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Relationship of research attitude and knowledge with academic achievement of prospective teachers in Pakistan

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Background: In a data-driven society, educators are expected to excel in the field of research so that they may examine problems that they are facing and find their solutions. The current study aims to examine the relationship of prospective teachers' research attitude and knowledge with their academic achievement in research courses. This quantitative exploration is based on a self-report survey for which a correlational research design was used.

Method: Multi-stage sampling technique was employed to select a sample of 540 prospective teachers from two public and two private universities of Lahore district. Two instruments (Attitude toward Research and Research Knowledge Scale) were used to measure their level of research attitude and knowledge. The academic achievement was measured through the Grade Point Average (GPA) of prospective teachers in the research course.

Results: The findings revealed that prospective teachers had a positive attitude toward research and a high level of research knowledge. Prospective teachers' research attitude and knowledge had a significant positive relationship with their academic achievement in the research course. There was no significant difference between the attitude of public and private universities' prospective teachers. However, their levels of research knowledge were significantly different.

Conclusion: Prospective teachers with positive attitude toward research and good research knowledge were high achievers in the research course. It is suggested that educational institutes should organize research conferences, seminars, workshops and other research forums to enhance the prospective teachers' knowledge, practical applications of research methodologies and understanding of research to promote a positive attitude toward research.

KEYWORDS

attitude, research, prospective teachers, research knowledge, academic achievement

Introduction

Research plays an important role in the progress of any discipline and the development of the academic environment in today's data-driven world. In education, research addresses the practical educational challenges faced by both teachers and learners by providing insights into improving teaching and learning practices. Through research, data can be collected and analyzed to develop our understanding of the phenomenon under investigation (Swindoll, 2012). The ultimate goal of the research is not only to comprehend phenomena but also to disseminate meaningful knowledge to others (Abun et al., 2021; Fishbein and Ajzen, 1975; Imran et al., 2019).

In the context of prospective teachers, who are in training to become educators, they need to develop a positive attitude toward research and a sound knowledge of it. As attitude comprises beliefs, emotions, and behaviors, it reflects an individual's readiness to engage with a subject (Zan and Martino, 2007). Measuring prospective teachers' attitude toward research is important to facilitate their learning by developing a positive research attitude among them (Papanastasiou, 2005; Segarra and Julià, 2022). A positive attitude toward research can give confidence to prospective teachers to conduct and use research (Imran et al., 2019; Saini et al., 2020). Swindoll (2012) claimed that to be a successful researcher, the training and experience are not as important as the research attitude. Furthermore, the attitude is strongly associated with academic achievement, which influences one's overall performance (Indoshi et al., 2010; Oguan et al., 2014). According to Hill (2007), a positive attitude is essential to achieving goals in any field. Similarly, research knowledge equips future teachers with the skills needed to locate, interpret, and apply research findings effectively (Lunenberg et al., 2007; Reis-Jorge, 2007; Van Katwijk et al., 2023).

It is the responsibility of teachers to develop the attitude and knowledge of prospective teachers to conduct research (Landicho, 2020). Prospective teachers should be aware of the method to locate, find and interpret research because they have to deal with the students in the future and will surely need a better knowledge and attitude toward research for effective teaching (Abun et al., 2021; Gussen et al., 2023; Van Katwijk et al., 2023). Previous studies have also reflected the importance of the attitude of teachers, students and prospective teachers of both public and private sectors (Carranza Esteban et al., 2024; Ciraso-Calí et al., 2022; Dutton, 1951; Gredig et al., 2020; Khan et al., 2018; Kutluca and Gokalp, 2011; Maqsood et al., 2019; Odubunmi, 1986; Okpala, 1985; Ozel, 2007; Uyangor and Karaca, 2010; Yara, 2009; Zientek et al., 2011). In particular, Saleem et al. (2021) found that life science research students' academic success in Pakistan is significantly influenced by their research attitudes and knowledge management skills. Despite these findings, limited research has been conducted to explore the relationship between research attitude, research knowledge, and academic achievement among prospective teachers in Pakistan. This gap highlights the need for current investigation.

Significance of the study

The findings of this study may help policymakers and teacher educators enhance research training in teacher education

programs. By identifying gaps in research knowledge and attitude, strategies can be developed to better prepare prospective teachers for evidence-based educational practices.

