innovation behavior and thriving at work, and plays a mediating role. Therefore, we make the following assumptions:

> Hypothesis 3A: Work-family enrichment mediates the relationship between family-supportive supervisor behavior and teacher innovation behavior.

> Hypothesis 3B: Work-family enrichment mediates the relationship between family-supportive supervisor behavior and teacher's thriving at work.

The moderating effect of proactive personality

Proactive personality is a stable personality trait with obvious individual differences, which refers to a behavioral tendency to focus on creating or changing the environment (Bateman and Crant, 1993). There is a self-regulatory mechanism between individual trait factors and behavioral outcomes, including the role of proactive personality, which affects the individual's choice of work-family conflict management. For example, studies have shown that proactive personality has a significant moderating effect between work-family conflict and turnover intention (Bergeron et al., 2014). According to psychological stress theory, if people have different cognitive evaluations of the same event, their attitudes and behaviors will differ and the outcomes will be significantly different (Zhao et al., 2019). Proactive personality, as a positive psychological trait, can affect people's cognitive evaluation and attitude and behavior when facing stressful events. If individuals have positive psychological traits, they can not only correctly recognize work and family problems, but also flexibly deal with them, and are not easily affected by changes in the internal and external environment (Zhao et al., 2019).

On the basis of resource conservation theory, because individuals have limited resources, they need to make decisions about when, where, and how to allocate resources accordingly. It was found that individual traits influence individual resource allocation. Individuals with high levels of proactive personality tend to be flexible in switching resources between work and family. This shift helps to facilitate work-family relationships (Boyar and Mosley, 2007). According to the work-home resource model, individuals make full use of the resources provided by family-supportive supervisory behaviors when facing work matters. However, both the resources generated by family-supportive supervisor behavior and the employee's proactive personality are effective scarce resources at the disposal of the individual. To some extent, the two resources can complement or replace each other. Even if the organizational contextual resources provided by family-supportive supervisor behavior are not sufficiently supportive, employees with high levels of proactive personality can effectively enhance work-family gains through optimal allocation of resources, which in turn promotes thriving at work and innovative teacher behavior. Individuals with low levels of proactive personality, on the contrary, will undoubtedly suffer from a lack of resources to facilitate effective work-family transitions, coupled with a lack of psychological resources for thriving at work and innovative work behavior.

Studies have shown that when individuals have a high level of proactive personality, they are not easily bound by the outside world and can always seize opportunities to actively change the environment. If the organization provides resources, individuals will work hard to complete their tasks. Faced with the same situation, individuals with low initiative personality tend to passively accept the environment and are unwilling to make more efforts to deal with work affairs (Bergeron et al., 2014). Proactive personality is also a coping resource for individuals to alleviate role ambiguity and role overload. Individuals with high proactivity are better able to construct and access work resources, have a more optimistic assessment of their ability to change the environment they are in, address role stress in a more effective way, meet role expectations, create a work environment that is beneficial to them, and advance inter-work and family gains (Van den Heuvel et al., 2015). Therefore, the coupling of family-supportive supervisor behavior and proactive personality can effectively enhance the

work-family enrichment of employees. To sum up, this study proposes the following hypotheses:

> Hypothesis 4: Proactive personality moderates the relationship between family-supportive supervisor behavior and work-family enrichment. That is, the higher the proactive personality, the stronger the positive predictive effect of family-supportive supervisor behavior on work-family enrichment, and the weaker the opposite.

Proactive personality not only moderates the relationship between family-supportive supervisor behavior and work-family enrichment, but also may influence the indirect effect of family-supportive supervisor behavior on teachers' innovative work behavior and teachers' thriving at work through work-family enrichment. Specifically, work-family enrichment mediates the effect of family-supportive supervisor behavior on teachers' innovative work behavior and teachers' thriving at work, and the level of proactive personality affects the mediating effect. Based on the above reasoning, this study proposes the following hypotheses:

> Hypothesis 5A: Proactive personality moderates the indirect effect of family-supportive supervisor behavior on teachers' innovative work behavior, that is, the higher the proactive personality, the stronger the indirect effect of family-supportive supervisor behavior on teachers' innovative behavior through work-family enrichment, and vice versa.

> Hypothesis 5B: Proactive personality moderates the indirect effect of family-supportive supervisor behavior on teachers' thriving at work, that is, the higher the proactive personality, the stronger the indirect effect of family-supportive supervisor behavior on teachers' thriving at work through work-family enrichment, and vice versa.

In summary, the theoretical model of this study is shown in **Figure 1**.

Materials and methods

Research subjects and data collection

This study conducts a questionnaire survey of teachers in three general higher education schools in southern China. The survey respondents are front-line teaching staff within the schools. To reduce the effect of common method bias on the relationship between variables, the following control methods are used: (1) data are collected in three stages, with a 2 week interval between each two stages; (2) anonymous responses are used to reduce respondents' tendency to personal bias; (3) variable names are not marked in the questionnaire to conceal the purpose of the study and the meaning of the question items, ensuring that respondents answer the questions according to their true personal feelings. Specifically, the research team placed the questionnaires in small, anonymous, sealable envelopes, each with double-sided tape attached in advance. Before the survey began, supervisors from various departments at each university emphasized the benefits of the study to the faculty members, gave a detailed description of the process, expressed their support for the project, and encouraged active collaboration before the supervisors left the room. The research team then handed out questionnaire envelopes to the subjects. The teachers completed and returned the envelope and returned the questionnaire directly to the researcher; finally, they received a payment of $10 from the researcher. It is also important to note that the questionnaires were paired using a coded format (i.e., the first phase of the questionnaire had a number set on it and subjects were asked to remember their number, and in the next two phases, subjects were asked to fill in their questionnaire number). Throughout the data collection process, the questionnaire was completely anonymous and participation was voluntary.

The survey consists of three phases: in the first stage, teachers evaluated family supportive leadership behavior and teacher proactive personality, and filled in demographic information (gender, age, education level, and working years); in the second stage, teachers evaluated job requirements and work-family gains; in the third stage, teachers evaluated intrinsic motivation, teachers' innovative work behavior and teachers' thriving at work. A total of 479 questionnaires were distributed in all three stages, with 476 questionnaires collected in the first stage, 469 questionnaires in the second stage and 453 questionnaires in the third stage. The questionnaires in the three stages were matched, and finally 409 valid questionnaires were obtained. According to the descriptive statistical results of the sample, 52.5% were male, 47.5% were female; 57.46% were under 35 years old, 23.96% were between 36 and 45 years old, 18.34% were over 45 years old; 44.01% were junior college and below, 55.99% were undergraduate and above; 71.88% of them have worked for 5 years or less, 18.83% for 5–10 years and 9.05% for 10 years or more. The questionnaires in the three stages were matched, and 409 valid questionnaires were finally obtained. According to the descriptive statistics of the sample, 52.5% were male and 47.5% were female; 57.46% were under 35 years old, 23.96% were 36 ~45 years old, and 18.34% were over 45 years old; 44.01% were college and below, 55.99% were bachelor and above; 71.88% had worked for 5 years and below, 18.83% for 5~10 years, and 9.05% for 10 years and above.

Variables

In this study, the job demand scale was scored by Likert 5-point method, with 1 representing "very small" and 5 representing "very large." All other scales were scored using a Likert 7-point scale, with 1 representing "strongly disagree" and 7 representing "strongly agree." The scales used in this study were all developed by domestic and foreign scholars (see **Appendix**). In order to make the translated Chinese questionnaires consistent with or similar to the original English questionnaires, the translation and back-translation were conducted by members of the research team and English majors.

Thriving at work

The Thriving at Work Scale consists of two dimensions: Vitality and learning. The vitality dimension is based on the

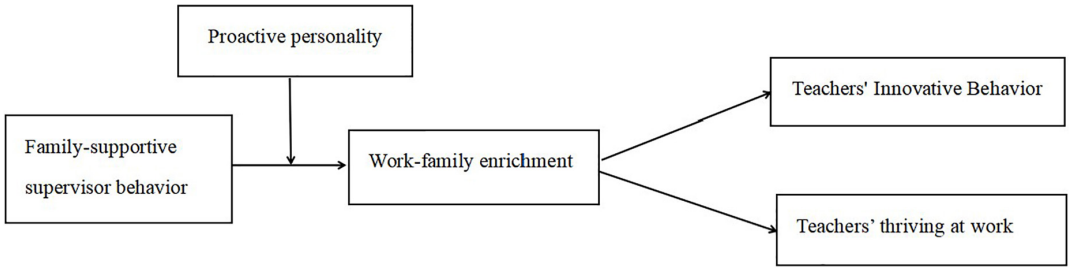


FIGURE 1
Theoretical model.

scale developed by Atwater and Carmeli (2009) and contains eight items, such as "I have plenty of energy to do my job;" the learning dimension is based on the scale developed by Carmeli and Spreitzer (2011) and contains three items, such as "The new things I learn at work help me in my life." As the current mainstream measurement instrument, the reliability of the scale has been validated in many research measurements with samples involving members of different types of organizations, which shows that the scale has a relatively wide applicability. In this study, the reliability coefficient of this scale was 0.916.

Proactive personality

The scale developed by Seibert et al. (1999) was used and contained 10 items, such as "I am constantly looking for new ways to improve my current life." The reliability of the scale has been validated in previous studies and has wide applicability. In this study, the reliability coefficient of the scale was 0.901.

Innovative behaviors

The innovative behaviors of teachers were measured by using the teacher innovation behavior questionnaire developed by Zhang and Zhang (2012). The questionnaire included three dimensions, including willingness to innovate (4 items), innovative actions (6 items), and innovative outcomes (6 items), with a total of 16 items. The reliability of the scale has been validated in previous studies and has wide applicability. In this study, the reliability coefficient of the scale was 0.942.

Work-family enrichment

The scale developed by Wayne et al. (2004) was used, with four items, such as "Having a good job allows me to play the role of a partner better at home." The reliability of the scale has been validated in previous studies and has wide applicability. In this study, the internal consistency coefficient of this scale was 0.842.

Family supportive supervisor behaviors

The scale developed by Hammer et al. (2009) was used, with four items. Hammer et al. (2009) concluded that family supportive supervisor behaviors are mainly related to the leader's supportive behaviors toward the employees' family life, and that the strength of their effectiveness is mainly derived from the employees' perceptions, so they should fill in the items themselves. An example question is "My supervisor demonstrates effective behaviors regarding how to balance work and non-work issues." The reliability of the scale has been validated in previous studies and has wide applicability. In this study, the internal consistency coefficient of this scale was 0.844.

Control variable

This study controls for demographic variables such as gender, age, education level, and years of experience in the workforce that may affect the study results. Moreover, previous studies have found that job requirements affect work-family relationships (Bakker et al., 2008), and internal motivation affects thriving at work (Menges et al., 2017). For this reason, the present study also controlled these two variables. Job requirements were measured using a scale developed by Karasek (1979), with questions such as "To what extent are your job requirements in conflict?" The internal consistency coefficient of this scale in this study was 0.913. The internal motivation was measured using a scale developed by Ryan and Connell (1989), with examples like "I did this job because it was interesting." In this study, the internal consistency coefficient of this scale was 0.857.

Results

Measurement tool description statistics

As can be seen from **Table 1**, the mean, standard deviation, skewness, and kurtosis of each variable and its question term, where the absolute value of skewness is less than two and the absolute value of kurtosis is less than seven, indicate that each variable basically obeys normal distribution.

Validation factor analysis of discriminant validity among variables

To test whether the measurement variables in this study have convergent and discriminant validity, this study uses Mplus8.3 software to conduct confirmatory factor analysis on family supportive leadership behavior, work-family enrichment, teachers'

TABLE 1 Description statistics of measurement tools.

Item and variable	*N*	Minimum	Maximum	Mean	Standard	Skewness	Kurtosis
Proactive personality mean	408	1.8	6.7	4.965	1.035	−1.004	1.204
FSSB mean	408	2	7	5.154	1.157	−0.747	0.360
Innovative behavior mean	408	1.375	6.688	4.631	1.298	−0.532	−0.858
Thriving at work mean	408	1.727	7	4.952	1.107	−0.554	0.009
Work-family enrichment mean	408	2	7	5.127	1.174	−0.971	0.566

TABLE 2 Confirmatory factor analysis.

Model	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA	SRMR
Judgment criteria			<3	>0.9	>0.9	<0.08	0.08
(A/ B/C/D/E) Five-factor model (A/ B/C/D/E)	1729.687	935	1.850	0.919	0.915	0.046	0.041
(A+B/C/D/E) Four-factor model (A+B/C/D/E)	2224.772	939	2.369	0.870	0.863	0.058	0.049
(A+B+C/D/E) Three-factor model (A+B+C/D/E)	3072.332	942	3.261	0.784	0.773	0.074	0.088
(A+B+C+D/E) Two-factor model (A+B+C+D/E)	4826.817	944	5.113	0.606	0.587	0.100	0.121
(A+B+C+D+E) One-factor model (A+B+C+D+E)	6467.813	945	6.844	0.440	0.413	0.120	0.146

a: A, family supportive supervisor behavior; B, work-family enrichment; C, teachers' innovation behavior, D, teachers' thriving at work; E, proactive personality; b: "+" indicates that two factors are combined into one factor.

innovative behavior, teachers' thriving at work and proactive personality. The analysis results showed that the five-factor model met the criteria (χ2/D F = 1.850, CFI = 0.919, TLI = 0.915, RMSEA = 0.046, SRMR = 0.041), and the fitting coefficients of the five-factor model were significantly better than those of the other models (see Table 2). The results in Table 3 show that the factor loadings of proactive personality, family-supportive supervisor behavior, innovative behavior, thriving at work, and work-family enrichment are above 0.5 and CR values are above 0.7, and all variables are above 0.5 except for proactive personality AVE value which is slightly below 0.5, so this questionnaire has good convergent validity. In Table 4 of the correlation coefficients, the square root of AVE for family supportive leadership behavior, proactive personality, work-family enrichment, innovative behavior and thriving at work are 0.767, 0.699, 0.764, 0.709, and 0.712, respectively, which are all greater than their corresponding correlation coefficients, thus indicating that the questionnaire has good discriminant validity.

Descriptive statistics and correlation analysis

The means, standard deviations and correlation coefficients of each variable can be observed in Table 4. Among them, family-supportive supervisor behavior was positively and significantly correlated with work-family enrichment (r = 0.409, p < 0.01), with thriving at work (r = 0.363, p < 0.01), and with innovative behavior (r = 0.281, p < 0.01); work-family enrichment was positively and significantly correlated with thriving at work significantly (r = 0.469, p < 0.01) and work-family enrichment was positively correlated with innovative behavior significantly (r = 0.304, p < 0.01). The hypothesis was therefore tentatively supported.

Hypothesis testing

In this study, SPSS 26.0 software was used for hierarchical regression analysis to test the hypotheses. In the cointegration test, the highest VIF value is 1.758, which is less than 10, thus indicating that there is no cointegration problem between the independent variables. It can be seen from Model 2 in Table 5 that family-supportive supervisor behavior has a significant positive effect on work-family enrichment (β = 0.327, p < 0.001). It can be seen from Model 4 in Table 5 that the interaction between family-supportive supervisor behavior and proactive personality has a significant positive effect on work-family enrichment (β = 0.124, p < 0.01), which indicates that proactive personality has a positive moderating effect between family-supportive supervisor behavior and work-family enrichment, and the hypothesis H4 is supported. It can be seen from Figure 2 that when the proactive personality is low, the positive effect of family supportive supervisor behavior on work-family enrichment is weak (β = 0.189, t = 2.856, p < 0.01), and when the proactive personality is high, the positive effect of family supportive supervisor behavior on work-family enrichment is weak (β = 0.189, t = 2.856, p < 0.01). Family-supportive supervisor behavior had a strong positive effect on work-family enrichment (β = 0.436, t = 7.098, p < 0.001).

It can be seen from Table 6 that in Model 2, the family-supportive supervisor behavior has a significant positive effect on the teacher's innovative behavior (β = 0.176, p < 0.001), and the hypothesis H1 is supported. In Model 3, family-supportive supervisor behavior has a significant positive impact

TABLE 3 Convergent validity.

Variables	Title	Factor load	S.E.	t-value	*P*-value	CR	AVE
Family-supportive supervisor behavior	X1	0.712	0.030	23.855	0.000	0.85	0.588
	X2	0.822	0.023	35.115	0.000		
	X3	0.857	0.022	39.684	0.000		
	X4	0.660	0.033	20.102	0.000		
Proactive personality	W1	0.823	0.019	43.035	0.000	0.905	0.489
	W2	0.787	0.022	35.998	0.000		
	W3	0.621	0.033	18.850	0.000		
	W4	0.626	0.033	19.153	0.000		
	W5	0.566	0.036	15.608	0.000		
	W6	0.709	0.027	25.886	0.000		
	W7	0.719	0.027	27.017	0.000		
	W8	0.662	0.030	21.792	0.000		
	W9	0.697	0.028	24.677	0.000		
	W10	0.745	0.025	29.924	0.000		
Innovative behavior	CXXW1	0.670	0.029	23.177	0.000	0.943	0.507
	CXXW2	0.700	0.027	26.014	0.000		
	CXXW3	0.748	0.023	31.915	0.000		
	CXXW4	0.757	0.023	33.233	0.000		
	CXXW5	0.720	0.026	28.189	0.000		
	CXXW6	0.746	0.024	31.581	0.000		
	CXXW7	0.753	0.023	32.494	0.000		
	CXXW8	0.705	0.027	26.594	0.000		
	CXXW9	0.717	0.026	27.909	0.000		
	CXXW10	0.708	0.026	26.931	0.000		
	CXXW11	0.667	0.029	22.911	0.000		
	CXXW12	0.691	0.027	25.155	0.000		
	CXXW13	0.699	0.027	25.986	0.000		
	CXXW14	0.696	0.027	25.649	0.000		
	CXXW15	0.708	0.026	26.904	0.000		
	CXXW16	0.699	0.027	25.945	0.000		
Thriving at work	GZFR1	0.635	0.032	19.998	0.000	0.917	0.502
	GZFR2	0.645	0.031	20.667	0.000		
	GZFR3	0.679	0.029	23.382	0.000		
	GZFR4	0.752	0.024	31.325	0.000		
	GZFR5	0.760	0.023	32.461	0.000		
	GZFR6	0.694	0.028	24.845	0.000		
	GZFR7	0.646	0.031	20.771	0.000		
	GZFR8	0.701	0.028	25.481	0.000		
	GZFR9	0.747	0.024	30.726	0.000		
	GZFR10	0.745	0.024	30.469	0.000		
	GZFR11	0.772	0.022	34.309	0.000		
Work-family enrichment	M1	0.712	0.030	23.614	0.000	0.847	0.584
	M2	0.845	0.023	37.377	0.000		
	M3	0.835	0.023	35.744	0.000		
	M4	0.645	0.035	18.495	0.000		

TABLE 4 Descriptive statistics and correlation analysis.

