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RECEIVED 23 July 2025

ACCEPTED 20 October 2025

PUBLISHED 25 November 2025

CITATION

Garay Abad L and Hattie J (2025) The
evolving definition of quality: how teacher
experience and subject domain shape
perceptions of instructional materials.
Front. Educ. 10:1671376.
doi: 10.3389/feduc.2025.1671376

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The evolving definition of quality: how teacher experience and subject domain shape perceptions of instructional materials

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Introduction: Despite substantial global investment in curricular resources, surprisingly little empirical research has explored how teachers themselves define and evaluate the quality of instructional materials, particularly as these perceptions evolve across different stages of the teaching career. This study examined how teachers' approaches to evaluating instructional material quality evolve across career stages.

Methods: We surveyed 2,102 educators from Germany, Austria, and Switzerland, all active users of the eduki platform. Through exploratory factor analysis and multivariate analysis of variance (MANOVA), we identified three distinct response patterns in how teachers evaluate materials: teacher perceptions of peer-created material quality, pedagogical and structural characteristics of high-quality materials, and teacher-centric considerations and practical benefits.

Results: Teachers' priorities across these evaluation approaches vary significantly with experience. The overall MANOVA was statistically significant (Wilks' Lambda = 0.89, $F(81, 4,476) = 1.97, p < 0.001$). Early-career teachers emphasize peer-created materials for lesson delivery ($M = 4.34, SD = 0.69$) and professional development ($M = 3.88, SD = 0.87$), along with stimulating content ($M = 4.16, SD = 0.95$) and curriculum compliance ($M = 3.85, SD = 0.96$). In contrast, experienced teachers prioritize practical benefits such as ease of use ($M = 3.84, SD = 0.93$), technology integration ($M = 3.29, SD = 0.94$), support for diverse learning needs ($M = 3.85, SD = 0.88$), and inclusion of current research ($M = 3.34, SD = 0.90$), with effect sizes ranging from small to moderate ($d = -0.33$ to 0.54). The greatest differences were observed between early-career and experienced teachers.

Discussion: These findings indicate that quality evaluation is a developmental process that evolves with teaching expertise. We propose a career-responsive approach to material development with implications for content design, professional development, and platform personalization.

KEYWORDS

teaching materials, teacher development, material quality perception, professional growth, instructional design, quality criteria, career-stage differentiation, peer-created materials

1 Introduction

Despite substantial global investment in curricular resources, surprisingly little empirical research has explored how teachers themselves define and evaluate the quality of instructional materials, particularly as these perceptions evolve across different stages of the teaching career. This study addresses that gap by examining how teachers' approaches to evaluating instructional material quality evolve across different career stages, grounded in teacher perceptions and analyzed through the lens of professional development.

The present research builds on our prior work examining the instructional and developmental functions of teaching materials (Garay Abad and Hattie, 2025), which demonstrated that materials serve dual roles: shaping classroom practice and supporting teacher growth in differentiated ways across career stages. In that study, we found that “teaching materials influence both instructional design and professional development across teacher career stages,” and that “teacher-generated materials emerge as the most impactful.”

This paper extends that inquiry by turning to teachers' own definitions of quality. While existing literature has explored instructional design and teacher development, there is limited evidence on how teachers conceptualize “quality” and how this definition evolves across professional stages. By focusing on teacher perceptions, we highlight novel dimensions of quality such as adaptability, structural clarity, and professional relevance, and propose a systematic framework of quality criteria across both career stages and subject domains. This focus on quality perception itself—rather than only the instructional or developmental functions of materials—represents a new direction in research on teaching materials.

We address three interrelated research questions: (1) What distinct response patterns emerge when teachers evaluate instructional material quality across different evaluation criteria? (2) How do these evaluation patterns vary across career stages? (3) What implications do these evolving evaluation approaches hold for instructional material design and teacher development strategies?