Research questions

This study aims to investigate the relationship of research attitude and knowledge of prospective teachers with their academic achievement in the research course. The study addressed the following research questions:

1. What is the level of research attitude and knowledge of prospective teachers?
2. What is the relationship between the attitude of prospective teachers toward research and their academic achievement in the research course?
3. What is the relationship between the research knowledge of prospective teachers and their academic achievement in the research course?
4. Is there any significant difference between the level of public and private sector prospective teachers' attitude toward research?
5. Is there any significant difference between the level of public and private sector prospective teachers' research knowledge?

Literature review

In the field of social sciences, especially in educational and psychological research, the relationship between attitude, knowledge and academic achievement is an important topic. Several studies have been conducted on prospective teachers' research attitude in Pakistan's context (Bibi et al., 2012; Butt and Shams, 2013; Hussain et al., 2016; Khan et al., 2018). To our knowledge, no study has yet been conducted regarding the relationship of prospective teachers' attitude toward research and research knowledge with their academic achievement in the research course. Therefore, the current study is expected to provide a perspective on this phenomenon.

Attitude toward research

In modern times, educators need to remain updated in their knowledge and skills to face the challenges of the rapidly progressing education system. In this regard, educational research has become an important component in the field of education to examine problems and find their solutions (Guerra Ayala et al., 2023). Therefore, the positive attitude of prospective teachers toward research is the need of the hour. Many studies have been conducted at the local and international levels to examine the research attitude, and it has been found that attitude toward research is generally negative and students find it difficult to study research course (Bilal et al., 2019; Bock et al., 2024; Butt and Shams, 2013; Jansen et al., 2021; Oguan et al., 2014; Papanastasiou, 2005; Wise, 1985). Students have insufficient basic research knowledge and skills about searching, reviewing and

evaluating literature, which is to be paraphrased. They also found problems in giving citations.

Although the studies mentioned above presented the negative attitude of educators toward research, several other researchers in different contexts also found prospective teachers and students with a positive attitude toward research (Abun et al., 2021; Bock et al., 2024; Boruah, 2020; Hussain et al., 2016; Khan et al., 2018; Maqsood et al., 2019; Jansen et al., 2021; Oguan et al., 2014; Saini et al., 2020). Moreover, Shaikat et al. (2014) found that students in private sector universities were more positive in their attitude toward research than the students of public sector universities in Pakistan (Butt and Shams, 2013). Research is the best criterion for the progress of any country. With the availability of research facilities, students would be more interested in performing research. Training workshops and planning research projects will also create a positive impact on their attitudes.

Research knowledge

The development of prospective teachers' research knowledge is imperative for conducting research and practical implications of the results of research (Bock et al., 2024; Lunenberg et al., 2007; Reis-Jorge, 2005). According to Van der Linden et al. (2015), it is necessary to develop the ability of prospective teachers to conduct and use research by developing their knowledge in different aspects of research, i.e., (i) goals and benefits of the research, (ii) topics suitable for research, (iii) steps included in the process to conduct research (e.g., problem statement, research questions, appropriate research design, data collection procedure and data analysis), (iv) the knowledge of the criterion for quality of research and application of that knowledge in their own research, and (v) clear reporting of research results to make their colleagues understand the process, the results and implications of the research. All these aspects of research knowledge are necessary for prospective teachers to locate, find and interpret research and its practical implications. Bilal et al. (2019) examined that undergraduate and postgraduate student of the University of Health Sciences, Karachi, had good research knowledge, but their attitude was not up to the mark. Meerah et al. (2012) examined that postgraduate students at the University Kebangsaan, Malaysia, have a moderate level of knowledge and skills to conduct research. The study also suggested that there is a need to enhance research training to make students skillful and knowledgeable researchers in the field of education.

Academic achievement

Academic achievement is an important topic in the improvement of the quality of any education system, including universities. Academic achievement sets the future of a nation. The higher the academic achievement, the higher the growth of the education system (Arbabisarjou et al., 2016; Mirkamali et al., 2015). In general terms, academic achievement is defined as a student's academic performance in school. Academic achievement refers to prospective teachers'

grade point average (GPA) in the course of research, which reflects their understanding of research methods and statistical analysis techniques, as covered in the course content (Li, 2012). Technological advancements have also contributed significantly to the understanding of academic achievement in the digital learning environment. For instance, Liu et al. (2022) found that emotional and cognitive engagement have an interactive relationship and can jointly predict learning achievement in MOOC forum discussions. Liu et al. (2018a) highlighted the role of social interaction in academic success, emphasizing that academic achievement is influenced not only by cognitive ability but also by social presence and participation. It was further revealed that emotional tone and engagement intensity play meaningful roles in academic success in online learning environments (Liu et al., 2018b).