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Gender	0.475	0.500	–										
2. Education	2.556	0.901	−0.027	–									
3. Age	2.350	1.055	0.000	0.068	–								
4. Years of work	2.610	1.297	0.048	−0.005	0.646**	–							
5. Internal motivation	5.134	1.170	0.015	0.032	−0.009	0.029	–						
6. Job requirements	4.456	0.717	−0.046	0.125*	−0.009	0.005	0.282**	–					
7. Family supportive leadership behavior	5.154	1.157	−0.023	0.003	−0.043	−0.043	0.349**	0.156**	0.767				
8. Proactive personality	4.965	1.035	0.097*	0.028	−0.102*	−0.02	0.242**	0.277**	0.122*	0.699			
9. Work-family enrichment	5.127	1.174	−0.015	0.064	0.005	0.023	0.328**	0.266**	0.409**	0.260**	0.764		
10. Thriving at work	4.952	1.107	0.012	0.05	−0.033	−0.039	0.399**	0.359**	0.363**	0.325**	0.469**	0.709	
11. Innovative behavior	4.631	1.298	−0.022	−0.004	0.03	0.041	0.347**	0.221**	0.281**	0.238**	0.304**	0.308**	0.712

*$p < 0.05$, **$p < 0.01$.
The diagonal is the square root of AVE.

on teachers' innovative behavior (β = 0.126, $p < 0.05$), and work-family enrichment has a significant positive impact on innovative work behavior (β = 0.153, $p < 0.01$). Therefore, there is a partial mediating effect of work-family enrichment on the relationship between family-supportive supervisor behavior and teacher innovation behavior, and H3A is supported. In Model 5, family-supportive supervisor behavior has a significant positive effect on thriving at work (β = 0.237, $p < 0.001$), and the hypothesis H2 is supported. In Model 6, family-supportive supervisor behavior has a significant positive effect on thriving at work (β = 0.141, $p < 0.01$), and work-family enrichment has a significant positive effect on thriving at work (β = 0.294, $p < 0.001$), which indicates that work-family enrichment has a partial mediating effect on family-supportive supervisor behavior and thriving at work. Assume that H3B is supported.

The mediating effect and the mediating effect with moderation were further tested by model 4 and model 7 of PROCESS 4.1, where Bootstrap was 5,000 times. As seen in Table 7, the mediating effect of work-family enrichment in family-supportive supervisor behavior and innovative work behavior is 0.050 with a confidence interval that does not contain 0 (0.013, 0.093), and hypothesis H3A is therefore further supported. The mediating effect of work-family enrichment in family-supportive supervisor behavior and thriving at work was 0.096, with a confidence interval not containing 0 (0.059, 0.138), and hypothesis H3B was further supported. At high and low values of proactive behavior, the mediating effects of work-family enrichment in family-supportive supervisor behavior and teacher innovation behavior were 0.029 and 0.067, with 95% confidence intervals of (0.003, 0.067) and (0.018, 0.123), respectively, both with significant mediating effects and a difference in mediating effects of 0.038, 95% confidence intervals did not contain 0 (0.007, 0.085). Therefore, it is suggested that proactive behavior moderates the mediating effect of work-family enrichment in family-supportive supervisor behavior and teacher innovation behavior, and hypothesis H5A is supported. The mediating effects of work-family enrichment in family-supportive supervisor behavior and thriving at work were 0.056 and 0.128, with 95% confidence intervals of (0.009, 0.104) and (0.082, 0.181), at high and low values of proactive behavior. Both mediating effects were significant, with a difference in mediating effects of 0.073 and 95% Confidence interval does not contain 0 (0.023, 0.135). It therefore indicates that proactive behavior moderates the mediating effect of work-family enrichment in family-supportive supervisor behavior and thriving at work, and hypothesis H5B is supported.

Discussion

Research conclusions

Based on the work-home resource model and resource conservation theory, this paper explored the effects of family-supportive supervisor behaviors on teachers' innovative behaviors and teachers' thriving at work as well as the mechanisms of work-family enrichment and proactive personality in which the following conclusions were obtained. Family-supportive supervisor behavior have a significant positive predictive effect

TABLE 5 Test results of hierarchical regression analysis (with work-family enrichment as the dependent variable).

Variable	Variable work-family enrichment			
	Model 1	Model 2	Model 3	Model 4
Control variables				
Gender	−0.010	−0.003	*v*0.019	−0.005
Education	0.032	0.038	0.037	0.040
Age	−0.005	−0.002	0.019	0.018
Years of working experience	0.018	0.033	0.024	0.035
Internal motivation	0.275***	0.166***	0.141**	0.151**
Job requirements	0.184***	0.164***	0.128**	0.137**
Independent variables				
Family-supportive supervisor behavior		0.327***	0.322***	0.313***
Moderating variables				
Proactive personality			0.155***	0.139**
Independent variables*moderating variables				
Family-supportive supervisor behavior*proactive personality				0.124**
R^2	0.142	0.235	0.255	0.270
ΔR^2	0.142	0.093***	0.021**	0.014**
F	11.029***	17.520***	17.116***	16.337***

With *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$, to obtain the standardized moderating effect, the data were standardized.

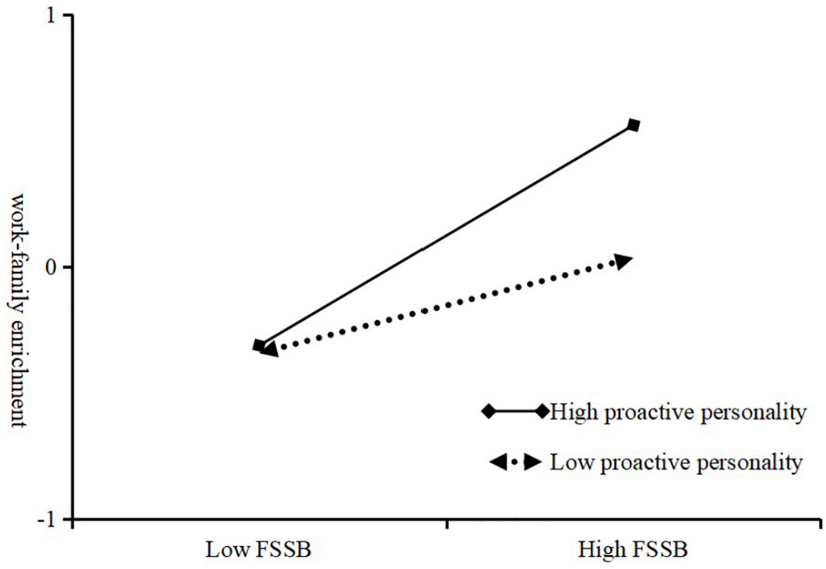


FIGURE 2
Analysis of the moderating effect of proactive personality on family supportive leadership and work-family enrichment.

on teachers' innovative behaviors and teachers' thriving at work, and this effect is partially mediated through work-family enrichment. At the same time, proactive personality not only moderates the relationship between family-supportive supervisor behavior and work-family enrichment, but also further regulates the indirect relationship between family-supportive supervisor behavior affecting teachers' innovative behaviors and teachers' thriving at work through work-family enrichment. Specifically, the higher the level of proactive personality, the stronger the indirect effect of family-supportive supervisor behavior through work-family enrichment on teachers' innovative behavior and teachers' thriving at work.

Theoretical implications

The theoretical contributions of this study mainly include the following four aspects. First, it responds to investigate the

TABLE 6 Test results of hierarchical regression analysis (with work-family enrichment as the dependent variable).

Variable	Innovative behavior			Thriving at work		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variables						
Gender	−0.022	−0.018	−0.018	0.023	0.028	0.029
Education	−0.034	−0.031	−0.037	0.006	0.010	−0.001
Age	0.026	0.027	0.027	0.009	0.011	0.012
Years of working experience	0.016	0.024	0.019	−0.057	−0.046	−0.056
Internal motivation	0.310***	0.252***	0.226***	0.325***	0.246***	0.197***
Job requirements	0.137**	0.126**	0.101*	0.268***	0.253***	0.205***
Independent variables						
Family-supportive supervisor behavior		0.176***	0.126*		0.237***	0.141**
Mediating variables						
Work-family enrichment			0.153**			0.294***
R^2	0.140	0.167	0.185	0.228	0.277	0.343
ΔR^2	0.140	0.027***	0.018**	0.228	0.049***	0.066***
F	10.884***	11.451***	11.315***	19.774***	21.929***	26.088***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 7 Bootstrap results for mediating effects and mediated effects with moderation.

	Effect value	Standard error	Lower limit of confidence interval	Upper confidence interval
Family-supportive supervisor behavior → work-family enrichment → innovative behavior				
	0.050	0.021	0.013	0.093
Family-supportive supervisor behavior → work-family enrichment → thriving at work				
	0.096	0.021	0.059	0.138
Family-supportive supervisor behavior → work-family enrichment → innovative behavior				
Low proactive personality (−1SD)	0.029	0.017	0.003	0.067
High proactive personality (+1SD)	0.067	0.026	0.018	0.123
Difference	0.038	0.020	0.007	0.085
Family-supportive supervisor behavior → work-family enrichment → Thriving at work				
Low proactive personality (−1SD)	0.056	0.024	0.009	0.104
High proactive personality (+1SD)	0.128	0.025	0.082	0.181
Difference	0.073	0.028	0.023	0.135

mechanism of family-supportive supervisor behavior on teachers' innovative behavior and thriving at work from the perspective of work-family enrichment to fill the gaps in existing research on innovative behavior and thriving at work. School support has been found to have a significant impact on teachers' work outcomes. However, these studies have mainly focused on examining the effects of formal support provided by schools to teachers in the work domain on innovative behaviors and thriving at work, neglecting to examine the effects of informal support provided by schools and managers from both the work and family ends on innovative behaviors and thriving at work and the mechanisms underlying them. Therefore, this study combined the work-home resource model and the resource conservation theory to study the influence path and mechanism of informal support of family-supportive supervisor behavior provided by managers from the perspective of work-family balance on teachers' innovative work behavior and thriving at work from the positive interface of work-family enrichment. Secondly, this study fills some gaps in the current research in the work-family enrichment domain. Currently, although researchers have shown increasing interest in the work-family enrichment domain, they have mostly focused on the negative spillover effects (work-family conflict) between the work-family domain (Xin et al., 2018). Moreover, research on the antecedent and outcome variables of work-family enrichment is still poorly developed. Most studies have focused on whether individual psychological resources are conducive to work-family enrichment, but fewer studies have focused on the important role that supervisor support in the work domain can play in the achievement of positive work-family relationships (Carmeli and Russo, 2016). The present

study incorporated work-family enrichment into the modeling framework and explored the mechanisms by which family-supportive supervisor behavior contribute to teachers' innovative behaviors and thriving at work. This result enriches the research in the field of work-family enrichment and further complements the theory of work-home resources, thereby providing a reference and reference for subsequent related research. Finally, this study examined the moderating role of proactive personality in the process of family-supportive supervisor behavior influencing work-family enrichment and further explored the mediating effect of the first stage of being moderated. This contributes to the understanding of the specific mechanisms through which family-supportive supervisor behavior work, and enriches and deepens previous research based on the work-home resource model. Family-supportive supervisor behavior is a generator of resources; work-family enrichment is a transformer of resources; and proactive personality is a catalyst for resource generation and transformation. They work together to regulate the generation of family-supportive supervisor behavior (resources) and the transformation of work-family enrichment into resources. This suggests that the positive effects of proactive personality are not limited to mitigating work-family conflict, but can also facilitate supervisor support at work to promote teacher outcomes through work-family enrichment. At the same time, it also suggests to some extent that there are conditions for the application of the work-home resource model to be applicable. Specifically, the effects of family-supportive supervisor behavior on teachers' innovative behaviors and thriving at work can vary at different levels of active personality. Therefore, future research should take note of the scope of application of the work-home resource model when applying it.

Practical implications

The results of this study also have a multitude of implications for administrators and teachers. To begin with, based on the importance of family-supportive supervisor behaviors in influencing teachers' thriving at work, we propose to enhance the application and cultivation of family-supportive supervisor behaviors in school management. Family supportive supervisor behavior is a form of informal organizational support provided by supervisors, and therefore the initiative and quality of such support can be further enhanced through appropriate training for supervisors and efforts to create a family supportive corporate culture. In addition, in the process of selecting supervisors, we should also examine whether the supervisor's values endorse family-supportive behavior, and identify and select supervisors who approve of family-supportive behaviors as more beneficial to the school's human resource management practices.

Secondly, the relationship between work and family is an issue of global concern. The higher the work-family enrichment of teachers, the more conducive it is to enhance the degree of innovation and investment of teachers. Therefore, schools should also shape teachers' correct values of work and family through corporate culture, reduce teachers' work pressure and improve teachers' quality of family life. At the same time, exchanges such as training, lectures and salons are provided in schools to enhance teachers' skills in dealing with work and family relations, guide teachers to find a balance between work and family step by step, and realize the positive effect of work on family by flexibly allocating their various material and psychological resources in the field of work and family. Therefore, teachers can make more efforts to obtain resources and stimulate teachers' thriving at work and innovative behavior. In addition, flexible working system can also be implemented to meet the individual needs of teachers and fully mobilize the enthusiasm of teachers.

Finally, proactive personality plays an important role in determining the behavior of individuals. Teachers with high proactive personalities excel at communicating with people, building good relationships with supervisors, and inspiring more creativity and performance for the school with the support and encouragement of supervisors. Schools, especially innovative schools, can use proactive personality as a criterion for hiring, adding proactive personality tests to meet other hiring requirements and giving preference to those with high levels of proactive personality. For employees within the school, in addition to training teachers in creative and innovative skills, training can also target the initiative of supervisors and teachers to stimulate their potential proactive personalities and make them show more proactive behavior.

Research shortcomings and prospects

This study has certain limitations and aspects that need to be studied in greater depth. Firstly, based on the work-home resource model and resource conservation theory, this study explored the relationship between family-supportive supervisor behavior and teachers' innovative behaviors and thriving at work. However, the emotions and behaviors that individuals exhibit in their families are closely tied to the organizational context in which they are embedded; therefore, it is equally important to explore the impact of work context factors on teachers' innovative work behaviors and thriving at work. To this end, we suggest that future research could further explore the effects of antecedent variables such as job requirements and feelings of school support on innovative work behaviors and thriving at work. Secondly, within the overall framework of the work-home resource model, this study explores the mechanisms underlying the influence between family-supportive supervisor behavior and teachers' innovative behaviors and thriving at work, with strong theoretical contributions. However, the results of this study showed that work-family enrichment only partially mediated the effect. Therefore, future research can further enrich the existing findings by combining other theories (e.g., ecosystem theory, resource-acquisition-development model) to continue to explore other latent mediating mechanisms by which family-supportive supervisor behavior influences teachers' innovative behavior and thriving at work. Finally, the use of a self-statement approach to data collection may lead to the problem of common method bias in this study. Although data were collected from three stages in this study, which could attenuate the problem of homoscedasticity to a certain extent, future studies could collect corresponding variables from different sources (e.g., having leaders fill out questionnaires on teachers' innovative behavior and thriving at work) to improve the rigor of the research design.

Data availability statement

The original contributions presented in this study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

QL responsible for article writing and data analysis. ML responsible for article revision and translation. Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Dear Ms./Mr.

Hello! Thank you for taking the time to participate in this survey! This questionnaire is for academic research only, and the information you fill in is for the researcher's use in scientific research. This questionnaire is anonymous, there is no right or wrong answers, the authenticity of your answers is very important to this study, your answers and information will be absolutely confidential! Please feel free to answer. Thank you for your cooperation and support!

I. Basic information (please cross "✓" on the corresponding option according to your real situation).

1. Your gender.

A Male B Female.

2. Your highest education.

A high school / junior college and below;

B College,

C Bachelor's degree,

D Master and above,

3. Your age.

A Under 25 years old,

B 26–35 years old,

C 36–45 years old,

D 45 years old or above,

4. Your working years.

A 1 year and less,

B 1–3 years,

C 3–5 years,

D 5–10 years,

E 10 years and above,

Part 2

Please read the following entries carefully, each entry contains seven alternative answers, please answer according to your own true feelings and cross "✓" on the corresponding option, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, General 5, Basically agree 6, Agree 7, Strongly agree.

1. I am constantly looking for new ways to improve my current life.
2. No matter where I am, I can always offer some constructive advice.
3. If I agree on something, I will do it no matter what the chance of success is.
4. I will stick to my ideas, even if someone opposes.
5. I will always look for the best way to deal with things.
6. When I firmly believe in an idea, no difficulty can stop me from implementing it.
7. I can find the opportunity earlier than others.
8. Few things are more exciting than seeing my ideas become reality.
9. If I see something I don't like, I will try to change it.
10. I am good at finding new opportunities.

Part 3

Please read the following entries carefully, each entry contains seven alternative answers, please answer according to your own true feelings, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, General 5, Basically agree 6, Agree 7, Strongly agree.

1. My boss makes me feel like I don't have to worry about talking to him/her about work-life conflicts.
2. My supervisor works efficiently and is creative in resolving conflicts between work and non-work.
3. My supervisor demonstrates effective behavior regarding how to balance work and non-work issues.
4. My supervisor is able to organize work in the department/unit to the mutual benefit of the employee and the company.

Part 4

Please read the following entries carefully, each entry contains 7 alternative answers, please answer according to your own true feelings, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, General 5, Basically agree 6, Agree 7, Strongly agree.

1. I encourage students to think about and discuss controversial issues.
2. I encourage students to use their creativity as much as possible in their learning.
3. I encourage students to explore new solutions to problems on their own.
4. I value students' own thinking and summarizing of problems.
5. I advocate that students should have the courage to express views different from those of others.
6. I support students' attempts and persistence on difficult tasks.

7. I often have ideas for reform and teaching innovation.
8. I use different teaching methods flexibly in order to impart knowledge and skills.
9. I want to try different forms of teaching organization.
10. I try to incorporate innovative ideas into my teaching activities.
11. I prepare a lot of extracurricular knowledge related to the teaching content from multiple perspectives.
12. I actively organize teaching activities that can enhance the interest of learning.
13. I take the initiative to learn the teaching experience of others.
14. I am open to others' suggestions for improvement of my teaching.
15. I actively seek to learn from peers or experts and exchange opinions.
16. I pay attention to looking for feedback related to teaching from students' studies.

Part 5

Please read the following entries carefully, each entry contains 7 alternative answers, please answer according to your own true feelings, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, General 5, Basically agree 6, Agree 7, Strongly agree.

1. I am active and energetic in my work.
2. I have plenty of energy to complete my work.
3. My energy can last the whole day.
4. I have enough energy to complete the day's work successfully.
5. When I go to work in the morning, I have enough energy to start a new day's work.
6. When I work, I am in a state of mental invigoration.
7. The work I do can bring me positive energy.
8. I am able to maintain an energetic state at work.
9. I can learn many new things at work.
10. The new things I learn at work are helpful to my life.
11. The new things I learn at work make my life more exciting.

Part 6

Please read the following entries carefully, each entry contains 7 optional answers, please answer according to your own true feelings and cross "✓" on the corresponding option, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, General 5, Basically agree 6, Agree 7, Strongly agree.

1. The work I do helps to deal with personal and practical problems at home.
2. The work I do allows me to become a more interesting person at home.
3. The day job goes well so that I can play the role of a partner better at home.
4. The skills I use at work are equally effective in dealing with family matters.

Part 7

There are many different reasons why everyone is in the job they currently have, so what motivated you to take it? Please read the following entries carefully, each entry contains 7 alternative answers, please answer according to your own true feelings, thank you for your cooperation!

1, Strongly disagree 2, Disagree 3, Basically disagree 4, Generally 5, Basically agree 6, Agree 7, Strongly agree.

1. I am in this job because it is interesting.
2. I am in this job because I like it very much.
3. I am engaged in this job because I enjoy this job brings me a sense of pleasure.
4. I am engaged in this job because the job itself is very attractive.

Part 8

Please read the following entries carefully, each entry contains five alternative answers, please answer according to the actual situation today and cross "✓" on the corresponding option, thank you for your cooperation!