2 Theoretical and conceptual framework for quality perception

The concept of instructional material quality is informed by multiple disciplinary traditions, including instructional design, curriculum theory, educational psychology, and cognitive science. While these fields offer distinct perspectives, they converge around shared principles that define high-quality lesson design. These principles align with the three factors identified in this study: teacher perceptions of peer-created material quality, pedagogical and structural characteristics of high-quality materials, and teacher-centric considerations and practical benefits. This section synthesizes the relevant literature underpinning each of these factors and explores their significance across stages of the teaching career.

2.1 Clarity of learning intentions and success criteria

A consistent indicator of quality is the clear communication of learning intentions and success criteria. This principle, central to

instructional design and student agency, is well supported in the literature. Wiggins and McTighe's (2005) backward design model emphasizes aligning tasks with explicit outcomes. Hattie's (2009, 2023) meta-analyses reinforce that goal clarity enhances both student achievement and metacognitive awareness.

Clarke (2014) and Black and Wiliam (1998) show that when students understand the purpose of a task and how success is defined, their engagement and self-regulation improve. From a design perspective, this involves embedding goals and criteria directly into instructions and visual layout. For early-career teachers, such clarity offers structure and reassurance. For more experienced teachers, it facilitates rapid alignment with broader curricular frameworks.

2.2 Cognitive demand and depth of knowledge

Cognitive challenge is a defining characteristic of instructional quality. Materials should not only convey content but prompt learners to analyze, connect, and apply knowledge. Frameworks such as Bloom's revised taxonomy (Anderson and Krathwohl, 2001), Webb's (1997) Depth of Knowledge, and the SOLO taxonomy (Biggs and Collis, 1982) provide ways of understanding how thinking progresses from surface to deeper levels. Hattie and Donoghue's (2016) model of surface, deep, and transfer learning further emphasizes the importance of progression.

Effective materials support this progression through varied task types, increased conceptual complexity, and structured opportunities for application.

2.3 Instructional coherence and alignment

Instructional coherence refers to the alignment between learning goals, instructional activities, and assessment practices. Tyler's (1949) curriculum framework and Schmidt et al.'s (2005) comparative studies highlight the importance of coherence both within individual lessons and across instructional sequences. High-quality resources exhibit this coherence by logically sequencing tasks, ensuring consistency in language, and making explicit links to expected outcomes.

2.4 Engagement, feedback, and responsiveness

Beyond clarity, challenge, and coherence, additional principles enhance material effectiveness. These include cognitive activation, formative feedback, and differentiation. Cognitive activation involves connecting new content with prior knowledge through prompting, reflection, and structured discourse (Bransford et al., 2000; Rosenshine, 2012). High-quality materials support this through embedded prompts, worked examples, and self-explanation opportunities.

Formative feedback, when actionable and timely, helps students close learning gaps and consolidate progress (Sadler, 1989; Wiliam and Leahy, 2024). Differentiation ensures materials are appropriately accessible across a range of learner profiles. Drawing on Tomlinson (2001) and Vygotsky's (1978) zone of proximal development, differentiated materials include tiered task types, scaffolded supports, and flexible paths for engagement.

2.5 Frameworks for design and development

Robust instructional materials are typically grounded in systematic design frameworks. The ADDIE model (Analyze, Design, Develop, Implement, Evaluate) offers a structured planning cycle. The TPACK framework (Mishra and Koehler, 2006) emphasizes the interplay between content, pedagogy, and technology, especially for digital tools. Universal Design for Learning (CAST, 2011) promotes inclusive practices through multiple means of representation, engagement, and expression. Materials that reflect these frameworks tend to be more intentional, adaptable, and pedagogically coherent, especially when used by teachers at varying levels of experience.

2.6 Synthesis and theoretical alignment

The principles outlined above provide a comprehensive theoretical foundation for our study. Building on these, we conceptualize a three-factor model of instructional material quality evaluation, which includes (1) teacher perceptions of peer-created material quality, (2) pedagogical and structural characteristics of high-quality materials, and (3) teacher-centric considerations and practical benefits.