Research attitude, research knowledge and academic achievement

Attitude is strongly associated with academic achievement, which influences one's overall performance (Oguan et al., 2014). Li (2012) found a strong positive correlation among the attitude, self-efficacy, effort and academic achievement of urban students in a research methods and statistics course (Carranza Esteban et al., 2024). Oguan et al. (2014) examined the influence of students' anxiety and attitude toward research on their academic achievement in the research course. They believe that the difficulty of research, research anxiety and workload given to students are associated with their negative attitude toward research, which leads to lower grades. Many researchers have conducted studies in different contexts and found a positive relation between attitude and academic achievement (i.e., Fishbein and Ajzen, 1975; Li, 2012; Oguan et al., 2014; Van Katwijk et al., 2023). On the other hand, some studies have revealed that attitude alone is not an important predictor of students' academic achievement (Ma and Kishor, 1997; Masrai et al., 2021, 2022; Mickelson, 1990). Mickelson (1990) identified various variables, including ethnic background and social class, that can significantly predict one's academic achievement (Gredig et al., 2020). Mokresh et al. (2024) found a positive attitude but lacked research knowledge among medical students in Turkey. Roman (2022) explored an average level of research knowledge and skills and a high extent of attitude toward research among graduate students in one state university in the Philippines. It was also found that attitude affects research productivity (i.e., completed research, presented, published, and research with citations) significantly. Ma and Kishor (1997) conducted a meta-analysis to assess the relationship between attitude toward mathematics and achievement in mathematics. Albumijdad et al. (2022) found a negative research attitude and knowledge among the medical residents in Saudi Arabia. To the best of our knowledge, no study has been found that examined the relationship of prospective teachers' attitude toward research and research knowledge with their academic achievement in the research course. Therefore, this study attempted to fill this gap.

Methodology

Study design

This study was quantitative in nature. A cross-sectional correlational research design based on a self-report survey was used.

Study participants and data collection

The population of the study comprised all prospective teachers enrolled in a Master's degree program (session 2020–2022) in two public and two private universities of Lahore district. The study sample, consisted of 540 prospective teachers, was selected through a multistage sampling technique. In the first stage, the researcher selected two clusters from each stratum using a cluster non-proportional stratified random sampling technique. In the second stage, all morning and self-supporting classes of prospective teachers were selected from each selected cluster through a simple random sampling technique. In the third stage, 20 prospective teachers were selected from each selected class using a convenient sampling technique. Data were collected through personal visits to the prospective teachers. This study was approved by the research team's university ethics committee. Informed consent was ensured by the potential participants before collecting data. Five hundred and forty questionnaires were received back, 38 were discarded due to incomplete information. Therefore, a total of 502 questionnaires filled by prospective teachers were used for final data analysis.

Measures

The attitude toward Research Scale (ATR) developed by Papanastasiou (2005) was adapted. The original version consisted of 32 items regarding five factors (i.e., *Research usefulness for profession, research anxiety, positive attitudes toward research, relevance to life, research difficulty*). Based on the opinions of field experts, “research anxiety” and research difficulty were merged, but the number of items was the same as in the original version.

The research knowledge scale developed by Meerah et al. (2012), which consisted of seven items, was also used. The items of both scales were rated on a five-point Likert-type scale from strongly disagree “1” to strongly agree “5.” The research attitude and research knowledge scales were categorized based on the mean score obtained on a five-point Likert scale. Scores ranging from 1.00 to 2.49 indicated a low level, 2.50 to 3.49 indicated a moderate level, and 3.50 to 5.00 indicated a positive or high level of research attitude and research knowledge.