1, very small 2, small 3, fair 4, large 5, very large.

1. How fast does your job require you to work.
2. How hard your job requires you to work.
3. How much your job requires a large workload.
4. How much your work time is not enough to complete the task.
5. How much your job requires you to work too much.
6. How much time you feel is not enough to complete your work.
7. How often your work requirements conflict with each other.

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Students' in-class impression management: Comparing models for measuring student strategies of self-presentation

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This paper addresses an issue that has largely been neglected in educational research so far: students' impression management. Impression management is defined as an individual's active effort to present the self in a certain, usually positive way. Owing to a lack of empirical studies on students' impression management at class, we primarily pursued the basic aim of designing an instrument for analyzing deliberate student tactics of self-presentation. Its development was based on work on school-specific coping strategies. Construct validity and criterion validity were tested in a sample consisting of 201 Austrian high school students. The results indicated that a correlative five-dimensional factor structure fit the data best. Furthermore, students with higher scores on the presented and appearing self also scored higher on most dimensions of the Impression Management scale than their peers who cared less about their teacher's perception. These findings raise the question of what types of impression management can be deemed functional with respect to academic success.

KEYWORDS

impression management, self-presentation, model comparison, appearing self, presented self

1. Introduction

In recent years, impression management has gained attention in numerous fields. Research on impression management can be found in personality assessment (social personality assessment, Helmes et al., 2014), in the context of job application processes (Kristof-Brown et al., 2002; Levashina and Campion, 2006, 2007; Roulin and Bourdage, 2017), self-presentation in social media (Rui and Stefanone, 2013; Picone, 2015; Popescu, 2019), participation in Massive Open Online Courses (MOOCs, Becker-Lindenthal, 2015), or with addictive behaviors of adolescents (Callaghan and Doyle, 2001) as well as in organizational research (Gardner and Cleavenger, 1998; Bolino and Turnley, 1999; Bolino et al., 2014; Rehman Khan and Javed, 2018). For instance, Abraham and Hansson (1995) found that impression management is one important factor in successful aging at work. Rehman Khan and Javed (2018) emphasize that people are involved in impression management "when they are evaluated by someone who controls the valued outcome" (ibid., p. 3). Therefore, impression management is also relevant in the school context. Thus, schools are not only about education,

but also about socialization, qualification, and allocation (Fend, 2008). In particular, its selection function has gained attention in recent years, as the duration of compulsory schooling has been extended, but at the same time it has been largely degraded to a preliminary stage for preparing the transition to further educational institutions (Reichenbach, 2013). For students, this means that the success they achieve while in school is critical with respect to their future academic or professional career. Against this background, it comes as no surprise that the quality of diagnostics in educational settings has become a major topic of research (Ohle and McElvany, 2015). Evaluations of achievements of individual students form a central part of the responsibilities of the teaching profession. These evaluations provide a basis for the regulation of educational opportunities and career prospects (Lüders, 2001). Despite this pivotal function of social selection and its biographical significance, evaluations are often characterized by "a considerable extent of scope" (Lüders, 2001, p. 218, translation by the authors) because they are rarely based on strictly objective measurement criteria. Recent studies about the quality of pedagogical diagnostics have shown that teachers' judgement is not as accurate as one might hope, and that students' actual performance (standardized tests) and teachers' evaluation differ hugely (Ohle and McElvany, 2015; Pielmeier et al., 2018). That means, educational researchers are well aware of this potential bias (Heinze, 1980; Eder and Bergmann, 2004) as the following quote shows:

> In case of school failure, teachers' feedback has proven to be less negative towards those pupils who make an effort rather than towards those who did not put enough effort to succeed (the "lazy" students!), even when performances were equivalent … (Matteucci, 2014, p. 544).

If there is scope for decisions and weighting, there are consequently opportunities for social influencing. With special regard to evaluations that are decisive in terms of educational careers, Neuenschwander (2010) emphasizes that not only academic achievement but also engagement in class and the students' behavior influence their teachers' decisions about the transition to continuing education, e.g., secondary school. Consequently, for students it is important they also leave a good impression, that the teacher thinks of them as motivated, engaged and interested.

Although impression management is also considered important in education, to date, there has been little systematic research on students' impression management in the classroom and their attempts to portray themselves in a certain (positive) light. As Juvonen and Murdock (1993) pointed out 30 years ago there has been more research on self-presentation strategies given a negative event than during neutral or positive events. More recent research on impression management, for example, has focused on self-handicapping behavior as one self-presentation strategy to control/manage the impression one wants to leave. Literature on whether and what self-presentation strategies students use in order to make a good impression is scarce. Against this background of missing research, our paper addresses the issue of impression management that is the deliberate attempts of students to influence their teachers' perception and judgments. Because instruments for measuring different aspects of student impression management in the classroom have been lacking so far, the chief aim of our study consists in devising such an instrument. In view of these primarily methodological objectives, our paper focuses on the validation of the newly developed instrument.

2. Impression management: Presentation of the self

Depending on the research tradition and paradigm, definitions and conceptualizations of impression management differs hugely. While the psychoanalytic tradition clearly understands impression management as conscious lying and deception, organizational research attributes both a conscious and an unconscious dimension to impression management. In addition, a distinction is made between advantageous and disadvantageous self-presentation, verbal and nonverbal tactics, as well as honest and deceptive impression management (Fapohunda, 2017). From a social psychological perspective, impression management is understood as the active and conscious effort of an individual to present the self in a certain (usually positive) light and to leave a certain impression on the public with a specific goal in mind (Baumeister, 1999; Matteucci, 2014; Parhankangas and Ehrlich, 2014). In this tradition, Goffman (1971) understood the world as a social stage on which we present ourselves in accordance with particular rules, in particular contexts with particular intentions. Forgas and Jones (1985) too emphasized that a large part of interpersonal communication is aimed at achieving a particular purpose, often simply the purpose of making a positive impression on one's interlocutor. Thus, many messages are characterized by strategic thinking, planning, and evaluation. In this paper, impression management is understood as the selective presentation or strategic disclosure of information that is applied in order to enter into smooth interpersonal relationships or to achieve important (social) goals, even if this involves negative or deceptive self-presentation (Picone, 2015). Leary (1996, p. 4) also emphasizes:

> Although some self-presentations are exaggerations and others are downright lies, most of the time the impression people try to make on others are not deceptive. We are all multifaceted individuals, and in any given situation, we could convey many different impressions of ourselves, all of which are true. Rather than lying, people typically select the images they want of others to form from their repertoire of true self-images. This selection is often tactical in the sense that it is based on their goals in the situation and on their assumptions about which impressions will best achieve those goals.

As Strauß (2005, p. 69, translation by the authors) pointed out, "the presentation of the self is an immanent part of each social situation: without self-presentation, there can be no interaction, and without interaction, there can be no self." If this presentation is to be successful, the individual needs a clear idea of the expectations of the "audience" as well as sensitivity to what is deemed appropriate in a specific social situation (Forgas and Jones, 1985; Forgas, 1999).

This is also important in the context of school in general and especially in the context of classroom instruction. As Juvonen and Murdock (1993) showed, 8th grade students are also aware of this, as they assume that teachers like successful students more than unsuccessful and students who try hard more than those who do not try.

2.1. Impression management in the classroom

Students can usually be assumed to know how to leave a favorable impression. Woods (1990) noted that students often hide their interests behind a kind of mask. They avail themselves of various strategies or tactics so as to conform to the expectations of their teachers and to attract attention in a positive way. Against this background, Niederbacher and Zimmermann (2011) drew the following conclusion with respect to social interactions in the classroom:

> At school, teachers and students interact. Their actions are tied to societal expectations and roles. … If they fulfill these expectations, they will receive recognition and rewards; if they fail to fulfill these expectations, they will be met with disapproval and receive punishment or even sanctions. … The better students adapt themselves to the teachers' expectations and presumptions in class, and the better they succeed in disguising themselves in the sense of an integration of both curricula [i.e., the formal and the hidden curriculum], the greater the likelihood of a successful educational career. (Niederbacher and Zimmermann, 2011, p. 101, p. 109, translation by the authors)

This sensitivity to social situations and to the expectations that are associated with them is not equally developed in all individuals (Forgas and Jones, 1985). It is for this reason that Goffman (1971) notes that the success of self-presentation depends on the ability of the presenter. The challenge consists in successfully convincing other individuals of the impression or the image that is meant to be conveyed. In the context of classroom instruction, it is thus advantageous to show interest in the subject matter and to manifest motivation and engagement because being interested, motivated, and engaged in itself might not suffice if the teacher does not recognize it. A student who is not able (or not willing) to muster engagement spontaneously should at least try to make others believe that he or she is truly engaged. Irrespective of the motives behind this attempt, the effort is necessary for sparing the others', e.g., teacher's feelings and maintaining their favorable opinion (Goffman, 1967). This conclusion points to two aspects: First, impression management is related to decency and politeness. Second, make-believe is an important dimension of impression management (Mercolli, 2012).

2.2. Impression management – A social skill

As set forth in the previous sections, the concept of impression management refers to active and deliberate efforts of individuals to present themselves in a social situation in a (usually positive) light for conveying a particular image with a particular intention (Baumeister, 1999; Matteucci, 2014; Parhankangas and Ehrlich, 2014). Make-believe performs a central function in this regard, particularly in situations in which a student is not able or willing to muster the engagement that is expected by the teacher (Goffman, 1967). These considerations make it plausible to assume that students who care what their teacher thinks of them make more effort to convey a positive image than students who do not care about their teacher's perception. Furthermore, it is likely that students who do not satisfactorily succeed in school but would like to be successful rely more heavily on tactics of self-presentation than successful peers. In Eder's (1987) framework, such tactics mainly belong in the categories of demonstrative engagement, personal and situational adaptation, and ingratiation. In order to cast a positive light on themselves, students need to be sensitive to the expectations of their teacher. Impression management can therefore be regarded as a social skill that presupposes other skills like taking another individual's perspective (see Bandura, 1986; Selman, 2003) or possessing an understanding of social expectations and conventions (see Turiel, 1983).

2.3. Dimensions of students' impression management

With regard to the students' impression management and the question what strategies students apply in order to cast the self in a good light, a literature review showed that there is little research activity in this domain. Two central empirical studies on student tactics were conducted by Heinze (1980) and Hoferichter (1980). Heinze's focus on student strategies was, however, quite different from this paper's focus. Heinze (1980) namely developed a system of different strategies that students use for "surviving" boring and monotonous classes rather than to instances of positive impression management or relationship management with the teacher. In Hoferichter's (1980) study, children were asked what tips they would give a younger sibling on how to get through school as smoothly as possible. This question also pertains to coping strategies and not immediately to impression management or self-presentation as such. Eder (1987) adopted Hoferichter's question and used it in a study with a broader scope. He categorized the participating students' answers into nine distinct coping strategies (Eder, 1987, pp. 104f.): I. Participation and Learning, II. Demonstrative Engagement, III. Identification, IV. Integration, V. Situational Adaptation, VI. Personal Adaptation, VII. Ingratiation, VIII. Resistance, and IX. Distance and Withdrawal. Taking these categories as a basis, Maschke and Stecher (2006) developed a standardized instrument on coping strategies. Since this instrument does not capture strategies that are aimed at impression management, we could not apply it in our study either. Nevertheless, four of nine dimensions identified by Eder (1987) describe self-presentation tactics as we understand them as they focus on deliberately try to convey a positive image of the self as being interested, motivated and competent (authors). These dimensions are Demonstrative Engagement, Situational Adaptation, Personal Adaptation and Ingratiation. While demonstrative engagement describes the active effort to appear as interested and committed through participation, situational adaption tactics are used not to let demotivation or disinterest show. Personal adaptation and ingratiation describe tactics that rather invest in relationship work with the teacher. These four dimensions were supplemented by the dimension self-promotion which originated from a study on impression management of leaders (Gardner and Cleavenger, 1998). Self-promotion is defined as a "behavior that presents the actor as highly competent, with regard to certain skills or abilities" (Gardner and Cleavenger, 1998, p. 9) and can therefore also be understood as a special kind of demonstrative engagement.

As explained above, impression management is not about whether or not a student is truly interested in what is being taught but rather about whether a student is successful in conveying the image of an interested student to the teacher. Naturally, the question of whether students really succeed in making the intended impression on their teacher can only be answered by looking at the interplay between the individual student and the teacher. In order to find out whether the teacher interprets a student's behavior in the intended way, the student's self-report needs to be compared with the teacher's perceptions. Doing so first requires a valid measurement instrument that records student reports on their impression-management activities in the context of classroom instruction. This paper will, therefore, focus on the development and validation of a scale measuring impression management. In what follows, we shall present a prototype of such an instrument and describe how we implemented and validated it. As the qualification "prototype" indicates, the current version of the instrument is merely to be seen as a first attempt at capturing tactics of impression management. In particular, we seek to determine whether student impression management can be analyzed in a valid manner by drawing on Eder's (1987) work on coping strategies complemented by impression management strategies in the field of leadership and management (Gardner and Cleavenger, 1998). Aggainst this background, we focus impression management on self-presentation strategies that aim at presenting the self as being competent, motivated and interested. The reciprocal relationship between student impression management and the teacher's perception is, at the present state of development, still beyond its scope.

3. Aim, research questions, and hypotheses

The main aim of our project was to develop an ecologically valid instrument to analyze students' impression management in the classroom. Based on the school-specific coping strategies identified by Eder (1987) and Gardner and Cleavenger (1998), this instrument was supposed to capture the student perspective on self-presentation tactics. First of all, we wanted to test assumptions concerning the dimensionality of the construct (as a crucial aspect of construct validity) and criterion validity and design a practicable instrument, which was eventually achieved through item reduction. The focus was on three research questions:

1) Can impression management on an empirical basis be modeled as a one-dimensional factor or as a second-order factor, or is impression management to be regarded as a multi-dimensional model consisting of several differing tactics of self-presentation?

With respect to criterion validity, we wanted to clarify the following questions:

2) Is there a linear relationship between students who want their teachers to perceive them as engaged students (effort) and the use of tactics of self-presentation?
3) Is there a linear relationship between students who believe that their teachers perceive them as engaged students (effort) and the use of tactics of self-presentation?

As for construct validity, we expected that a multi-dimensional model would better fit and replicate the data than a one-dimensional model or a second-order model. This would confirm the relevance of Eder's (1987) categories (Hypothesis 1). As explained in Section 2, impression management is about the presentation of the self in public. With reference to Fend (1994), the self can be conceived as an "epistemic entity" that "is oriented towards understanding and grasping one's own inner world. This grasp is socially negotiated and thus constitutes the social character of the self. At the same time, it is dynamic and oriented towards change, an increase in extension, and ideals" (Fend, 1994, p. 199, translation by the authors). Fend (1994, p. 210) distinguished four dimensions of the self: the real self ("This is how I really am"), the ideal self ("This is how I would like to be"), the presented self (socially desirable self: "This is how they should think of me"), and the appearing self ("This is how they think of me").

As regards criterion validity, we assumed that students who care what their teacher thinks of them (presented self) score higher on the dimensions of impression management than students who are unconcerned with their teacher's perception (Hypothesis 2). Furthermore, we expected that students who believe that their teacher perceives them to be engaged in class (appearing self) score higher on those dimensions of impression management that aim at presenting oneself as a motivated and interested student (Hypothesis 3).

4. Operationalization and validation of the construct impression management

4.1. Operationalization of the construct impression management

As mentioned earlier, impression management in the context of school has rarely been the focus of empirical research. Since there were no measurement instruments available, we set out to develop our own scales. With the help of this range of new items we wanted to find out whether students deliberately use certain tactics for making a positive impression on their teachers. The formulation of the items rested on Eder's (1987) coping strategies. We included only those categories, however, that focus on the creation of a positive image and directly relate to the teacher or to instruction. The operationalization of the construct Impression Management consisted of five dimensions:

1) Demonstrative Engagement: This dimension relates to the tactics that students deliberately use for presenting themselves through active participation as motivated, interested, and engaged students. These tactics are characterized by a high degree of activity.
2) Self-Promotion (demonstrative engagement in terms of knowledge and skills): This dimension, in adoption of Gardner and Cleavenger (1998) targets tactics students use to present themselves as competent. That is, they demonstrate that they have the knowledge and skills necessary to follow and understand the lesson.
3) Situational Adaptation: This type of impression management rests on tactics that tend to be adaptive in nature. Their purpose does not consist in actively presenting oneself as a motivated or engaged student but rather in concealing disinterest.

4) Personal Adaptation: This dimension concerns adaptation to the teacher's expectations that suppose students to be interested and motivated.
5) Ingratiation: This dimension refers to active relationship management. The student presents himself or herself as a learner who respects and esteems the teacher and is obedient.

The items belonging to these five dimensions were tailored to German-language instruction and were hence worded subject-specifically. German is not only the national language of Austria (where the study has been conducted) but it counts also to the major subjects of teaching. Being skilled in German language was found to be an important factor for school success and further academic career (Becker and Hecken, 2007). Furthermore, it is to assume that it is easier for students to manage their impression and take influence on grading in a subject that is less based on objective grading criteria such as right or wrong. The final version of the questionnaire consisted of 18 items in total that were to be rated on a four-point Likert-type scale (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree).

As a basis for evaluating criterion validity, the students were asked to answer additional questions about their presented self (according to Fend, 1994) with respect to the effort they make in class. The scale *Presented Self* (effort to present oneself as an engaged student) included five items with the following structure:

I want my German-language teacher to think that …

1) I make an effort in the German-language class (λ = 0.77; M = 3.38; SD =0.76).
2) I am interested in the German-language class (λ = 0.75; M = 3.43; SD =0.74).
3) I am motivated in the German-language class (λ = 0.78; M = 3.47; SD = 0.71).
4) I learn a lot for the German-language class (λ = 0.65; M = 2.86; SD =0.996).
5) I follow the German-language teacher's instructions (λ = 0.67; M = 3.40; SD = 0.74).

Agreement and disagreement with these five items could again be expressed through the above mentioned four-point Likert-type scale. The means (*M*) and the standard deviations (*SD*) of the five items (values added in parentheses) indicate that the students on average agreed with the items. Four of the five items reached an average above 3 (maximum = 4). The significant standard deviations point to a certain degree of variability, however. Cronbach's Alpha of the scale Presented Self proved to be satisfying (α = 0.85).

The scale Appearing Self (belief that one is perceived as an engaged student) also included 5 items that had to be rated on the same four-point Likert-type scale (α = 0.82). The wording of the items went as follows:

It is likely that my German-language teacher thinks that …

1) I make an effort in the German-language class (λ = 0.77; M = 2.93; SD =0.86).
2) I am interested in the German-language class (λ = 0.74; M = 2.91; SD =0.84).
3) I am motivated in the German-language class (λ = 0.83; M = 2.88; SD = 0.86).
4) I learn a lot for the German-language class (λ = 0.55; M = 2.46; SD =0.97).
5) I follow the German-language teacher's instructions (λ = 0.60; M = 3.24; SD = 0.83).

The instrument had the form of a paper-and-pencil questionnaire whose completion took the students about 30 min. In addition, we collected biographical data of the participants.

4.2. Sample

In total, 201 high-school students ("Gymnasium" level) from six Austrian classes completed the questionnaire in class. 39% of the participants were male (78 students) and 61% female (123 students). The average age amounted to 14.3 years (SD = 1.31 years). The sample resulted from convenience sampling including all students who were present on the day of the survey. The data were hierarchically structured. Participation in the study was, however, voluntary.