The scales showed good reliability (Attitude toward Research Scale with reliability $\alpha = 0.78$ and Research Knowledge Scale with reliability $\alpha = 0.88$). The validity of the instrument was ensured by the experts of the field. The academic achievement was measured through the Grade Point Average (GPA) of prospective teachers in the research course. The GPA was calculated based on a single core

research course that is a compulsory part of the teacher education curriculum at both public and private universities.

Statistical analysis

The collected data were analyzed using the Statistical Package for Social Sciences (IBM SPSS) version 21. Mean and standard deviation were calculated to explore the research attitude and the level of research knowledge. Reliability analysis was conducted to assess the reliability of the Scales. To examine the normality of the data, Shapiro-Wilk normality tests were also applied. Pearson product-moment correlation coefficient (Pearson r) was applied to find the relationship between the research attitude, knowledge and academic achievement of prospective teachers in the course of research. An independent sample t -test was used to find out the difference in prospective teachers' research attitude and knowledge with respect to the sector (public and private).

Results

The demographic information of the respondents is presented in Table 1. It portrays that out of 502 participants, 299 (59.6%) were female and 203 (40.4%) were male. The majority of the participants, 273 (54.4%) belongs to the 20–29 age group, 163 (32.5%) ranged between 30–39 years, and only 66 (13.1%) participants were above 40 years. Most participants, 336 (66.9%), were from public sector universities.

RQ1. What is the level of research attitude and knowledge of prospective teachers?

Table 2 depicts that a large number of prospective teachers have a positive attitude in all sub-scales of attitude toward research. The mean score of usefulness of research for profession ($M = 21.88$; $SD = 3.54$) was higher than all other subscales (*Positive attitude toward research, research anxiety and difficulty, relevance to life*). Overall, the attitude toward research was higher ($M = 62.21$; $SD = 7.41$) than the research knowledge ($M = 27.02$; $SD = 5.64$)

TABLE 1 Demographic information of the participants.

Demographics	Frequency	%
Gender		
Female	299	59.6
Male	203	40.4
Age (years)		
20–29	273	54.4
30–39	163	32.5
40 and above	66	13.1
Sector		
Public	336	66.9
Private	166	33.1

TABLE 2 Summary statistics of research attitude and knowledge of prospective teachers.

Factors	Min	Max	Mean	SD	Skewness
Usefulness of research for profession	9.00	25.00	21.88	3.54	−0.072
Research anxiety and difficulty	4.00	20.00	14.03	4.01	−0.125
Positive attitude toward research	4.00	20.00	16.16	3.23	−0.074
Relevance to life	7.00	15.00	10.14	1.41	0.166
Overall attitude toward research	28.00	77.00	62.21	7.41	−0.106
Research knowledge	7.00	35.00	27.02	5.64	0.041

among the prospective teachers. Examining both constructs allows us to identify whether fostering a positive attitude or enhancing knowledge contributes significantly to academic achievement in research (Papanastasiou, 2005; Maqsood et al., 2019).

RQ2. Is there any significant difference between the public and private sector university prospective teachers' attitude toward research?

Table 3 specifies the results of the *t*-test. The mean score for public sector prospective teachers in the subscale "Usefulness of Research for Profession" was smaller ($M = 21.64$, $SD = 3.21$) than the private sector prospective teachers ($M = 22.37$, $SD = 3.94$). However, the mean score for public sector prospective teachers in the subscale "Relevance to Life" was higher ($M = 10.24$, $SD = 1.46$) than the private sector prospective teachers ($M = 9.92$, $SD = 1.21$). A significant difference was found between the attitude of public and private sector prospective teachers in two subscales of attitude toward research ["usefulness of research for profession" $t(500) = -2.19$, $p = 0.03$ and "relevance to life" $t(500) = 2.49$, $p = 0.01$]. The values of Cohen's *d* also showed a small effect size in these dimensions of attitude, reflecting slight but meaningful differences between the groups. On the other hand, there was no significant difference between the attitude of public and private sector prospective teachers in the rest of the subscales ["research anxiety and difficulty" $t(500) = 0.78$, $p = 0.44$; "positive attitude toward research" $t(500) = 0.96$, $p = 0.34$]. Overall, there was also no significant difference between the research attitude of public and private sector prospective teachers, $t(500) = 0.27$, $p = 0.79$. It may be inferred that public and private sector prospective teachers

have almost the same level of attitude toward research (as shown in Figure 1).

RQ3. Is there any significant difference between the level of public and private sector prospective teachers' research knowledge?

Table 4 shows that a statistically significant difference exists between the mean scores of research knowledge for public ($M = 27.75$, $SD = 4.98$) and private sector prospective teachers ($M = 25.54$, $SD = 6.55$); $t(500) = 3.84$, $p = 0.00$. Cohen's *d* value indicated a small to moderate effect size, suggesting public sector prospective teachers had modestly higher research knowledge than private sector. In other words, public sector prospective teachers have a higher level of research knowledge than private sector prospective teachers (as shown in Figure 2).

RQ4. What is the relationship between the attitude of prospective teachers toward research and their academic achievement in the research course?

Table 5 depicts the results of the Pearson product-moment correlation. It revealed that the prospective teachers' attitude toward the usefulness of research for profession, and positive attitude toward research, is positively correlated with their academic achievement [$r = 0.01$ ($p < 0.01$); $r = 0.03$ ($p < 0.01$)]. However, research anxiety and difficulty of prospective teachers have a negative relationship with their academic achievement in the research course $r = -0.03$ ($p < 0.01$). A statistically significant but weak positive relationship was found between the overall attitude of prospective teachers toward research and their academic achievement in the research course $r = 0.03$ ($p < 0.01$) which revealed that while a trend exists, the strength of this association is minimal. Prospective teachers with high grades have a slightly more positive attitude toward research, while those with low grades show a less favorable attitude.

RQ. 5 What is the relationship between research knowledge of prospective teachers and their academic achievement in the research course?

Table 6 illustrates that the research knowledge of prospective teachers had a significant but modest positive relationship with their academic achievement in the research course $r = 0.152$ ($p < 0.01$). This indicates that the strength of the association

TABLE 3 Comparison of public and private sector prospective teachers' attitude toward research.

Variables	Public (336)		Private (166)		t-value	df	P	Cohen's d
	M	SD	M	SD				
Usefulness of research for profession	21.64	3.21	22.37	3.94	−2.19	500	0.03	0.21
Research anxiety and difficulty	14.13	4.14	13.83	4.01	0.78	500	0.44	−
Positive attitude toward research	16.26	3.09	15.96	3.51	0.96	500	0.34	−
Relevance to life	10.24	1.46	9.92	1.21	2.49	500	0.01	0.24
Attitude on overall scale	62.27	7.31	62.08	7.47	0.27	500	0.79	−

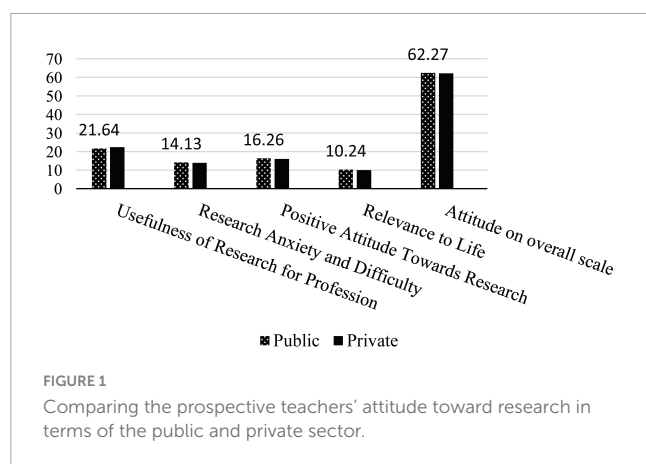
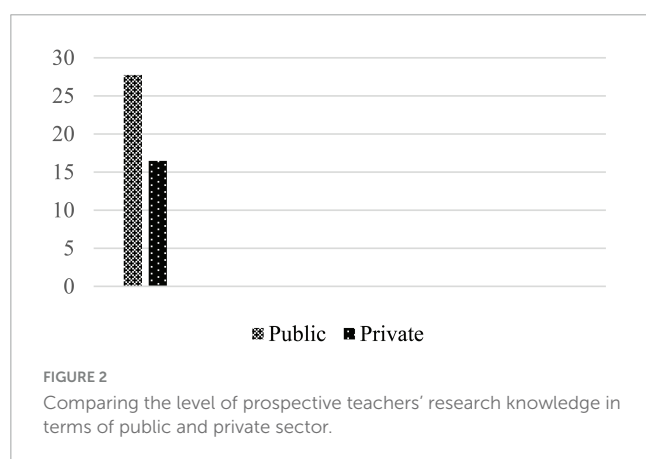


TABLE 4 Comparison between the level of public and private sector prospective teachers' research knowledge.