4.3. Statistical analyses

All statistical analyses were conducted with the help of SPSS (version 23; descriptive analyses) and Mplus (version 7.2, Muthén and Muthén, 2012; latent variable models and correlation model). In order to do justice to the hierarchical data structure, we used the sandwich estimator (type = complex, Muthén and Asparouhov, 2011) that is implemented in Mplus and maximum-likelihood estimation with robust standard errors. Missing values were treated by means of full-information-maximum-likelihood estimation (FIML, Muthén and Muthén, 2012). The assumption was that the data were missing conditionally at random (MAR). For evaluating the goodness of fit of the individual models, we followed Hu and Bentler (1999) and applied the following criteria: $1 < CMIN < 3$, $CFI \geq 0.95$, $RMSEA \leq 0.06$, and $SRMR \leq 0.08$. The comparison of the models was based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC).

5. Results concerning impression management

5.1. Model comparison: Correlative five-dimensional model versus one-dimensional model and second-order factor model

As the project's main goal consisted in the development of an ecologically and valid instrument to measure students' impression management, a first step consisted in deleting items that did not reach a satisfying quality standard.

Only items with standardized factor loadings of ≥0.4 were considered further for statistical analyses. As Table 1 shows, five items were excluded. Thereafter, we identified all items with one or more cross loadings (*via* identification indices). This resulted in the exclusion of three more items. The decision to exclude them as well was not only statistically motivated but also theoretical. The cross

TABLE 1 Values resulting from the latent structural equation model of the five-dimensional structure of impression management.

Dimensions of IM	Loading	SE	Mean	*SD*	α
Demonstrative engagement					**0.86**
In my German-language class (*imGLc*), I often put my hand up with the intention of making my teacher believe that I'm motivated.	0.85	0.04	2.74	0.96	
ImGLc, I actively take initiative with the intention of my teacher ascribing a high level of motivation to me.	0.72	0.05	2.74	0.89	
ImGLc, I often put my hand up with the intention of making my teacher think that I'm interested.	0.896	0.02	2.72	0.99	
Self-promotion					**0.74**
Even if I do not know the correct solution *imGLc*, I try to behave as if I know it.	0.72	0.02	2.46	0.96	
When many students put their hand up *imGLc*, I put my hand up too to make the teacher think that I know the answer even if this is not always true.	0.57	0.04	1.69	0.97	
ImGLc, I try to look as if I know the answer.	0.82	0.04	2.31	1.03	
Situational adaptation					**0.83**
ImGLc, I do not let my disinterest show.	0.48	0.03	3.04	0.85	
ImGLc, I try to appear motivated even though I'm (sometimes) not motivated.	0.68	0.03	3.12	0.80	
ImGLc, I do not let it show that I'm not motivated.	0.63	0.03	2.89	0.93	
ImGLc, I behave as if I were interested in German.	0.78	0.04	2.95	0.87	
ImGLc, I behave as if I were motivated.	0.81	0.06	2.94	0.80	
Personal adaptation					**0.73**
ImGLc, I sometimes fake interest because I want to leave a positive impression.	0.59	0.08	2.89	0.90	
ImGLc, I sometimes fake participation because I want my teacher to think that I'm a good student.	0.66	0.096	2.90	0.85	
ImGLc, I sometimes make my teacher believe that I have prepared myself for class even if it is not true.	0.53	0.04	2.51	0.87	
ImGLc, I sometimes fake motivation because I want to leave a positive impression.	0.84	0.03	2.66	0.96	
Ingratiation					**0.66**
I pretend to fulfill my teacher's expectations.	0.77	0.06	2.83	0.87	
I pretend to follow my teacher's instructions.	0.61	0.09	2.72	0.91	
When my teacher explains what we are supposed to do, I pretend to find this important.	0.48	0.07	2.58	0.87	

loadings indicated that the content of the items did not capture the intended dimension well enough. In the last step, we accepted an error correlation between two items of the dimension Situational Adaptation: "In my German-language class, I do not let it show that I'm not interested" and "In my German-language class, I do not let it show that I'm not motivated" ($r = 0.26$; $p < 0.01$). The wording of these items is almost identical. The only difference is that the first item relates to interest while the second item relates to motivation. Error correlation thus seemed to be acceptable.

After excluding the items with too low quality, we made use of confirmatory factor analysis for calculating a correlative five-dimensional model (Model A) that was based on the remaining 18 items. Table 1 provides an overview of the exact wording of the remaining 18 items together with their factor loading, standard error, mean, and standard deviation. The item characteristics achieved a satisfactory model fit ($\chi^2 = 189.313$, $df = 124$, $p < 0.01$; CMIN = 1.43; CFI = 0.952; RMSEA = 0.051; SRMR = 0.054; AIC = 8227.026; BIC = 8441.74). Reliability was tested by means of Cronbach's Alpha of the dimensions. Internal consistency proved to be satisfactory with values between $\alpha = 0.66$ and $\alpha = 0.86$.

Table 2 shows the correlations between the latent dimensions. It is discernible that the dimension Personal Adaptation correlates highly with three of the four other dimensions. The correlation with the dimension Ingratiation turned out to be very high ($r = 0.86$) and thus slightly exceeds the value that Brown (2006) identified as the critical limit for one-dimensionality ($r = 0.85$). The content of both dimensions concerns the students' behavior towards the teacher, which is intended to create a positive impression. Nevertheless, there is a clear difference: the dimension Ingratiation focuses on the intention to make the teacher believe that the student is obedient whereas the dimension Personal Adaptation relates to the attempt to pretend motivation and interest in the subject. As these two dimensions can be distinguished at least from a theoretical and an analytical point of view, we decided to retain the five-dimensional structure for the time being and compared it to a one-dimensional model and a second-order model (see Table 3, Hypothesis 1).

As already mentioned, AIC and BIC served as evaluation criteria. In addition, we carried out a chi-square test of independence. As far as the two information criteria (AIC, BIC) are concerned, low values are considered to be better than high values. For applying a chi-square statistic, it is necessary to test whether the deviation in χ^2, given the non-centrality parameter delta of the degrees of freedom (df), is significant. If robust maximum-likelihood estimation (MLM) is used, the chi-square test for differences needs to be corrected for the scaling correction factor (Satorra-Bentler correction).

Table 3 displays the results of the model comparison. A comparison between the correlative five-dimensional model (Model A) and the one-dimensional model (Model B) shows that the goodness

TABLE 2 Correlations between latent dimensions of self-presentation.

	Self-promotion	Situational adaptation	Personal adaptation	Ingratiation
Demonstrative engagement	0.19*	0.62***	0.39***	0.29***
Self-promotion	1	0.39***	0.73***	0.71***
Situational adaptation		1	0.78***	0.699***
Personal adaptation			1	0.86***

***$p < 0.001$.
*$p < 0.05$.

TABLE 3 Model comparison with optimized model: Results of χ^2 difference tests (corrected according to Santorra-Bentler).

Model	χ^2 (*df*)	*CFI*	*AIC*	*BIC*	Delta (comparison with Model A)
Correlative five-dimensional model (A)	189.31 (124)	0.952	8227.03	8441.74	Basis model
One-dimensional model (B)	571.64 (134)	0.675	8627.88	8809.56	$\Delta\chi^2$: 400.52, *df*: 10, $p < 0.001$
Second-order model (C)	233.32 (129)	0.923	8269.66	8467.86	$\Delta\chi^2$: 34.17, *df*: 5, $p < 0.001$

of fit of Model B is very poor (CMIN = 4.27; CFI = 0.675; RMSEA = 0.127; SRMR = 0.106). The AIC value is considerably higher than in Model A (8627.88 vs. 8227.03). The same applies to the BIC value (8809.56 vs. 8441.74). It is therefore not surprising that the chi-square test (corrected according to Satorra-Bentler) is highly significant ($\chi^2 = 400.52$, df = 10, $p < 0.001$). Thus, it is reasonable to prefer the correlative multi-dimensional model (Model A) to the one-dimensional model (Model B). Although the goodness of fit of Model C, which suggests a latent variable Impression Management as a second-order factor, apparently only slightly diverges from the cut-off criteria ($\chi^2 = 233.32$, $df = 129$, $p < 0.01$; CMIN = 1.81; CFI = 0.923; RMSEA = 0.063; SRMR = 0.077; AIC = 8269.66, BIC = 8467.86), the comparison between the models clearly indicates that Model A is to be preferred. The AIC and BIC values are higher for Model C, and the chi-square test, corrected according to Satorra-Bentler, turned out to be significant ($\chi^2 = 34.17$, $df = 5$, $p < 0.001$). As regards the loadings of the constructs on the second-order dimension, it becomes visible that the latent variable Demonstrative Engagement in particular has a comparatively low loading ($\lambda = 0.441$) while the dimension Personal Adaptation has a high loading ($\lambda = 0.986$).

After the evaluation of the fit indices, we can conclude that the five-dimensional model proved to be better than the one-dimensional model (*g*-factor model) as well as the second-order model. For this reason, we used Model A as the starting point for measuring different aspects of impression management and thus for an empirical clarification of the second and the third research question and Hypotheses 2 and 3.

5.2. Evaluation of criterion validity: Correlations

In order to test Hypotheses 2 and 3, we introduced the scales Presented Self and Appearing Self (Fend, 1994, also modeled as latent constructs with correlated errors of items with the same content but differing modalities of the self) as correlates to the five-dimensional model. The scales Presented Self and Appearing Self correlated significantly with each other ($r = 0.45$; $p < 0.001$). The moderate correlation indicated, however, that these two concepts of self-reference can be discriminated. Table 4 gives an overview of the correlations between the dimensions of impression management and presented self as well as appearing self (under mutual control).

With respect to Hypothesis 2, four of the five expected correlations proved to be positively significant. Students who expressed a stronger wish to be perceived as being engaged in the German-language class (presented self) showed higher ratings of the dimensions Demonstrative Engagement ($r = 0.41$; $p < 0.001$), Situational Adaptation ($r = 0.59$; $p < 0.001$), Personal Adaptation ($r = 0.32$; $p < 0.001$) and Ingratiation ($r = 0.28$; $p < 0.05$) than their peers. That is to say, the more they care whether or not their teacher perceives them as being engaged in the class, the more they demonstrate their engagement and the less they let show that they are not motivated or interested. This finding supports Hypothesis 2. The correlation between the dimension Self-Promotion and the presented self, by contrast, was not found to be significant ($r = 0.15$; ns). As for the appearing self, the correlations with the dimensions Demonstrative Engagement ($r = 0.48$; $p < 0.001$), Situational Adaptation ($r = 0.55$; $p < 0.001$) and Personal Adaptation ($r = 0.18$; $p < 0.05$) proved to be significant, which is in line with expectations and thus consistent with Hypothesis 3. These three dimensions of impression management all—with more or less active effort—aim at presenting oneself as an interested, motivated and engaged student.

6. Discussion

The starting point of our work presented in this paper was the assertion that evaluations of academic achievement by teachers only seldom rest on purely objective criteria alone. Rather, there is usually scope for decisions and weighting. In view of this, many empirical studies have included—besides data that relate to the students' level of cognitive performance—socio-demographic characteristics such as, for instance, the number of books at home (OECD, 2001) for explaining individual differences in achievement. The extent to which

TABLE 4 Correlations between impression management and the presented as well as appearing self.

Dimensions of impression management	Presented self regarding student's effort (Hypothesis 2)	Appearing self regarding student's effort (Hypothesis 3)
Demonstrative engagement	0.41***	0.48***
Self-promotion	0.15 ns	0.01 ns
Situational adaptation	0.58***	0.55***
Personal adaptation	0.31***	0.18*
Ingratiation	0.27*	0.22 ns

ns = not significant.
***$p < 0.001$.
*$p < 0.05$.

students can actively influence their teachers' evaluations through their own behavior and their self-presentation, by contrast, has mostly been excluded from the search for explanations. One reason for this omission might be that the term impression management carries a negative connotation in the sense of "deceit." Even though impression management and deceit are conceptually distinct, acting-as-if can still be understood as a special kind of deceit. The reason for this is that the act of availing oneself of certain strategies of self-presentation is often aimed at making a "false" impression on another person so that there is indeed a certain intention of deceiving (Mercolli, 2012). That impression management in the context of classroom instruction can also have something to do with decency and politeness has only rarely been taken into consideration so far. This is a serious shortcoming because strategies of impression management can "open up real chances for action to both the individual and the collective classroom community" (Maschke and Stecher, 2006, p. 513, translation by the authors). Likewise, Reichenbach (2013) pointed out that classroom instruction in general can be seen as an interaction essentially consisting of exchange and deceit. Deceit in the sense of make-believe can be deemed functional because it contributes to maintaining discipline and order in the classroom and thus stabilizing the social fabric. Situations, as Reichenbach (2013) emphasizes, in which neither exchange nor deceit is possible, may result in open problems, probably even in open conflict. If there is neither exchange nor deceit, no teaching will be possible anymore (pp. 123–124).

Building on this functional understanding of impression management, we pursued the question concerning the extent to which students deliberately avail themselves of strategies of self-presentation. The overall aim of our empirical research consisted in developing and evaluating an instrument for analyzing student tactics that serve the purpose of positive self-presentation. Taking Eder's (1987) categorization of student coping strategies as a starting point supplemented by a dimension of Gardner and Cleavenger (1998), we eventually arrived at a valid five-dimensional correlative measurement model. This model of impression management proved to be more appropriate than a one-dimensional model (g-factor) or a second-order model (hierarchical model). For optimizing the fit, eight items had to be excluded, however. At the same time, this reduction led to an increase in the economy of the instrument and thus in its practicability.

The results of our data analyses showed that students possess tactics of self-presentation that accentuate their engagement in class in a demonstrative way, emphasize their knowledge and their skills, and serve the purpose of personal adaptation and ingratiation (teacher-student relationship). Hypothesis 1, which assumed that a multi-dimensional model would be the most suitable option, could thus be confirmed.

In line with expectations as expressed in Hypothesis 2, we were also able to show that students who want their teachers to perceive them as making an effort (presented self) indeed make an effort and achieved higher means in four of the five dimensions than students who care less about their teachers' perception. The correlation between the presented self and the dimension Self-Promotion, by contrast, was not significant. This is plausible, however, because it is the only dimension of impression management that focuses neither on learning (demonstrative engagement and situational adaptation) nor on relationship management (personal adaptation and ingratiation) but rather aims at pretending to have understood the content of the German-language class. This dimension may have different types of consequences: if it comes off well, this kind of deceit may have negative effects and reduce the student's learning gain at school because the teacher might suppose that the content that was to be conveyed has been understood and therefore considers further or differently worded explanations to be unnecessary.

Like Hypothesis 2, Hypothesis 3 was confirmed as well. We found significant positive correlations between the appearing self and the dimensions Demonstrative Engagement, Situational Adaptation, and Personal Adaptation. All three strategies aim at presenting oneself as an interested and motivated student. Thus, students who believe that their teacher considers them to be an engaged student (appearing self) also score higher on those dimensions of impression management that pertain to presenting the self in this way.

In view of these findings, the question of the positive function of impression management ought to be addressed in a further empirical study with an extended scope that analyzes the effects of the five dimensions on the students' academic success within a longitudinal research design. The rationale behind this desideratum is that it is plausible to assume that particularly experiences of discrepancy (e.g., wanting to be perceived as an interested and motivated student but not appearing to be interested and motivated in the present situation) can, in the long run, have effects on a student's impression management and its adaptation, transformation, and development. The research focus of this paper was restricted to the development and the empirical validation of an instrument that serves the purpose of measuring student impression management in German-language classes. This initial step is indispensable, however, because it prepares the groundwork for a thorough empirical investigation both of the correlations between impression management and a teacher's evaluation of a student's achievements, and of the development of impression management tactics and their long-term consequences. Nevertheless, there might be other self-presentation tactics as for instance to appear respectful, humble, or even such that do not aim at casting the self in a good light which have not been considered due to the paper's focus on a positive impression management. This focus is clearly a limitation of the study as well as the fact that the instrument is based on only two empirical studies one in the context of school the other in leadership management. Other limitations are the rather small sample size, the high correlation between two dimensions which indicates a not so optimal model fit as well as the neglected hierarchical data structure. Furthermore, we emphasized that impression management can be regarded as a social skill. In

empirical research, the construct has only been operationalized *via* self-reports until now. In order to investigate in what ways and to what extent impression management is successful, it will be necessary to include objective and relational (teacher ratings, comparison with student ratings) data. Given this desideratum, a critical point that has repeatedly been raised also applies to our study, at least from an empirical point of view: Classroom interaction has mostly been analyzed in a unidirectional way so far. Besides, we have evaluated our instrument merely in a convenience sample, and the scales are still in need of optimization.

Despite these limitations, our study can be deemed relevant in several respects, and it provides a promising starting point for further research. First, students seem to be aware of their efforts in terms of (positive) impression management, and they know that they can avail themselves of specific tactics that can be applied for the purpose of self-presentation in different educational situations. Against this background, it seems worth investigating to what extent the use of self-presentation tactics pays. This question could also be addressed from the angle of potential undesirable effects of socialization because successful impression management could lead to the conviction that clever social behavior can compensate for lacking effort and engagement. Second, our analyses show that the construct Impression Management is characterized by variance. That is to say that not all students make use of tactics of self-presentation to the same extent. Besides, as first results indicate, not each form of impression management is equally functional with respect to academic success (i.e., positive evaluations of student achievements). Follow-up studies could thus address the question as to whether there is also a negative or "wrong" form of impression management (concealing a lack of understanding or pretending understanding) that might have negative consequences. Third, the possibility that successful impression management can affect the diagnostic quality of teacher evaluations of academic achievement is worth considering in the context of the discourse on pedagogical professionalism.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The impact of career calling on higher vocational nursing students' learning engagement: The mediating roles of career adaptability and career commitment

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Learning engagement is an important predictor of academic success and a key indicator of educational quality. It has therefore attracted considerable research interest, with previous studies exploring how to enhance engagement *via* pedagogical approaches, strategies, and content, as well as through teacher-student interaction. However, the relationship between individual learners' internal mechanisms and learning engagement has yet to be investigated in depth. Accordingly, the present study explored the direct effects of career calling on higher vocational nursing students' learning engagement and the mediating roles of career adaptability and career commitment *via* a parallel mediation model. Data were collected from 388 nursing students at two higher vocational colleges in China and the hypotheses were tested using correlation and regression analyses. The results showed that career calling imparted a significant positive effect on the nursing students' engagement in learning, with career adaptability and career commitment mediating this relationship. These findings highlight the importance of promoting learning engagement among nursing students and the need to carefully design instructional activities for the healthcare profession.

KEYWORDS

career calling, learning engagement, career adaptability, career commitment, higher vocational nursing students

1. Introduction

Learning engagement denotes a state of sustained, positive affect toward learning characterized by vigor, dedication, and absorption (Schaufeli et al., 2002). An important predictor of academic success and indicator of educational quality, learning engagement has recently attracted considerable research attention. It is positively related to learners' academic achievement and experience of attendance as well as deep learning, reduced dropout rates, increased learner satisfaction with school, future career development levels, wellbeing, and critical thinking skills (Howell, 2009; Trenholm et al., 2019; Jian et al., 2022). However, in China as in other contexts, insufficient engagement in learning among university students is a widespread phenomenon. The problem is particularly prominent among higher vocational

nursing students: under powerful pressures to learn, such learners exhibit a lack of interest, initiative, motivation, and identification with their profession, a lack of goal-setting, and burnout; they may also have insufficient access to high-quality learning opportunities (Salam et al., 2013; He et al., 2018). As nurses of the future, these students' lack of engagement not only affects their learning and future levels of professional competence but also determines the quality of nursing available to all users of the country's healthcare services. It is therefore crucial to explore the antecedents of poor learning engagement among nursing students since doing so will improve the quality of their learning and develop their professional competence.