Sector	N	M	SD	t-value	df	P	Cohen's d
Public	336	27.75	4.98	3.84	500	0.00	0.38
Private	166	25.54	6.55				



is relatively low. In other words, prospective teachers with high grades demonstrated a higher level of knowledge regarding research, whereas prospective teachers with low grades exhibited a comparatively low level of research knowledge.

TABLE 5 Relationship between prospective teachers' attitude toward research and their academic achievement in the research course.

	Variables	1	2	3	4	5	6
1	GPA in the course of research	–	0.01**	–0.03**	0.03**	–0.01	0.03**
2	Usefulness of research for profession		–	–0.01	0.21***	0.13**	0.61**
3	Research anxiety and difficulty			–	0.13**	0.06**	0.60**
4	Positive attitude toward research				–	0.34**	0.67**
5	Relevance to life					–	0.43**
6	Total of research attitude scale						–

** $p < 0.01$, *** $p < 0.001$.

Discussion

The aim of current study was to examine the relationship of prospective teachers' research attitude and knowledge with their academic achievement in research course. Positive attitude and high level of knowledge regarding research are essential for trainee teachers so that their skill of conducting and using research may be developed. The education systems of developing countries such as Pakistan cannot meet the current challenges without advancement in the field of research. Research is not an easy task, and prospective teachers may often feel anxious at various stages. Several researches have explored negative attitude of prospective teachers toward research (Abun et al., 2021; Butt and Shams, 2013; Gredig et al., 2020). The results of the current study revealed that prospective teachers have a positive research attitude. Although the prospective teachers may feel overwhelmed, as a requirement of the degree, they have to undertake this task. They are aware of the usefulness of research in their professional careers. The existing body of knowledge on the selected area of research, guidance of the teachers, and their constructive feedback at each step of the research, diverse experience during data collection and data analysis phase and richness of the obtained results are the key determinants that may kindle the interest in and positive attitude toward research. The literature also reveals the evidence of educators' positive attitude toward research (Assar et al., 2022; Hussain et al., 2016; Khan et al., 2018; Maqsood et al., 2019; Oguan et al., 2014; Saini et al., 2020), which indicates that future teachers are aware of the importance of research for their professional development. However, attitude alone cannot guarantee research competency without sufficient knowledge and practice.

The results of the present study revealed a high level of prospective teachers' research knowledge. Prospective teachers cannot conduct research without sound knowledge of it. Existing literature also provides evidence about the importance of research knowledge for prospective teachers to develop their ability to conduct and use research (Landicho, 2020; Reis-Jorge, 2007; Van Katwijk et al., 2023). Bilal et al. (2019) found that undergraduate and postgraduate students had sound research knowledge, although their attitude toward research was not up to the mark. Even though their knowledge of research was adequate, they considered it insufficient to take part in research practically or to conduct their own research. The results of another study conducted by Meerah et al. (2012) indicated that postgraduate students have a moderate level of knowledge and skills to conduct research, which is similar to the results of the present study (Assar et al., 2022). Knowledge regarding the theory/methods and application of these methods is necessary to conduct research (Abun et al., 2021).

TABLE 6 Relationship between research knowledge of prospective teachers and their academic achievement in the research course.

	Variables	1	2
1	GPA in the course of research	–	0.152***
2	Research knowledge		–

*** $p < 0.001$.

The gap between theoretical understanding and practice can limit the prospective teachers' ability to meaningfully contribute to academic and institutional research culture, but it highlights a solid foundational awareness of research among trainees.

The results of the current study also disclosed that prospective teachers' research attitude and research knowledge have a positive relationship with their academic achievement in the research course. Adequate research knowledge and a positive attitude toward research can be helpful for prospective teachers to conduct research and obtain good grades in the course of research. Fishbein and Ajzen (1975) found attitude as a significant predictor of academic achievement. The results of the study conducted by Oguan et al. (2014) disclosed that one significant predictor of academic achievement is attitude, and a person with a positive attitude would perform better academically. Li (2012) found a strong positive correlation among the attitude, self-efficacy, effort and academic achievement of CityU students toward the research methods and statistics course. Oguan et al. (2014) examined the influence of students' anxiety and attitude toward research on their academic achievement in the research course. They believe that the difficulty of research, research anxiety and workload given to students are associated with their negative attitude toward research, which leads to lower grades. These findings may provide a clear direction for teachers to develop a positive attitude among prospective teachers by focusing on their emotional and academic readiness.