Career calling has been described as "the practice of a particular life role in a transcendent calling that originates in and transcends the self, i.e., in a way that demonstrates or gains a sense of purpose or meaning and other-oriented values and goals as a fundamental source of motivation" (Dik and Duffy, 2009). The concept emphasizes people's sense of ulteriority that aligns them with societal obligations, familial heritage, or religious convictions. This sense makes individuals feel that their work—either directly or indirectly—helps others or society as a whole and thus allows them to experience a deep sense of meaning and purpose in life. Career calling has attracted much interest from practitioners working in management and education as well as in positive, occupational, industrial, and organizational branches of psychology. Numerous studies show that career calling is positively related to wellbeing outcomes such as work engagement, life happiness, and job satisfaction; it is particularly important for jobs that are challenging and require extra time, energy, and effort. For example, although nurses in developing countries face problems such as low pay, overload, poor working environments, and the possibility of occupational exposure to harmful substances, those with higher levels of career calling are more meticulous and conscientious, make fewer errors, and report fewer turnover intentions (Afsar et al., 2019). Similarly, while the doctors in Bott et al.'s research Bott et al. (2017) generally found their work stressful and challenging, those with stronger career calling also tended to report more positive work experiences. They reported feeling more motivated, productive, and responsible for using their skills to help others. Career calling also exists among university students and is positively related to their career-related decision-making behavior (Hunter et al., 2010). Students with stronger career calling tend to enjoy greater access to educational resources (Duffy and Sedlacek, 2010). They are also more proactive in their pursuit of personal growth and achieve higher levels of academic satisfaction (Duffy et al., 2011a).

Socio-cognitive theories of career development have been used to explore the links between career calling, self-efficacy, expectations of career outcomes, and engagement in learning (Chen et al., 2016; Shang et al., 2022). However, this research has tended to focus on single samples of pre-service teachers rather than students of other professions. In the current study, we wished to deepen understanding of the unique relationship between career calling and learning engagement among nursing students. Such uniqueness exists in these students' orientations to professional learning, the complexity of course content, the considerable academic pressures they face, and their particular need for a sense of career calling compared to students on other professional courses. Accordingly, the present study explored the factors influencing the learning engagement of nursing students to enable more effective evaluation and reform of their current professional development programs. Our study also aimed to help improve employment outcomes in a general sense, given that the career adaptability and commitment of students in all fields is linked to their engagement in university learning. Students in all fields prepare for their future careers by learning professional theoretical knowledge and practicing vocational skills at university, and their career adaptability and commitment also influence their learning engagement. In summary, this study investigated the relationship between career calling and learning engagement, and the mediating role of career adaptability and career commitment among nursing students.

2. Theoretical background and study hypotheses

2.1. Career calling and learning engagement

A professional calling can be defined as the sustained, meaningful passion for a particular domain that infuses one's choice of career with a broader sense of meaning, purpose, and direction (Dobrow and Tosti-Kharas, 2011). Relatedly, self-determination theory states that individuals choose their behavior to meet their needs in a particular environment, engaging actively in behaviors or tasks that benefit their development. Several studies have shown that across different work areas, career calling has significant and positive associations with positive work experiences such as job engagement and pleasure, wellbeing, and career commitment while it is negatively associated with less beneficial experiences. For example, Duffy et al.'s (2012) online survey of 201 workers in various industries found that career calling was positively correlated with their job satisfaction. Ke et al. (2020) reported that career calling positively affected the learning behavior of civil servants. Dobrow and Tosti-Kharas (2011) surveyed employees within the fields of music, arts, business, and management, finding that career calling positively impacted their job engagement, job satisfaction, career-related self-efficacy, and clarity of professional identity. Lastly, Zhou et al. (2020) explored the relationship between career calling and work fatigue among Chinese police officers during the COVID-19 pandemic: their results indicated that a moderate level of career calling boosted work-related personal resources and could therefore reduce negative work experiences such as work fatigue and role overload.

Unlike adults in the workplace, university students may perceive career calling as a spiritual motivator. Students often actively prepare themselves for their future professional lives by constructing an ideal future work self *via* career calling, which motivates further engagement in anticipatory or future-oriented career behavior (Strauss et al., 2012). Career calling is therefore closely linked to undergraduate students' career development. Examining this relationship, Duffy and Sedlacek (2007) found it was positively related to career decidedness, comfort, self-clarity, and work-choice salience, and negatively related to indecisiveness and lack of educational information. Similarly, Hirschi and Herrmann (2013) reported that career calling was significantly and positively related to career planning, decidedness, and self-efficacy among university students while Duffy et al. (2014) found it promoted individual growth initiatives among university students. The present study defines the learning engagement of nursing students as their active, positive, and

sustained commitment to comprehensive and up-to-date professional learning, which can be motivated by career calling. In this way, learners can achieve professional self-worth and self-satisfaction. Accordingly, H1 was as follows:

> *H1*: Career calling has a positive effect on nursing students' learning engagement.

2.2. The mediating roles of career commitment and career adaptability

Career commitment is the intensity of motivation that an individual shows at work to achieve his or her goals (Hall et al., 1971). It indicates the extent to which an individual identifies with his or her occupation by taking responsibility and fulfilling professional obligations. Career commitment positively impacts job skills, reduces turnover rates, and increases job satisfaction (Aryee and Tan, 1992; Chang, 1999) because committed individuals tend to take a more active role in their work and strive to create an environment conducive to their professional development.

Research has repeatedly highlighted the strong relationships between career calling and job-related outcomes such as job engagement and satisfaction. But how are such relationships established? Duffy et al. (2012) argue that career commitment mediates the positive association between career calling and positive job-related outcomes. For example, Duffy et al.'s (2011b) survey of 370 staff at a Western research university found that career commitment fully mediated the relationship between people's sense of calling and their job satisfaction, meaning that individuals with stronger career calling were more satisfied with their jobs because they identified more with their work. Afsar et al. (2019) found that nurses with a stronger sense of career calling tended to display greater commitment to their careers, which significantly reduced their turnover rate and raised their workplace performance. In addition, career commitment may help motivate professional development and learning: findings from Ke et al.'s (2020) survey of 367 Chinese civil servants showed it mediated the link between their sense of vocation and learning. Therefore, strong career identifications motivated these professionals to maintain self-directed learning behavior. Based on these findings, we hypothesized that nursing students with a strong sense of career calling would display greater learning engagement due to the mediation of their career commitment:

> *H2*: Career commitment mediates the relationship between career calling and nursing students' learning engagement.

Savickas's (2002) career construction theory proposed that career development results when the individual's adaptation to the environment is aligned with his or her psychology rather than his or her intrinsic structural maturity. One core concept of career construction theory is *career adaptability*, which refers to the individual's psychological readiness and resources for current or anticipated tasks related to his or her career. Essentially, career adaptability is a self-regulatory ability that drives individuals to continually adjust their environmental responses. It consists of four dimensions: concern, control, curiosity, and confidence. Concern refers to how people consider their sense of purpose when setting career goals. Control enables individuals to manage and shape their own careers. Curiosity refers to the individual's exploration of the possibilities for self-fulfillment and opportunities in their careers. Finally, confidence refers to an individual's sense of efficacy in overcoming potential career obstacles.

Career construction theory predicts that people with high levels of career adaptability will have more mental resources and greater work-related adaptability. They carefully follow future trends and prepare to proactively face challenges, adapt to changes in their career environments, and engage in new forms of work. Career adaptability not only correlates positively and significantly with job performance but also affects students' academic development. For example, Yu and Li (2015) found that students with stronger career adaptability were highly motivated to learn, actively constructed learning goals, and planned their coursework and self-growth well, producing excellent academic outcomes. Guo et al. (2014) found that career adaptability played a positive role in enhancing the professional competence of undergraduates.

Psychology researchers define career calling as the deepest level of an individual's perception of subjective professional success. It provides individuals with "metacompetencies" (Hall and Chandler, 2005), helping them to achieve psychological success even when objective success eludes them. One such metacompetency is *career adaptability*, which is the ability of individuals to remotivate themselves and update their job-related knowledge and skills. It also aids self-directed learning and the ability to switch careers. The scant research into career calling and career adaptability suggests the two are significantly correlated. For example, Praskova et al. (2014) uncovered a moderately strong correlation based on survey data from 216 Australian students gathered at two points 6 months apart. Yang and Chen (2020) found that nurses' career calling was positively correlated with their career adaptability. They also found that career adaptability positively influenced the nurses' occupational embeddedness. Drawing on the findings summarized above, we proposed the following hypothesis:

> *H3*: Career adaptability mediates the relationship between career calling and nursing students' learning engagement.

In our investigation of the internal mechanism of the mediated effects of career calling on learning investment, hypotheses 1–3 were exploratory, reflecting the fact that research on nursing students' learning engagement in China is still in its infancy. We hoped to provide a solid theoretical foundation to enhance such students' investments in learning and to improve the quality of education they receive. Figure 1 displays our theoretical model.

3. Materials and methods

3.1. Participants and procedure

The online questionnaire (Wen Juanxing) was sent to participants *via* WeChat or email. After providing their informed consent, the respondents completed all the items and submitted their questionnaires. All responses were anonymous and stored securely for access by the study team solely for the purposes of this research.

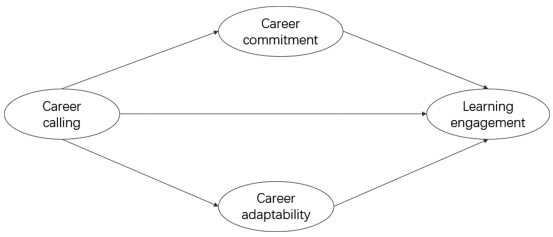


FIGURE 1
Hypothesized model of mediated relationships between career calling and learning engagement.

Approval for the study was granted by the Ethics Committee of Zhengzhou Railway Vocational & Technical College.

The participants ($N = 403$) were nursing students from two higher vocational colleges in a central Chinese province. A total of 15 responses were excluded because 80% or more of the answers were the same or the response time was too fast (less than 2 min). This left 388 questionnaires, a return rate of 96.28%. Male students completed 92 (23.71%) of the questionnaires and female students, 296 (76.29%). By grade level, 135 were freshmen (34.79%), 141 were sophomore students (36.34%) and 112 were juniors (28.87%). A summary of respondent characteristics is presented in Table 1.

TABLE 1 Demographic characteristics of respondents.

Variables	N (% of 388)
Gender	
Male	92 (23.71%)
Female	296 (76.29%)
Grade	
Freshmen (year 1)	135 (34.79%)
Sophomores (year 2)	141 (36.34%)
Juniors (year 3)	112 (28.87%)
Home location	
Rural towns	320 (82.5%)
Small and medium-sized cities	52 (13.4%)
Big cities	16 (4.1%)
Categories of high school	
Secondary vocational and technical college	48 (12.4%)
Ordinary high school	304 (78.4%)
Key high school	36 (9.3%)
Type of college application	
Nursing as own choice	216 (55.7%)
Nursing not own choice	172 (44.3%)
The highest level of education of the participant's father	
Primary school and below	116 (29.9%)
Secondary or technical secondary school	208 (53.6%)
Higher vocational School	52 (13.4%)
Undergraduate and above	12 (3.1%)
The highest level of education of the participant's mother	
Primary school and below	156 (40.2%)
Secondary or technical secondary school	184 (47.4%)
Higher vocational School	36 (9.3%)
Undergraduate and above	12 (3.1%)

3.2. Measures

3.2.1. Learning engagement scale

Learning engagement was assessed using the Chinese version of the Utrecht Work Engagement Scale for Students (Gan et al., 2007). The scale has previously been used to research Chinese educational contexts (e.g., Wu et al., 2020; Shang et al., 2022; Wang et al., 2022). It consists of 17 items and 3 dimensions: vigor, dedication, and absorption. The items were rated on a 5-point Likert scale (1 = never; 5 = every day), with higher scores reflecting stronger learning engagement. The Cronbach's alpha coefficient for this study was 0.94.

3.2.2. Career calling scale

The two-item Brief Calling Scale was adapted from Dik et al. (2012) and has briefly been used to measure career calling in non-Chinese (Duffy and Autin, 2013; Douglass and Duffy, 2015; Duffy et al., 2017) and Chinese contexts (Zhang et al., 2015; Cai et al., 2022). The two items are "I have a sense of calling to nursing" and "I am very aware of the calling that nursing should have." The items were rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree), with higher scores reflecting higher levels of career calling. The Cronbach's alpha coefficient in this study was 0.70.

3.2.3. Career adaptability scale

Career adaptability was assessed using the Career Adaptability Scale (Hou et al., 2012; Porfeli and Savickas, 2012). This scale has been widely used in previous studies with both non-Chinese (İspir et al., 2019; Safavi and Bouzari, 2019; Boo et al., 2021) and Chinese participants (Hou et al., 2019; Xu et al., 2020; Boo et al., 2021) to assess career adaptability. The 24-question scale consists of 4 dimensions: career concern, career control, career curiosity, and career confidence, with 6 questions in each dimension. The items were rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree), with higher scores reflecting higher levels of career adaptability. The Cronbach's alpha coefficient for this study was 0.96.

3.2.4. Career commitment scale

The Career Commitment Scale was adapted from Blau (1989) and was developed through previous studies with non-Chinese (Ahmed, 2017; Afsar et al., 2019) and Chinese participants (Huang et al., 2019). The scale consists of seven items rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree), with higher scores reflecting higher levels of career commitment. The Cronbach's alpha coefficient of the scale in this study was 0.94.

3.3. Data analysis

Preliminary analysis was conducted using SPSS (v. 26.0) to identify participants' characteristics, measure the reliability of each scale, and analyze the correlations between the four variables of career calling, learning engagement, career adaptability, and career

commitment. To test the fit of the model, a validated factor analysis (CFA) was conducted using the Amos software (v. 25.0) measurements of x^2/df, RMSEA, CFI, and TLI. According to Hu and Bentler (1999), a model is considered acceptable if the values returned are as follows: $x^2/df \leq 5$, RMSEA <0.08, and CFI/TLI > 0.9. A model is considered a good fit if the value of $x^2/df \leq 5$, RMSEA < 0.055, and CFI and TLI > 0.95. Finally, the mediation test was performed using the SPSS PROCESS macro.

4. Results

4.1. Common method bias test

In this study, Harman's single-factor test was used to test for common method bias (Eby and Dobbins, 1997). The exploratory factor analysis of the 50 questions showed that the first factor explained 39.08% of the variance, below the 40% threshold, thereby ruling out any significant common method bias.

4.2. Confirmatory factor analysis

To examine the discriminant validity between the four variables of career calling, learning engagement, career commitment, and career adaptability, a validated factor analysis was conducted. As shown in Table 2, compared with the three-factor, two-factor, and single-factor models, the four-factor model provided the best model fit ($\chi^2 = 197.466$, df = 98, $x^2/df = 2.015$, RMSEA = 0.043, CFI = 0.923, and TLI = 0.906). This confirmed the variables possessed good discriminant validity.

4.3. Descriptive analysis

Descriptive statistics and correlation analyses were conducted for each variable (see Table 3). Career calling was significantly and positively correlated with learning engagement ($r = 0.324$, $p < 0.01$) and career adaptability ($r = 0.295$, $p < 0.01$), and strongly and positively correlated with career commitment ($r = 0.538$, $p < 0.01$). Career adaptability ($r = 0.521$, $p < 0.01$) and career commitment ($r = 0.470$, $p < 0.01$) showed a significant positive correlation with learning engagement.

4.4. Hypothesis testing

To further determine the relationship between the variables, we conducted regression analyses (see Table 4). Model 6 controlled for demographic variables and showed a significant positive correlation between career calling and engagement in learning ($\beta = 0.424$, $p < 0.01$), thereby supporting hypothesis 1.

To verify the parallel mediating effects of career adaptability and career commitment on the relationship between career calling and learning engagement, we applied MacKinnon's multiple mediating effects test MacKinnon (2000). This has three steps: first, to test whether the effect of the independent variable on the dependent variable is significant; second, to test the significance of the independent variable's effects on multiple mediating variables and whether multiple mediating variables significantly affect the dependent variable; third, to test whether the effect of the mediating variables on the dependent variable is significant by including multiple mediating variables in the regression equation of the dependent on the independent variable.

TABLE 2 Confirmatory factor analysis results (N=388).

Model	x^2	df	x^2/df	RMSEA	CFI	TLI
Four factors	197.466	98	2.015	0.043	0.923	0.906
Three factors	439.864	101	4.355	0.187	0.739	0.69
Two factors	603.057	103	5.855	0.225	0.615	0.552
Single factors	619.484	104	5.957	0.227	0.603	0.542

Four factors = career calling, learning engagement, career commitment, and career adaptability; three factors: career calling, learning engagement, and career commitment + career adaptability; two factors: career calling, learning engagement + career commitment + career adaptability; single factors: career calling + learning engagement + career commitment + career adaptability.

TABLE 3 Means, standard deviations, and correlations.

Items	M	SD	1	2	3	4
1. Career calling	3.495	0.734	-			
2. Career adaptability	3.384	0.660	0.295**	-		
3. Career commitment	3.298	0.786	0.538**	0.482**	-	
4. Learning engagement	3.351	0.615	0.342**	0.521**	0.470**	-

N = 388, $^{*}p < 0.05$, $^{**}p < 0.01$, and $^{***}p < 0.001$.

The first result of these tests suggested that career calling had a positive and significant effect on learning engagement. Secondly, as Models 2 and 4 demonstrated, the mediating variables (career adaptability and career commitment) were both positively influenced by the respondents' sense of purpose ($\beta = 0.341$, $p < 0.01$; $\beta = 0.483$, $p < 0.001$). Thirdly, as shown in Model 7, career adaptability and career commitment both had a significant positive mediating effect on learning engagement ($\beta = 0.346$, $p < 0.001$; $\beta = 0.336$, $p < 0.01$). Finally, Model 8 demonstrated that the regression coefficient of career calling on learning engagement decreased from 0.424 to 0.176 and became non-significant after adding both career adaptability and career commitment while the coefficients of career adaptability ($\beta = 0.347$, $p < 0.01$) and career commitment ($\beta = 0.267$, $p < 0.05$) on learning engagement were both significant. This result indicates that both career adaptability and career commitment mediated the relationship between career calling and learning engagement, thereby confirming hypotheses 2 and 3.

To further test the significance of the mediating effect of career adaptability and career commitment on the link between career calling and engagement in learning, a bias correction test for the mediating effect was conducted following the steps described by Preacher and Hayes (2008). The results of the parallel mediating effect model test are shown in Table 5. First, the direct effect of career calling on learning engagement was 0.148 at a 95% confidence interval [−0.027, 0.323], an insignificant direct effect. Second, the indirect effect of career calling on learning engagement through career adaptability was 0.099, 95% CI [0.028, 0.232], establishing a significant mediating effect for career adaptability in the relationship. Finally, the indirect effect of career calling on learning engagement through career commitment was 0.108, with a 95% CI [0.013, 0.189]. This result

TABLE 4 Regression analysis of parallel mediator model variables.

Variables	Career adaptability		Career commitment		Learning engagement			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Categories of high school	−0.055	0.081	−0.317	−0.001	−0.357	0.149	0.09	0.121
College application	0.005	0.066	−0.108	−0.146	0.357	0.113	0.089	0.129
Career calling		0.341**		0.483***		0.424**		0.176
Career adaptability							0.364***	0.347**
Career commitment							0.336**	0.267*
R^2	0.003	0.927	0.119	0.308	0.004	0.149	0.349	0.369
F	0.140	3.336*	6.368	13.783***	0.187	5.433**	12.330***	10.623***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 5 Bootstrap analyses of significance of mediation.

Model pathways	Effect	Bootstrap SE	95% Confidence interval		Percentage
			Boot LLCI	Boot ULCI	
Indirect effect	0.207	0.071	0.078	0.356	58.31%
Direct effect	0.148	0.088	−0.027	0.323	
Career adaptability	0.099	0.041	0.028	0.232	27.89%
Career commitment	0.108	0.039	0.013	0.189	30.42%
Career adaptability—Career commitment	−0.008	0.070	−0.145	−0.128	

shows that career commitment significantly mediated the relationship between career calling and learning engagement (see Table 5).

5. Discussion

This study aimed to build understanding of the relationship between career calling, career commitment, career adaptability, and learning engagement. Specifically, we hypothesized that career calling would directly or indirectly predict the learning engagement of vocational nursing students in the Chinese context through vocational commitment and career adaptability. Our results confirmed this hypothesis, which is consistent with previous studies on the relationship between career calling, learning outcomes and personal wellbeing (Duffy et al., 2011a, 2014; Duffy and Dik, 2013; Shang et al., 2022). The findings also suggested that career calling is an important psychological resource for strengthening students' motivation and engagement in learning. For these students, career calling is manifested as a transcendent summoning or guiding force that aligns their career with a broader sense of life's meaning and purpose, and an intention to help others or advance the greater good (Li et al., 2021). Learners with stronger career callings will be more actively involved in considering and planning their own careers. As a result, they will invest more time and energy in their studies to build a solid foundation for their long-term professional development.

To further investigate the relationship between career calling and learning engagement, two mediating variables—career adaptability and career commitment—were used to build a parallel mediating effect model. The variables mediated the relationship between career calling and learning engagement fully and in parallel, thereby verifying hypotheses 2 and 3. This result strongly suggests that nursing students with a strong career calling were more engaged in their studies due to their commitment and adaptability to their careers. In other words, a high level of career calling may promote career commitment and career adaptability among nursing students, in turn boosting their academic engagement. This supports Douglass and Duffy's (2015) previous uncovering of a positive relationship between career calling and career adaptability (Douglass and Duffy, 2015), as well as Ke et al.'s (2020) finding that career commitment mediates the relationship between career calling and student learning behavior. The present study therefore confirmed potential roles for career commitment and career adaptability in building the psychological resources that help students deal with challenging learning tasks. One possible explanation is that if learners are more focused on their future occupation, while maintaining strong senses of responsibility for future occupational development, keen curiosity about future occupational opportunities, and the adaptability to solve job-related problems, they will remain positive when facing challenges to learning.

6. Theoretical implications

Many studies of educational quality have explored how to enhance learning engagement levels. However, rather than examining the effects of teaching styles, strategies, content, and teacher-student interaction on engagement, our study focused on the intrinsic expectations and career aspirations of individuals. We hypothesized that career calling, commitment, and adaptability might positively impact engagement by buffering individuals against the effects of stress caused by challenging learning circumstances. Our findings emphasized the importance of career calling, career commitment, and career adaptability for learning engagement and offered theoretical insights into how to enhance students' academic performance.

7. Practical implications

This study also guides careers education by highlighting that career calling, adaptability, and commitment can all enhance students' learning engagement and academic performance. Specifically, teachers should optimize course content and teaching activities to raise awareness of the importance and potential benefits of a career-focused mindset *via* activities such as role-play. Such modifications would build a sense of professional purpose among nursing students, prompting them to invest more time and energy in their learning. Schools and teachers should also attend more closely to career planning and guidance so students are fully aware of the opportunities available to them. Goals can be assigned for students to work towards. Finally, career calling, career adaptability, and career commitment could also be used to diagnose why some students struggle to complete their programs and provide solutions to such educational issues.

8. Conclusion

In this study, we investigated the associations between career calling, learning engagement, career adaptability, and career commitment by analyzing self-reported data from 388 nursing students. We also examined the mediating effects of career adaptability and career commitment on the relationship between career calling and learning engagement. Using a multiple mediation model, we demonstrated that career vocation positively affected learning engagement and that this relationship was mediated by career adaptability and career commitment. The study contributes to theoretical knowledge of career calling and learning engagement while also informing educators, policymakers, and administrators about the motivational aspects of nurse education.

9. Research limitations and future research

Nonetheless, the study also contains several limitations. First, the cross-sectional design made it impossible to establish any longitudinal causal relationships between career calling, career adaptability, career commitment, and learning engagement. We therefore plan to study the pathways between these variables longitudinally to fully understand the impact of career calling on nursing students' learning engagement over time as a means of improving the quality of nurse education programs. A second limitation is that this study has considered the mediating role of career adaptability as a whole but its four separate indicators (concern, control, curiosity, and confidence) may play different roles in this relationship—an issue that requires further exploration. Third, the study findings are based on the responses of higher vocational nursing students in a province in central China and their generalizability to other regions of the country or to nursing students at the undergraduate level and above will require further research. Fourth, the study used a self-administered questionnaire, which may lead to common method bias. Accordingly, subsequent studies should gather data through multiple channels to enhance the validity of the findings.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Zhengzhou Railway Vocational & Technical College. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1111842/full#supplementary-material

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The latent category of resilience and its relationship with the mental health and coping styles of medical students

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Background: Medical students suffer more pressure due to various reasons and their mental health problems get more attention. Resilience is a positive psychological perspective to explore the medical students' mental health and coping style problems. This study focuses on the medical students in school and uses the method of latent category analysis (LCA) to analyze the classification characteristics of their resilience. Therefore, the study aims to help psychological educators in medical colleges to develop positive mental health education strategies for medical students.

Objective: To explore the potential categories of resilience of medical students and the relationship between these categories and mental health and coping style.

Methods: A total of 1,457 medical students from four medical colleges in Anhui Province were selected as the research subjects by a convenience sampling method. A general information questionnaire, the Connor-Davidson Resilience Scale (CD-RISC), Kessler 10 and the Simplified Coping Style Questionnaire (SCSQ) were used to investigate; SPSS 25.0 and Mplus 7 software were used for basic analysis and latent category exploration.

Expected results: The medical students were divided into three potential categories of mental resilience: the low resilience group, moderate resilience self-improvement group and high resilience tough group. The optimism dimension level of the three categories was low. There were statistically significant differences in the distribution of resilience among medical students, such as gender, source of students, and paternal and maternal education level. There were significant differences in the mental health, positive coping style and negative coping style scores among the three categories. Female medical students with low parental education levels have a lower level of resilience. Logistic regression analysis showed that a lower maternal education level was a risk factor for resilience level, and a high positive coping style score and gender were protective factors for resilience level.

Discussion: There are group differences in the resilience of medical students, which suggests that school health workers should formulate targeted intervention programs for different types of students to improve their resilience and mental

health, and further more, this study reminds mental health workers in colleges and universities to pay more attention to the mental health status of female medical students whose parents are less educated.

KEYWORDS

resilience, mental health, coping style, latent category analysis, medical students

Introduction

Medical students are an important part of the development of health services. Because of the strong professional content, various subjects, long academic cycle, postgraduate entrance examinations and employment problems, medical students are under increased pressure, and their mental health and stress coping have received more attention (Liu et al., 2020). At present, the global pandemic is still spreading, and the new coronavirus will coexist with us for a long time, which will significantly increase challenges for the mental health of the population, especially depression, anxiety and stress coping (Gianfredi et al., 2021). Studies have shown that obsessive symptoms, anxiety, terror and psychosis of medical students are higher than those of the national norms (Zhang et al., 2021). It has been well shown that students experience stress and anxiety due to the nature and rigor of medical school if protective factors, such as "Grit" and "Resilience," aid some students' ability to cope better than others (Haskett et al., 2022).

Psychological resilience has been widely studied as a top quality. Masten (2015) believed that resilience may be affected by a series of activities, such as receiving effective care since childhood, the development of intimate relationships with adults, and learning effective problem-solving skills, which can help adults achieve self-awareness and emotional control and participate in meaningful projects. Resilience can helps individuals recover from depression and disappointment, resist adverse environmental effects and make positive adjustments in adverse environments. It can help individuals obtain physical and mental balance energy, successfully adapt to challenging life pressures and improve their wellbeing (Tedeschi and Kilmer, 2005; Liz and Hasson, 2020). Ran et al. (2020) studies found that the higher the resilience score, the lower the anxiety and depression levels. And students with higher resilience scores were more optimistic about clinical education. Those with higher resilience scores were less likely to report anxiety, insomnia, and tiredness (Haskett et al., 2022). Therefore, it is imperative to determine factors associated with or influencing resilience in Chinese medical students. It is also important to consider separate component factors of resilience since resilience is multi-dimensional (Birhanu et al., 2017). For example, in the contemporary context, we need to understand the resilience of medical students and their general characteristics (Such as gender, age, major, grade, paternal and maternal education level and so on), coping style and other factors. Previous studies had shown that different studies had found differences in resilience of medical students in gender comparison. Some studies found there were significant differences between females and males in the dimension of interpersonal assistance of resilience, the interaction effect of resilience with emotional abuse on depressive symptoms was stronger in females compared to males (Ding et al., 2020; Wei et al., 2021). However, Miao et al. (2019) found that male medical students scored higher on resilience than female medical students (Peng et al., 2012). Except gender, there are few studies on the influence of parents' education level, students' major and other general characteristics on the resilience of medical students. Fletcher et al.'s (2020) study found that maternal education level affected college students' mental health and learning behaviors in school and promoted college students' interpersonal relationships and academic achievement.

Resilience can reduce the risk of individual psychological problems, and it is a protective factor to maintain and promote mental health. It is often regarded by researchers as a moderator of mental health (Efstathopoulou and Bungay, 2021). Coping style can affect people's perceptions and management of stressful events. Some studies have shown that there is a certain correlation between psychological resilience and coping style. Improving the level of psychological resilience is conducive for individuals to adopt positive coping styles. Resilience seems to be a protective factor to reduce the impact of stressors (Connor et al., 2021). Therefore, from the perspective of positive psychology, exploring the psychological resilience of medical students to understand the mental health of medical students and how they cope with stress will open a new way of thinking.

Current research methods on resilience are mainly based on variable-centered ideas and methods, and different critical values are divided on the grounds of the scale scores to evaluate and determine the level of individual resilience (Wang et al., 2020). Miao analyzed related research on the resilience of medical students in China and found that the current studies on the psychological resilience of medical students has mainly focused on the relationship between the total resilience score and related variables (Miao et al., 2021). It is believed that the research method of the psychological resilience of medical students in China is still in its infancy, and further specific and systematic research is urgently needed. Due to the complexity of the resilience dimension, individuals in the total sample are often heterogeneous, the total score may conceal specific information, and there may be deficiencies in distinguishing different characteristics and qualitative differences between groups (Fang et al., 2017). Therefore, the evaluation and development of medical students' resilience should be based on the individual-centered perspective to explore the category characteristics and mode transformation of individual or group resilience of medical students. The homogeneity of resilience of medical students was investigated by category analysis method, so as to realize the dynamic grasp of the transformation trend of individual resilience of medical students. At the same time, it also provided theoretical basis for developing individualized intervention plan of resilience for medical students and improving their mental health level.

Research on individual orientation is helpful for analyzing the psychology and behavior of groups or individuals and has great breakthrough significance for further research on relationship (Gong et al., 2020). Individual-centered latent category analysis (LCA) has attracted increasing attention. LCA focuses on the relationship between variables, helps researchers understand the mixing of variables and the results of specific groups, determines different types of subgroups based on differences in the nature and degree of explicit variables, and captures population inequality, which cannot be observed in variable-centered research (Wang, 2018). At present, the research fields of potential models of resilience at home and abroad mainly involve young graduate students, children, police, empty-nest elderly individuals and cancer patients (Fang et al., 2017; Zhang et al., 2017; van der Meulen et al., 2019; Chen et al., 2022). This kind of research confirmed the difference in resilience of the research subjects and provided the corresponding objective description for the intragroup and intergroup differences in the psychological resilience of different groups. At present, studies on the latent category model of medical students include the stress perception (Liu et al., 2020) and suicide attempts of medical vocational students (Nan et al., 2022) but less frequently include resilience. This study focused on medical students. LCA was used to analyze the characteristics of the psychological resilience of medical students. The differences in the scores of mental health and coping styles among various potential categories were further explored. The effects of gender, major and grade on the potential classification of resilience were also discussed. The results provide the basis for the development of targeted intervention measures for positive mental health education for medical students.

Methods

Research subjects

Based on the principle of convenience sampling, this study selected undergraduate and specialized medical students from four medical colleges in Anhui Province. The purpose and precautions of the investigation were explained by on-site investigators. After informed consent was obtained, the two-dimensional code was scanned to complete the electronic questionnaire. After reviewing and eliminating invalid questionnaires, all survey content was kept strictly confidential. The inclusion criteria were students in medical school and those who provided informed consent. The exclusion criterion were students with mental illness and a previous history of mental illness. A total of 1,505 people met the criteria, and 1,457 responded, including 678 boys and 779 girls aged 20.21 $\pm$ 1.41 years. The effective response rate was 96.8%.

Research variables

Demographic indicators

The demographic data questionnaire was self-designed by the research group based on a literature review to collect the basic information about medical students, including 10 parameters such as gender, age, academic type, major, grade, paternal and maternal education level, source of students, etc.

Resilience

Connor-Davidson Resilience Scale (CD-RISC) was translated and revised by Yu (Yu and Zhang, 2005). The scale contained 25 items with three dimensions: optimism (e.g., No matter what happens I can cope with), self-improvement (e.g., I tend to recover quickly after a hard time or illness) and tenacity (e.g., I can make unusual or difficult decisions). Scores were calculated using a 5-point Likert scale from 0 (never like this) to 4 points (almost always). The total score ranged from 0$\sim$100. The higher the score was, the better the resilience. The reliability and validity of the scale were good. Cronbach's alpha for this scale is 0.95.

Mental health

The Kessler 10 scale was used for evaluating mental health, and included 10 items (e.g., Do you often feel restless?). A 5-point Likert scale ranging from 1 (almost never) $\sim$ 5 points (all the time) was used, and the total score ranges from 10 to 50 points. The higher the score, the worse the psychological status (Tran et al., 2019). The reliability and validity of the scale were good. Cronbach's alpha for this scale is 0.96.

Coping style

Style Questionnaire (SCSQ) was used to assess the coping style of the research subjects (Xie, 1998). With 20 items in total, it is divided into two dimensions: positive coping (e.g., Try to look on the bright side) and negative coping (e.g., Accept it, because there is no other way). A 4-point scale, ranging from 0 (not used) to 3 (frequently used), is used. The scores of each dimension are obtained by adding the items. The reliability and validity of the questionnaire in different age groups were good (Fang et al., 2018). Cronbach's alpha for this scale is 0.90.

Missing data

Data were collected by electronic questionnaire in this study. Before the formal investigation, the investigators of the research group and the assistance personnel of each school were trained. The investigators were responsible for explaining the investigation purpose and matters needing attention in filling out the questionnaire, answering relevant questions on site, and reviewing the questionnaire. Before data retrieval and entry, researchers conducted error checking, omission checking and logic checking on the questionnaire again, eliminated questionnaires with obvious logic errors, and adopted full information maximum likelihood processing for missing values, so as to effectively control the completion rate and efficiency of the questionnaire. Logic detection function is a special function in the design of electronic questionnaire, which can effectively reduce invalid questionnaires by setting option skip logic, topic association logic, option association logic and option reference logic. Missing data was estimated using the full information maximum likelihood (FIML) method. FIML was chosen due to its ability to retain cases with missing data, therefore avoiding potentially biased parameter estimates through pairwise and listwise deletion (Schafer and Graham, 2002).

Statistical methods

Based on the scores of each item of resilience, this study used Mplus 8.2 software to conduct latent profile analysis (LPA), fitting 1∼5 potential profile models using the Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted BIC (aBIC) and average information volume (entropy). The lower the AIC, BIC and aBIC, the higher the entropy (≥0.8 indicates that at least 90% of the individuals were correctly classified), and the higher the fitting degree of the model (Wang et al., 2020). The *P*-values of the LMR and blrt reached a significant level, which indicated that the K classification model had a better fitting effect than the k-1 model (Yang et al., 2021). On this basis, SPSS 25.0 was used to analyze the distribution differences of psychological resilience in the demographic variables of the medical students. The $\chi 2$ relationship between psychological resilience and related variables was analyzed by a multiple logistic regression model. The inspection level was set at $\alpha = 0.05$.

Results

Potential profile analysis of medical students' resilience

Taking the score of 25 items of resilience as the explicit variable, 1–5 potential profile models were established to estimate the model fitting of the pre-profile analysis of the characteristics of medical students' resilience. With the increase in the number of classifications, the AIC, BIC, and aBIC decreased continuously, while the AIC, BIC, and aBIC decreased slightly when the number of categories was three. This showed that the optimization degree of potential profile model fitting decreased with the increase in the number of categories. Comparing the significance levels of the 3–5 category models, the *P*-values of the LMR and blrt were less than 0.001, both reaching a significant level. However, when psychological resilience was divided into three categories, entropy had the highest classification accuracy. Considering the above indicators, the simplicity of the model and the readability of the results, medical students' resilience was divided into three types as the optimal classification results, as shown in **Table 1**.

Characteristics and nomenclature of potential categories of medical students' resilience

The scores of each potential category for 25 items are shown in **Figure 1**. The resilience scores of medical students in Category 1 (C1), Category 2 (C2), and Category 3 (C3) increased in turn. In this study, it was found that there was obvious group heterogeneity in the resilience of school medical students, which had obvious classification characteristics. There were 258 medical students included in Category 1 named "low resilience group," accounting for 17.7% of the total sample. Students with the lowest total resilience scores and scores of each dimension were

TABLE 1 Potential profile indices of the psychological resilience of medical students.

Model	*k*	AIC	BIC	aBIC	Entropy	LMR	BLRT	Category probability
Type 1	50	112887.724	113155.952	112997.112	/	/	/	/
Type 2	76	94930.953	95338.658	95097.222	0.961	<0.01	<0.001	0.54/0.46
Type 3	102	88658.772	88205.955	88881.923	0.967	<0.001	<0.001	0.18/0.51/0.31
Type 4	128	84311.475	84998.137	84591.508	0.955	<0.001	<0.001	0.14/0.40/0.34/0.12
Type 5	154	83001.29	83827.43	83338.205	0.942	<0.001	<0.001	0.13/0.29/0.22/0.26/0.11

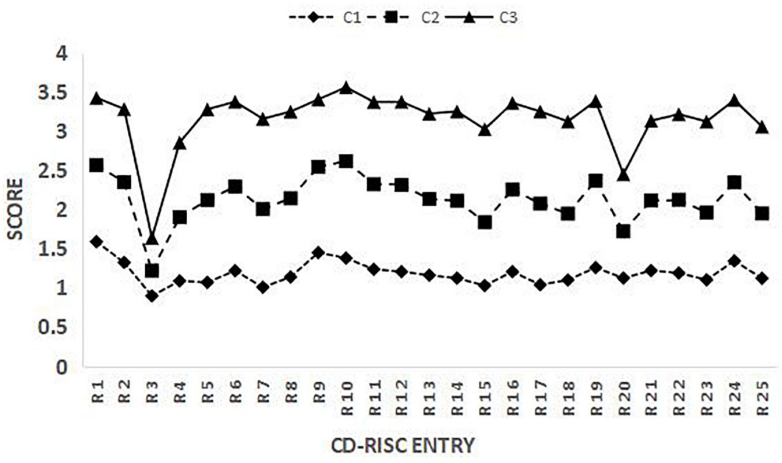


FIGURE 1
LPA of resilience of medical students.