The results of the current study further revealed that there was no significant difference between the level of public and private sector university prospective teachers' research attitude. However, they differed significantly in their research knowledge. Prospective teachers of public and private universities showed a positive attitude toward research and found research useful for their professional careers. Prospective teachers of public sector universities had better knowledge of educational research than those in private sector universities. On the other hand, Butt and Shams (2013) explored the negative attitude of prospective teachers toward research in public sector universities in Pakistan. Shaukat et al. (2014) found that the students enrolled in private sector universities were more involved than public sector university students in Pakistan. According to them, in the discipline of education, the private sector is more quality-conscious than the public sector. The results of the present study showed that the public sector is also trying to meet the global market demands, and the Higher Education Commission (HEC) is playing a major role in this regard by providing research grants, research projects and scholarships to develop research culture in accordance with international norms and produce best researchers not only in the field of education but in other disciplines too (i.e., Science and Technology, Social Sciences, Humanities and Life Sciences) (Abdelhafiz et al., 2024; Gutiérrez et al., 2023; Rashid, 2025; Rashid et al., 2021; Schneider et al., 2023; Suyu-Vega et al., 2022).

Implications of the study

This study tried to fill the gap and investigated the relationship of prospective teachers' attitude toward research and research knowledge with their academic achievement in the research course, which is an important phenomenon to apply methods or theory to conduct research.

Practical implications

The findings of the current study urge educational institutes to organize research conferences, seminars, workshops and other research forums to enhance the prospective teachers' knowledge and deeper understanding of research. Moreover, teachers can develop the interest of prospective teachers in the application of research methodologies and techniques in the classroom environment by providing them with guidance and timely feedback on their research-related tasks. Teachers should also manage instructional approaches while teaching research courses in appropriate ways to provoke critical thinking in students, which would be helpful in reducing their research anxiety and difficulty.

Policy implications

The present study provides insight for policymakers regarding the development of research attitude and knowledge in teacher education programs by introducing a policy to conduct mini research projects. Curriculum developers are advised to update the content regarding the educational research courses to meet the latest research trends. Some teacher education institutions do not make a thesis a compulsory practice. Instead, they offer internship programs or other projects. In this regard, the Higher Education Commission (HEC) can restrict the policy to conduct a thesis in the final year which would help to develop research aptitude among students.

Limitations and directions for future research

Although this study explored an important phenomenon of the association of research attitude and research knowledge with academic achievement in the research course, some limitations need to be highlighted. The sample of the study was restricted to the Lahore City, Punjab, Pakistan. Future studies may include samples from other cities and provinces of Pakistan. In this study, research knowledge scale (Meerah et al., 2012) was adapted to measure the level of research knowledge of prospective teachers. Future researchers may develop tests or quizzes based on the educational research courses or contents to measure the prospective teachers' research knowledge in a practical sense. This study was a quantitative exploration based on a survey research design. In future, a qualitative study may be conducted to explore this phenomenon carefully and in more detail to determine the level

of prospective teachers' research attitude and knowledge. A cross-provincial level or national level study may also contribute to the understanding of this phenomenon cohesively and thoroughly.

Conclusion

The main purpose of this study was to find out the relationship of prospective teachers' research attitude, research knowledge with their academic achievement in the research course. The findings revealed that prospective teachers' research attitude and research knowledge are positively correlated with their academic achievement in the research course. The results also revealed that prospective teachers have a positive research attitude and a high level of research knowledge, knowing its value for their professional growth. Moreover, there was no significant difference between the level of public and private sector university prospective teachers' attitude toward research. However, public and private sector prospective teachers were significantly different in their level of research knowledge. Public sector prospective teachers had better research knowledge than private sector prospective teachers. These findings highlight the importance of fostering both research skills and a supportive research culture in teacher education programs.

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 humans were approved by Institute of education and research, University of the Punjab. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

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