TABLE 2 Comparison of potential categories of the resilience of medical students with different demographic characteristics.

Demographic variables		Number of people	Low resilience group	Medium resilience self-strengthening group	High resilience group	χ^2 value	*P*-value
Gender	Male	678	116 (17.1)	306 (45.1)	256 (37.8)	6.996	0.030
	Female	779	139 (17.8)	408 (52.4)	232 (29.8)		
Major	Nursing	528	97 (18.4)	272 (51.5)	159 (30.1)	0.220	0.896
	Clinical medicine	547	92 (16.8)	243 (44.4)	212 (38.8)		
	Other	382	58 (15.2)	204 (53.4)	120 (31.4)		
Academic type	Undergraduate	905	137 (16.4)	414 (49.6)	284 (34.0)	2.712	0.067
	Specialty	552	121 (19.5)	329 (52.9)	172 (27.7)		
Grade	Freshman	589	98 (16.9)	276 (47.5)	207 (35.6)	1.803	0.406
	Sophomore	716	141 (18.8)	398 (53.1)	211 (28.1)		
	Junior	152	19 (15.1)	69 (54.8)	38 (30.1)		
Place of origin	City	673	103 (15.3)	331 (49.2)	239 (35.5)	11.610	0.001
	Countryside	784	155 (19.8)	412 (52.6)	217 (27.7)		
Father's education level	Junior high school and below	950	177 (18.6)	500 (52.6)	273 (28.7)	13.889	0.008
	High school/technical secondary school	298	53 (17.8)	149 (50.0)	96 (32.2)		
	Junior college/higher vocational college or above	209	28 (13.4)	94 (45.0)	87 (41.6)*		
Mother's education level	Junior high school and below	1,116	209 (18.7)	584 (52.3)	323 (28.9)	14.659	0.005
	High school/technical secondary school	214	32 (15.0)	104 (48.6)	78 (36.4)		
	Junior college/higher vocational college or above	127	17 (13.4)	55 (43.3)	55 (43.3)*		

*By the chi square test, it was further found that there was a statistically significant difference between "junior high school and below" and "junior college/higher vocational education and above" in the "high toughness group" ($\chi^2 = 13.776$, $P = 0.001$). The difference in the maternal education level between "junior high school and below" and "junior college/higher vocational education and above" was statistically significant in the "high toughness group" ($\chi^2 = 11.332$, $P = 0.003$).

included in the "low resilience group." There were 743 medical students included in Category 2 named "moderate resilience self-improvement group," accounting for 51.0% of the total sample. Their resilience was generally at the medium level, and the score of the self-improvement dimension was higher. There were 456 medical students included in Category 3, accounting for 31.3% of the total sample. The overall level of resilience was the highest for these students. Among these students, the score of the tenacity dimension was higher; therefore, this group was named the "high resilience tenacity group," as shown in Figure 1.

Univariate analysis of potential categories of medical students' resilience

The differences in the latent category distribution of the resilience of medical students with different genders, majors, academic types, grades, origins, and paternal and maternal education levels were compared. There were statistically significant differences in gender, source of the students, and paternal and maternal education level ($P < 0.05$), as shown in Table 2.

The scores of medical coping style and the mental resilience of students were compared. There were significant differences in the mental health scores and coping styles among students with different types of resilience, and there were statistically significant differences between the total mental health score and the coping style scores ($P < 0.001$), as shown in Table 3.

Multifactor analysis of potential categories of medical students' resilience

Taking the three potential categories of psychological resilience as the dependent variables and Category 3 (high resilience group) as the reference category, the single factor was included in the ordered logistics regression analysis as an independent variable. The parallel line test showed a $P < 0.05$, so multiple logistic regression analysis was used. The results showed that compared with "high resilience," a lower maternal education level was a risk factor for resilience level ($P < 0.05$), while a high score for positive coping style and male gender were protective factors for resilience level ($P < 0.001$), as shown in Table 4.

Discussion

Because of the complexity of the resilience dimension, if previous studies used the total score of the scale to evaluate the

TABLE 3 Comparison of the mental health and coping style scores of medical students in potential categories of psychological resilience.

Variable	Types of resilience			*F* value	*P*-value	Post-event comparison $P < 0.05$
	Low toughness group (n = 258)	Medium toughness self-strengthening group (n = 743)	High toughness group (n = 456)			
Mental health	22.23 ± 9.94	20.94 ± 8.84	17.64 ± 8.07	28.574	<0.001	C1 > C2 > C3
Active response	14.72 ± 5.20	20.57 ± 5.57	26.72 ± 6.20	381.101	<0.001	C1 < C2 < C3
Negative response	9.68 ± 5.64	9.23 ± 4.07	7.62 ± 3.52	17.784	<0.001	C1 > C2 > C3

TABLE 4 Multiple logistic regression analysis of potential categories of psychological resilience of medical students.

Category	Factor	*B* value	Standard error	Walds χ^2	*P*-value	Or value	95% CI
Low toughness group	Constant	1.967	1.244	4.318	0.038	/	/
	Active response	−0.349	0.020	296.338	<0.001	0.997	0.678∼0.734
	Gender–male	−0.965	0.278	12.053	0.001	0.381	0.221∼0.657
	Maternal education level–junior high school and below	1.022	0.594	4.683	0.047	4.577	0.995∼21.847
Medium toughness self -strengthening group	Constant	4.737	1.099	18.579	<0.001	/	/
	Active response	−0.171	0.010	278.710	<0.001	0.843	0.826∼0.860
	Gender–male	−0.641	0.178	12.940	<0.001	0.527	0.372∼0.747

level of resilience, the total score may be the same but the items and dimensions may be different. An LCA can distinguish medical students in different characteristic categories and the differences between students in different categories. The medical students in this group may lack tenacity and positive coping skills in the face of adversity and pressure, and they lack adaptability to life and learning and self-confidence in the challenges of adversity and stress. This group of students is the focus of attention of mental health workers in colleges and universities. The students in the "medium resilience self-improvement group" and "high resilience tenacity group" may have better cognitive flexibility, show better self-regulation and adaptability to maintain internal and external balance in the face of pressure, and may take positive actions toward positive goals when experiencing adversity, showing good self-esteem, self-reliance, and self-confidence.

Further analysis found that the three categories of medical students' resilience in this study showed a low optimistic tendency. An individual's way of guiding the future is deeply rooted in their cognition and even shapes how they perceive and respond to opportunities and threats at the unconscious level. The optimistic pessimistic tendency plays a very important role (Magee et al., 2022). Optimism is defined as a tendency to be less susceptible to a series of negative events, and an optimistic personality is more beneficial to mental health (Aue and Okon-Singer, 2020). The medical students in this study did not have an optimistic tendency, which may be related to the continuous pandemic situation. Studies have shown that during the pandemic prevention and control period, medical students generally had high loneliness, high learning burnout and other problems and were more likely to suffer from severe mental illness (Wu S. et al., 2020; Fan et al., 2021). Medical students are more likely to be exposed to the new coronavirus in later internships, which requires higher standards and requirements for medical students' medical practice skills (Wu Y. et al., 2020). At the same time, the pandemic situation has a great impact on the recruitment market and the traditional recruitment mode, resulting in employment difficulties for medical students at different stages and in greater demand and competition among medical students for postgraduate entrance examinations. Therefore, during the pandemic period, medical students were not confident enough to face the above problems, so the overall level of optimism was low.

Male students were more likely to be included in the "medium resilience self-improvement group" and "high toughness group." Regression analysis showed that being male was a protective factor for resilience level, which was consistent with relevant research (Erdogan et al., 2015). This may be affected by the traditional culture of society. Families, schools and society tend to cultivate boys' to have a stronger ability to resist pressure. Boys show higher adaptability when encountering difficulties. Therefore, their self-confidence and tenacity may be higher than those of girls. The study found that a low maternal education level is a risk factor for psychological resilience, which is consistent with other studies. Studies had examined that higher maternal educational achievement might help buffer stress sensitivity associated with heightened threat-related amygdala activity for young adults (Swartz et al., 2018). Sun believed that in the aspect of suicide ideation and planning among medical college students, maternal education level affected college students' mental health and learning behaviors, and mothers may be more protective than fathers (Sun et al., 2017). Due to the influence of social culture, mothers often take more responsibility in their children's education. Higher mother's education level was related to higher resilience in emotion

regulation, family support, and interpersonal assistance (Xiao et al., 2019). Mothers with higher education pay more attention to their children's physical and mental education and can sensitively identify their children's problems and provide corresponding psychological support in a timely manner. Their children may face pressure and difficulties with a more confident and tough attitude and have a higher level of psychological resilience. In contrast, when a mother's education level is low, their psychological resilience is higher, and the resilience of their children may be affected.

This study also confirmed that the mental health score of medical students in the "high toughness group" was significantly lower than those of the other two groups, indicating that the mental health level of this group was significantly higher than those of the other two groups. Previous studies have reported on the relationship between resilience and mental health. It shows that people with higher resilience experience less psychological stress and lower levels of anxiety and depression after facing adversity or trauma (Riehm et al., 2021; Taylor et al., 2022). Although study stress and the ongoing epidemic might have a potentially direct and continuously impact on the mental health of medical students, resilience as a protective factor which helps medical students adapt to adversity, buffers anxiety and depression, and helps medical students mobilize their mental resources to effectively reduce the risk of mental health.

The high positive coping style scores of medical students in the "high resilience group" indicates that medical students in different psychological resilience groups have different levels of perceived stress during school and have good discrimination, and a positive coping style is a protective factor of resilience levels, which was consistent with the research of Liu et al. (2020). Coping and resilience are interrelated but different concepts. Coping is an important part of resilience. As an influencing factor of individual resilience, a positive coping mechanism can improve individual resilience (Yesilot, 2021). Therefore, medical students with positive coping styles may adopt more effective ways to deal with stressful events in their studies and lives. As a protective factor, a positive coping style is more conducive to improving the psychological resilience of medical students.

Limitations and future directions

There are still some limitations in this study. First, this study is a cross-sectional survey, it is difficult to determine the causal relationship between resilience and related indicators. In the future, it is necessary to establish a cohort study among representative samples to further elaborate the relationship between the distribution characteristics of resilience and mental health and coping styles of medical students. Second, the survey was only conducted in Anhui Province, and the results were insufficient in generalization, so it is necessary to further expand the sample group and verify the analysis results in later studies.

Conclusion and implications

In summary, this study used the method of potential profile analysis to identify the types of psychological resilience among medical students, which can be divided into three potential categories: the low resilience group, medium resilience self-improvement group and high resilience tough group. Male medical students with high parental education levels have a higher level of resilience, and female medical students with low parental education levels have a lower level of resilience. The results show that there is a correlation between resilience and the mental health and coping style of medical students. Medical students with a high level of resilience are healthier. It was found that a positive coping style, as a protective factor, affects the level of resilience. Therefore, this study reminds mental health workers in colleges and universities to pay attention to the mental health status of female medical students whose parents are less educated. College education and mental health workers need to better understand the heterogeneity of resilience of medical students, so as to provide reference for the development of individualized psychological education intervention measures.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

This study was approved by the expert committee of Clinical College of Anhui Medical University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

J-YS, Y-QG, and H-PL were involved in the conceptualization and design of the study, and the development of the study protocol. J-YS, Y-QG, S-ML, and YY were involved in participant recruitment and data collection. J-YS and Q-QB lead the data analyses with consultation from JG and J-XL. J-YS, Y-QG, and H-PL wrote the first draft of the manuscript, with all authors working on several edits of this manuscript. All authors contributed to the article and approved the final submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Cultural variation in the SES-gender interaction in student achievement

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Introduction: Is the socioeconomic gap in academic achievement larger among boys than girls? Several scholars have proposed such an interaction between socioeconomic status (SES) and gender. Prior empirical studies have yielded mixed evidence, but they have been conducted almost exclusively in Western countries. Here we propose the hypothesis that the SES-gender interaction is stronger in less gender-equal societies.

Methods: We estimated the SES-gender interaction in 36 countries using data from two international large-scale assessments (PIRLS and TIMSS). The degree of gender equality was measured by the Global Gender Gap Index.

Results: Consistent with the hypothesis, the SES-gender interaction was stronger in societies with less gender equality.

Discussion: Our findings suggest that cultural factors determine how the socioeconomic achievement gap differs between boys and girls.

KEYWORDS

achievement gap, socioeconomic status, gender differences, international large-scale assessment, cultural variation

Introduction

Insufficient equity in education is recognized as one of the major challenges in school systems around the world (OECD, 2007; Ainscow et al., 2012). Countless studies have documented that students with richer and more well-educated parents tend to perform better in school (White, 1982; Sirin, 2005; Harwell et al., 2017). Although this phenomenon appears to be quite universal, the *size* of the achievement gap between students with high and low socioeconomic status (SES) is not constant. For example, the gap appears to change with time (Chmielewski, 2019) and to be moderated by school factors (Gustafsson et al., 2018). Here we are concerned with another potential moderator of the SES achievement gap: gender.

More than 30 years ago, a Swedish study found that SES gaps in scores achievement tests were larger among boys than girls (Fischbein, 1990). Consistent with this finding, several authors have proposed theoretical arguments predicting larger SES gaps in achievement among boys than girls (Connolly, 2006; Entwisle et al., 2007; Auwarter and Aruguete, 2008; Autor et al., 2019). There is some empirical support for this prediction. In addition to the Swedish study, larger SES achievement gaps among boys than girls have been observed in several studies in several Western countries: Denmark, the United Kingdom, and the United States (Entwisle et al., 2007; Penner and Paret, 2008; Mensah and Kiernan, 2010; Glaesser and Cooper, 2012; Brenøe and Lundberg, 2018; Autor et al., 2019). However, this finding was not replicated in several other studies, similarly conducted in Western countries: New Zealand, Norway, Ireland, the

United Kingdom, and the United States (Gibb et al., 2008; Fryer and Levitt, 2010; Strand, 2014; Lenes et al., 2022; McGinnity et al., 2022). Thus, while theorists have predicted larger SES achievement gaps among boys than girls, empirical studies in Western countries have not robustly obtained this finding.

It is well-known that psychological and behavioral findings obtained in Western countries are not necessarily representative of humanity at large (Henrich et al., 2010). Might gender be a stronger moderator of SES achievement gaps in other parts of the world? This question is not answered in prior studies. Indeed, we only found two non-Western studies of how gender moderates the SES achievement gap (Zhu et al., 2018; Liu et al., 2022), and their findings are difficult to interpret because they used SES data reported by students. Student-reported SES data has the drawback that gender differences in SES achievement gaps are conflated with gender differences in data reporting accuracy. Indeed, we have found in ongoing work that boys tend to report SES data less accurately than girls do, causing greater attenuation of SES achievement gaps among boys so that they look narrower than they are (For this reason, we did not include a handful studies that use student-reported SES data in our above review of Western studies: Deslandes et al., 1998; Connolly, 2006; McGraw et al., 2006; Glaesser and Cooper, 2012; Contini et al., 2017).

In short, it is currently unknown whether the Western pattern of results, with no robust gender difference in the size of SES achievement gaps, holds universally or whether culture plays a role. Next, we examine prior theories in order to analyze whether their applicability may differ between cultures.

Theories about gender moderating SES achievement gaps

The literature describes several mechanisms that could underlie SES achievement gaps and cause them to be larger among boys than girls. For a recent summary of the various mechanisms that have been suggested to underlie SES achievement gaps, see Rözer and van de Werfhorst (2019). Here, we only describe those mechanisms that have been suggested to interact with gender. Our descriptions are brief and only aim to convey the gist of the ideas.

One mechanism that may cause SES achievement gaps is parents' ability to invest financially in their children's education (Jerrim and Macmillan, 2015). For several reasons, such as expected returns of investment, parents may on average invest more in the education of their sons than daughters (Alderman and King, 1998). Parents' ability to invest financially in their children's education may therefore have a greater impact on investments in boys than in girls, and by extension a greater impact on boys' than girls' achievement in school.

Another mechanism is that lower-SES parents may have less time to spend with their children (Jerrim and Macmillan, 2015). It has been suggested that low-SES households are disproportionately female-headed and therefore might spend more time mentoring and interacting with daughters than sons (Autor et al., 2019). If so, the expected consequence would be a greater SES achievement gap among boys than girls.

A third mechanism behind SES achievement gaps is that parents, teachers, and peers tend to have lower expectations for children from more disadvantaged backgrounds (Seginer, 1983; Alvidrez and Weinstein, 1999; Wentzel and Muenks, 2016). Several authors have argued that this will cause wider SES-achievement gaps among boys than girls, because parents' and teachers' expectations regarding disadvantaged boys may be especially low, and disruptive peer group norms may be especially prevalent among disadvantaged boys (Connolly, 2006; Entwisle et al., 2007; Auwarter and Aruguete, 2008).

Could gender equality play a role?

The previous section presented three theoretical arguments for expecting SES-achievement gaps to be larger among boys than girls. Why then is this outcome not robustly observed in studies in Western countries? Here we suggest the possibility that it has to do with Western countries being among the most gender-equal societies in the world (World Economic Forum, 2020). Namely, all the arguments rely on assumptions of boys and girls not being treated equally with respect to parents' financial investments, parents' time, and parents', teachers', and peers' expectations. The validity of these assumptions may be weaker in more gender-equal societies and stronger in less gender-equal societies. If this is the case, then measures of SES achievement gaps among boys and girls in societies around the world should reveal a larger gender difference in less gender-equal societies.

Outline of the present study

The aim of our study is to test the hypothesis that the expected gender difference in the size of SES achievement gaps is more prominent in less gender-equal societies. Our research strategy has two steps: first, to obtain cross-nationally comparable estimates of the SES-gender interaction in numerous countries; second, to examine how these estimates correlate with the levels of gender equality in these countries.

For the first step, international large-scale assessments of student achievement provide an ideal source of data. Many countries around the world participate in these assessments, in which students belonging to a fixed age group take standardized achievement tests. The tests are accompanied by standardized questionnaires that include socioeconomic indicators. From such data we can estimate the SES-gender interaction in each country, and these estimates will be comparable between countries as the students are of the same age group, they take the same test, and their socioeconomic status is appraised in the same way.

For the second step, we require data on how countries differ in their levels of gender equality. Such data are not present in the student achievement assessments. Instead, we use data on gender equality compiled by the World Economic Forum. Combination of data from international large-scale assessments with country data from other sources is a commonly used method to test hypotheses about how educational outcomes vary across societies (e.g., Marks, 2005; Stoet and Geary, 2013; Eriksson et al., 2020).

Methods

International large-scale assessments of student achievement tend to target either fourth-year students (around age 10) or adolescents (around age 14–15). Our hypothesis is applicable to both age groups. However, the quality of SES data (i.e., parents' education and occupation) differs between the two age groups. SES data for adolescents is reported by

students, and student-reported SES data is not very reliable (Lien et al., 2001; Avvisati, 2020). Moreover, the reliability of student data varies across countries (Jerrim and Micklewright, 2014), and there may well be gender differences in reliability too. To avoid these problems we will instead focus on assessments of fourth-year students, in which SES data are provided by parents. Specifically, we use data from the Progress in International Reading Literacy Study (PIRLS) and the Trends in International Mathematics and Science Study (TIMSS), which are organized by the International Association for the Evaluation of Educational Achievement (IEA). We use data from 36 countries that participated in 2016 PIRLS as well as 2019 TIMSS (the most recent waves of these assessments) and that included the SES measures in the questionnaires to parents. This study was not preregistered.

Samples

PIRLS and TIMSS use representative samples of students from the participating countries. For details on the sampling strategies, see the official reports (Mullis and Martin, 2015, 2017). Table 1 describes the total sample size per data source.

Achievement measures

The test scores in the initial waves of PIRLS and TIMSS were standardized to achieve a global mean score of 500 points and a global standard deviation of 100 points; test scores in subsequent waves of these assessments have been calibrated to be comparable to the initial waves. In order to test a wide set of skills, the full tests used in international large-scale assessments are so comprehensive that students cannot take the tests in their entirety. Instead, a rotated test booklet design is used whereby every student only takes a subset of the full test, and a set of five plausible values for the student's score on the full test is then calculated (Martin et al., 2020).

In PIRLS, there is a single test of reading achievement. In TIMSS, every participant takes both a test in mathematics and a test in science. We use the average of the student's math and science scores in our analyses in this paper, as theories for the gender difference in SES achievement gaps do not take the specific subject into account.[1]

Gender and socioeconomic status

Student gender is coded 1 for boy and 0 for girls. We operationalize student SES by two standard measures available in PIRLS and TIMSS: parents' highest education level and parents' highest occupation level. Data on parents' highest education level are given on a five-step scale: primary school or no school (coded 1), lower secondary (2), upper secondary (3), post-secondary but not university (4), university or higher (5); data on parents' highest occupation level are given on a six-step scale: never worked for pay (1), general laborer (2), skilled worker (3), clerical (4), small business owner (5), and professional (6). See Martin et al. (2020).

In each country, we mean center the measures of gender, parents' highest education level, and parents' highest occupation level. That is, from each variable we subtract its mean value in the country.

Country levels of gender equality and development

We measure the level of gender equality in a country by its Global Gender Gap Index (GGGI). This is a number between 0 and 1, where higher values mean more equality. The GGGI is based on gender gaps in the domains of economics, politics, education, and health; scores for 2019 were obtained from the World Economic Forum (2020).[2]

As a control variable we use the level of development in a country, measured by the Human Development Index (HDI). This is a number between 0 and 1, where higher values mean higher development. The HDI is based on indicators of the levels of health, education, and standard of living in the country; score for 2019 were obtained from the United Nations Development Programme (2020).[3]

Analysis

The first step in the analysis is the estimation of the SES-gender interaction in each country. We use two different operationalizations of SES (education and occupation) and analyze two different assessments (PIRLS and TIMSS). For each country we thus estimate the SES-gender interaction four times. Estimation is done by multiple linear regression of test scores on the SES measure, gender, and the interaction term (SES × gender). The coefficient of the latter term is our estimate of the SES-gender interaction. To perform the multiple linear regression, we use SPSS syntax created by the IDB Analyzer, a software tool provided by IAE.[4] The IDB Analyzer handles analysis of plausible values by computing results for each plausible value and combining these estimates using Rubin-Shaffer rules (Rutkowski et al., 2010).

The second step in the analysis is examination of how the SES-gender interaction varies with the level of gender equality. In this step we perform country-level correlations between gender equality and the estimates of the SES-gender interaction obtained in step 1, both with and without controlling for the level of development. As results are similar for the four different estimates of the SES-gender interaction, we create a single index for the SES-gender

1 In supplementary analyses, we estimated the SES-gender interaction separately for math and science scores. The results were virtually identical to the ones we report for the average scores; country-level correlations between the estimates of the SES-gender interaction that we report and those we obtain from only math scores or only science scores are almost perfect, r=0.97. Hence, separating subjects do not add anything to our understanding of how the SES-gender interaction varies across countries.

2 The score for Taiwan was obtained from the report "2021 Gender at a glance in R.O.C. (Taiwan)," https://www.boca.gov.tw/dl-2644-65dec9e6cec54e1da10f3690bf1a65ec.html (Accessed January 31, 2023).

3 The score for Taiwan was obtained from the Subnational Human Development Database (Smits and Permanyer, 2019).

4 https://www.iea.nl/data-tools/tools

TABLE 1 Samples sizes and percentages of missing data.

Country	TIMSS				PIRLS			
	Sample	Percentage missing data			Sample	Percentage missing data		
	Size	Gender	Educ.	Occ.	Size	Gender	Educ.	Occ.
Austria	4,464	0	12	22	4,360	0	8	12
Azerbaijan	5,245	2	8	20	5,994	0	19	18
Bahrain	5,762	0	12	29	5,480	0	17	24
Belgium	4,655	0	10	12	5,198	1	13	16
Bulgaria	4,268	0	3	6	4,281	0	3	6
Canada	13,653	9	32	34	18,245	1	19	25
Chile	4,174	1	9	20	4,294	1	12	21
Czech Republic	4,692	4	17	21	5,537	0	8	10
Denmark	3,227	1	42	43	3,508	1	14	10
Finland	4,730	1	12	14	4,896	0	8	10
France	4,186	4	11	16	4,767	1	12	17
Georgia	3,787	6	4	21	5,741	0	7	25
Germany	3,437	13	35	38	3,959	11	28	41
Hungary	4,571	2	9	13	4,623	0	7	10
Iran	6,010	0	3	12	4,385	0	4	9
Ireland	4,582	0	7	12	4,607	0	8	15
Italy	3,741	0	10	11	3,940	0	12	13
Kazakhstan	4,791	0	5	8	4,925	0	9	4
Latvia	4,481	1	8	11	4,157	0	10	12
Lithuania	3,741	3	19	23	4,317	0	17	22
Malta	3,630	0	29	33	3,647	0	23	20
Morocco	7,723	0	16	22	5,489	0	19	29
New Zealand	5,019	1	60	60	5,646	1	52	54
Oman	6,814	0	9	20	9,234	0	11	20
Poland	4,882	0	7	9	4,413	0	3	7
Portugal	4,300	0	7	13	4,642	0	4	10
Qatar	4,933	0	22	33	9,077	0	22	30
Russia	4,022	0	1	5	4,577	0	2	4
Saudi Arabia	5,453	0	11	28	4,741	0	11	25
Singapore	5,986	0	5	8	6,488	0	6	9
Slovakia	4,247	0	5	11	5,451	0	7	10
South Africa	11,891	0	29	41	5,282	2	52	55
Spain	9,555	0	12	18	14,595	0	10	14
Sweden	3,965	1	23	22	4,525	2	20	19
Taiwan	3,765	0	1	4	4,326	0	2	6
United Arab Emir.	25,834	1	54	58	16,471	0	19	24

interaction by taking the average of the four estimates (Cronbach's $\alpha = 0.63$). We use this index to provide a single graphical illustration of the correlation between gender equality and the size of the SES-gender interaction. We also use the index in a hierarchical regression to demonstrate that the level of gender equality influences the SES-gender interaction above and beyond the level of development.

Missing data

The percentages of missing data on gender, parents' highest education, and parents' highest occupation in each country are given in Table 1. These percentages vary widely. In some countries, like Bulgaria or Taiwan, almost no data is missing. In New Zealand, by contrast, most SES data are missing. Missing data is unlikely to be a

problem for this study, however. In order for missing data to bias estimates of relation between the SES-gender interaction and gender equality, they must show a very particular pattern (i.e., data need to be especially likely to be missing for students who have a specific gender AND a specific socioeconomic status AND a specific level of achievement AND live in a country with a specific level of gender equality). Moreover, we checked that country percentages of missing data are not significantly correlated with country estimates of the SES-gender interaction or with country levels of gender equality (Supplementary Table S1).

Data availability statement. The raw data used in step 1 are publicly available at IEA's website (iea.nl). All country measures used in step 2 are available at OSF (https://osf.io/exkcm/?view_only=fc3a613c2a7c4d91b8ff9bc29ce7c7fd).

Results

Descriptive statistics of the country-level estimates of the SES-gender interaction and, for completeness, the main effects of SES and gender are presented in Table 2. While the main effects are not our focus of interest, note that there is a robust positive effect of SES on achievement, whereas the gender effect varies across assessments between a consistent disadvantage for boys in PIRLS (i.e., in reading) and, on average, a slight advantage for boys in TIMSS (i.e., in mathematics and science). The focus of our interest is the SES-gender interaction, which is on average slightly positive. For example, when SES is measured by parents' highest education the SES-gender interaction in PIRLS has a mean value of 2.5, while the mean value of the main effect of SES is about 10 times larger. This means that the effect of parents' education on reading achievement is roughly 10% larger among boys than girls in the average country.

TABLE 2 Descriptive statistics of country estimates of the main effects of SES and gender, and the SES-gender interaction, on student achievement in international large-scale assessments.

SES measure	Assessment	SES	Gender	SES × Gender
Education	PIRLS	24.6 (7.6)	−18.5 (13.3)	2.5 (4.4)
	TIMSS	25.4 (7.3)	1.6 (10.9)	1.4 (3.4)
Occupation	PIRLS	16.0 (5.6)	−18.1 (12.3)	0.8 (3.3)
	TIMSS	16.4 (5.9)	2.0 (10.5)	1.1 (2.4)

$N = 36$ countries. Entries are mean values with standard deviations in parentheses.

However, there is considerable variation across countries; for example, the effect of parents' education on reading achievement is almost 300% larger among boys than girls in Saudi Arabia, which is among the least gender-equal countries in this study according to the GGGI measure (Supplementary Table S2). Table 3 reports how each of the estimated effects correlated with the level of gender equality of countries. In support of the hypothesis of the current study, gender equality is negatively correlated with SES-gender interactions (whether or not we control for the development level of countries). In other words, it is especially in less gender-equal countries that the effect of SES on achievement is larger among boys than girls. The scatterplot in Figure 1 illustrates this finding by showing how the most gender-unequal countries tend to have the largest SES-gender interaction, that is, the greatest gender difference in the SES effect. The hierarchical linear regression in Table 4 demonstrates that the level of gender equality in countries explains their SES-gender interaction above and beyond the level of development.

Discussion

There are several theoretical reasons to expect SES achievement gaps to be larger among boys than girls, but prior studies have not found a robust gender difference in the size of SES achievement gaps. As prior studies were almost exclusively conducted in Western countries, we considered the possibility that different results may be obtained in other parts of the world.

From two international large-scale assessments we obtained data on SES, gender, and achievement that allowed us to estimate the SES-gender interaction in 36 countries across the world. Consistent with prior studies, estimates of the SES-gender interaction in Western countries did not have a consistent sign. However, in certain non-Western countries—like Bahrain, Qatar, Oman, Saudi Arabia, and the United Arab Emirates—the effect of SES on achievement was considerably larger among boys than girls. Moreover, these countries all have low levels of gender equality (as measured by the World Economic Forum). The moderating effect of gender equality was found regardless of whether SES was operationalized by parents' education or parents' occupation, and whether achievement was measured in the reading domain (PIRLS) or in the math-science domain (TIMSS).

Our interpretation of these results is that SES achievement gaps to some extent depend on how children are treated. In more gender-equal societies, boys and girls are treated more equally, which would

TABLE 3 Correlations with country levels of gender equality for the country estimates of main and interaction effects of SES and gender on student achievement.

SES measure	Assessment	Correlation between GGGI and the estimated effect of		
		SES	Gender	SES × Gender
Education	PIRLS	−0.18	0.64***	−0.56*** (−0.54***)
	TIMSS	0.07	0.39*	−0.29** (−0.40*)
Occupation	PIRLS	0.12	0.63***	−0.56*** (−0.56***)
	TIMSS	0.31†	0.38*	−0.05 (−0.16)

*$p < 0.05$; **$p < 0.1$; ***$p < 0.001$. $N = 36$ countries. Entries are Pearson correlations. GGGI is the Global Gender Gap Index. Within parentheses are partial correlations controlling for the Human Development Index.

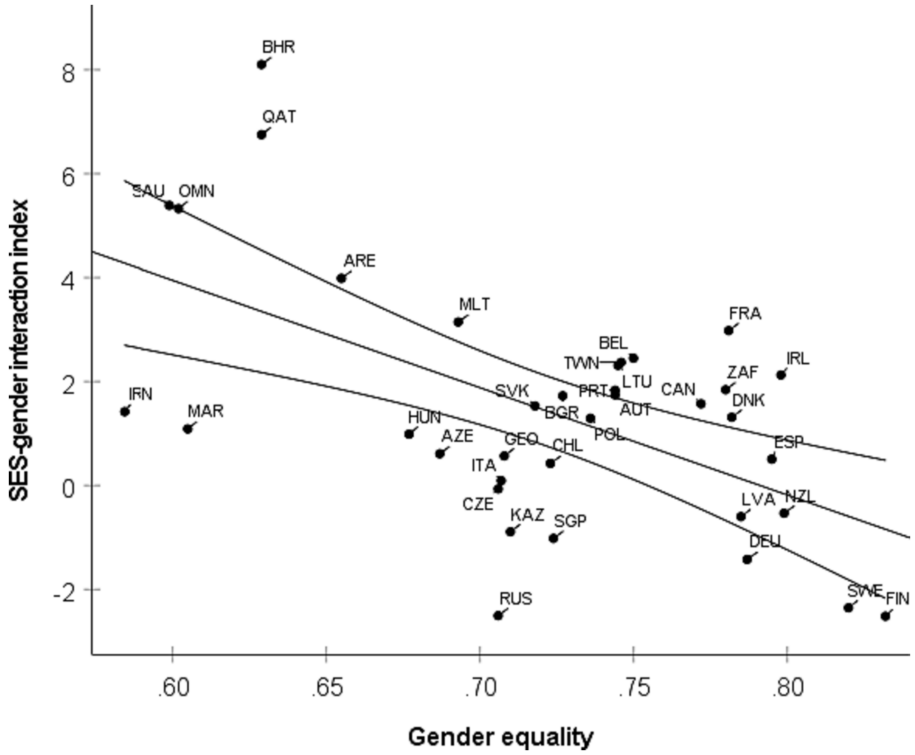


FIGURE 1
A scatterplot of the SES-gender interaction index against a measure of the level of gender equality in 36 countries. The SES-gender interaction index is the average of the four estimates of the difference between boys and girls in the effects of parents' education and occupation on student achievement in TIMSS and PIRLS. Gender equality is measured by the Global Gender Gap Index. Countries are referred to by their ISO 3-letter country code (Supplementary Table S2). The negative slope of the regression line (with 95% confidence interval) means that the SES-gender interaction is greater in less gender-equal countries. For example, the dot marked SAU refers to Saudi Arabia, a country with a relatively low level of gender equality (0.60) and a relatively large SES-gender interaction index (5.4). The latter value signifies that in Saudi Arabia, the average effect on achievement scores in TIMSS and PISA of having one-unit higher scores on parents' education and occupation was 5.4 points higher among boys (12.9) than among girls (7.5).

TABLE 4 Results of hierarchical linear regression of the SES-gender interaction index.

Variable	Model 1	Model 2
HDI	−0.08	0.30
GGGI		−0.72***
R^2	0.01	0.39
R^2 change		0.38

***$p < 0.001$; *$p < 0.05$; **$p < 0.1$. Entries are standardized coefficients. HDI is the Human Development Index. GGGI is the Global Gender Gap Index. R^2 is the proportion of variance explained by the model.

explain why there are little gender differences in the SES achievement gaps in these societies. Unequal treatment of boys and girls may manifest in, say, differences in parental investments in boys' and girls' education, or differences in parental expectations on boys and girls. Prior theories of SES-gender interactions in student achievement assume that such differences in how boys and girls are treated may interact with socioeconomic differences (Connolly, 2006; Entwisle et al., 2007; Auwarter and Aruguete, 2008; Autor et al., 2019). The novelty in the current study lies in that we consider how gender differences in treatment may vary with the level of gender equality of the society.

When estimating the SES-gender interaction, we also obtained estimates of the main effects of SES and gender on achievement. Country variation in SES achievement gaps was not related to gender equality. Other studies have examined other country factors that may explain why SES achievement gaps vary in size (e.g., Marks, 2005; Bodovski et al., 2017). By contrast, there was a strong correlation in our data between the main effect of gender on achievement and gender equality; boys achieve better, relative to girls, in more gender-equal societies. For a more detailed examination of this phenomenon, see Eriksson et al. (2020).

A limitation of our study is that it only covers 36 countries. The world is large and it would be interesting to see how SES achievement gaps differ between boys and girls in, say, African countries. Another limitation is that there may be omitted variables that confound the effect of gender equality. In the current study we controlled for the overall development level of the countries, but there may be other important variables that we did not control for. To examine whether the level of equality in the treatment of boys and girls has a causal effect on gender differences in SES achievement gaps, intervention studies could be conducted. It would be valuable to know whether SES achievement gap among boys can be reduced in size through measures that address specific ways in which boys and girls are treated differently. Another possibility is to study how the SES-gender interaction varies across ethnicities in the same country (Strand, 2014), to see whether it is related to ethnic differences in the level of gender egalitarianism.

Gender equality has increased globally for many decades (Inglehart and Norris, 2003). If there is a causal connection between

low gender equality and the size of the SES-gender interaction in student achievement, we should therefore expect that SES-gender interaction has decreased over time. Thus, our findings motivate future longitudinal studies of the same topic.

In conclusion, this study has documented that socioeconomic achievement gaps are often larger among boys and girls, and especially in non-Western societies with high levels of gender inequality.

Data availability statement

The raw data used in step 1 are publicly available at IEA's website (iea.nl). All country measures used in step 2 are available at OSF (https://osf.io/exkcm/).

Ethics statement

Ethical approval was not required for the study involving humans in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and the institutional requirements.

Author contributions

KE conceived of the study, performed the analysis, and wrote the paper. JL conducted the survey of the literature and provided critical feedback on the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1120211/full#supplementary-material

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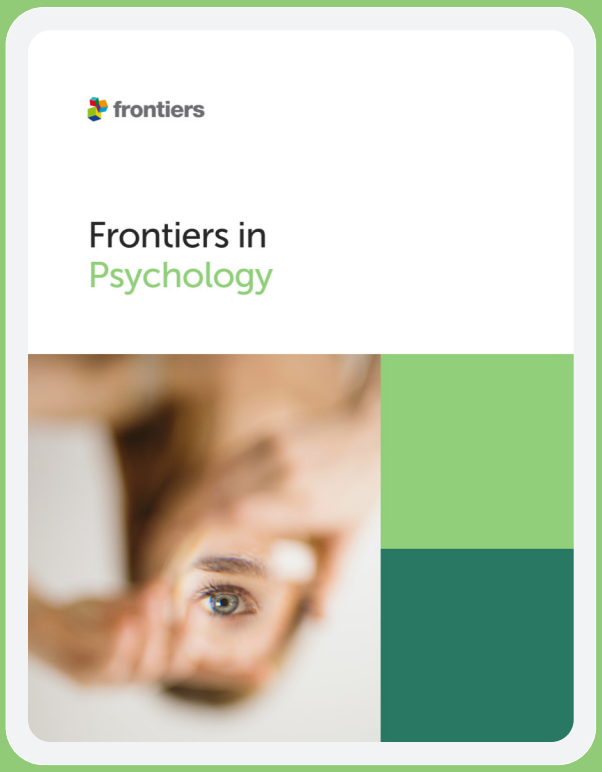
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