Through factor analysis, we identify three distinct response patterns that emerged when teachers evaluated different aspects of material quality. These response patterns are not static; they evolve with teachers' experience, highlighting the developmental nature of quality evaluation approaches. Our findings suggest that teachers at different career stages place varying emphasis across these patterns, underscoring the complex and dynamic relationship between experience and material quality evaluation.

The response patterns reflect how teachers responded differently when evaluating peer-created material quality versus pedagogical and structural characteristics of high-quality materials versus teacher-centric considerations and practical benefits. While all three patterns contribute to teacher evaluations of quality, each captures distinct aspects of how teachers approach material assessment.

By aligning our empirical analysis with this theoretical base and examining variations through MANOVA, we aim to propose a career-responsive evaluation model that remains responsive to the evolving pedagogical needs of teachers throughout their careers.

Based on the theoretical foundations outlined above, particularly career-stage models (Huberman, 1989; Berliner, 2004), instructional design principles (Wiggins and McTighe, 2005; Tomlinson, 2001), and theories of professional development (Hargreaves and Fullan, 2012), we anticipated that:

- (1) Teacher evaluations of instructional material quality would reflect multiple, distinct dimensions rather than a single unified construct, consistent with the multidimensional nature of instructional design principles and the complexity of pedagogical decision-making described in the literature.
- (2) Early-career teachers would place greater emphasis on features that provide external structure, clear guidance, and alignment with curriculum standards, reflecting the needs identified in novice teacher development literature and the cognitive demands of early professional practice.

- (3) Experienced teachers would prioritize adaptability, integration of current research, and alignment with personal pedagogical values, consistent with expert teacher characteristics and the development of professional capital over time.
- (4) Subject domain would influence quality priorities due to differences in disciplinary epistemologies, pedagogical traditions, and the nature of content taught across different curriculum areas.

Given the exploratory nature of this research, particularly the factor analysis used to identify quality dimensions, we framed these as theoretical expectations rather than formal hypotheses. Our analytical approach allowed the data to reveal the specific structure of quality evaluation dimensions empirically, while the theoretical framework guided our interpretation of how these patterns relate to teacher development and professional growth.

3 Methodology

3.1 Participants

This study draws on data from 2,102 educators who are active users of the eduki platform, an online educational marketplace for sharing, creating, and accessing teaching materials.¹ All participants were German-speaking teachers based in Germany, Austria, or Switzerland. Recruitment was conducted through direct platform messaging and voluntary participation between October and December 2024.

Participants self-identified into career stages and categorized into four groups: Trainees (less than 2 years of experience), Early-career teachers (2–5 years), Experienced teachers (6–10 years), and Very experienced teachers (more than 10 years). Respondents reported diverse teaching roles across primary and secondary education, with a high representation of teachers working across multiple levels.

The sample was determined through voluntary participation on the eduki platform and therefore represents a non-random, self-selected sample of teachers. While this method ensured access to a large, active teaching population across Germany, Austria, and Switzerland, it also limits representativeness and is acknowledged as a methodological limitation (see Section 5.4).

3.2 Survey instrument

The survey instrument consisted of 26 five-point Likert-scale items and a small number of open-ended questions, designed to capture teacher perceptions of instructional material quality. The instrument was developed using an internally constructed research framework informed by instructional design theory and teacher development literature. It was reviewed and refined in consultation with pedagogical advisors prior to distribution.

Items measured perceptions across several key dimensions, including clarity of learning objectives, instructional coherence, differentiation, adaptability, usability, alignment with curriculum

¹ <https://eduki.com/de>

standards, assessment integration, student engagement, and perceived impact on both teaching practice and professional growth. Additional items explored teachers' evolving definitions of quality over time and comparisons between teacher-generated and publisher-produced resources. The survey was structured around three distinct types of items: questions specifically about peer-created materials, items addressing general pedagogical and structural characteristics of materials, and questions focused on teacher-centric practical considerations.

Demographic data included teaching experience, subject specialization, grade level, and frequency of material creation and use. All closed-ended items used a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Progression-related questions used a parallel five-point scale from 1 (Decreased Significantly) to 5 (Increased Significantly). The full codebook, including item wording and scale structure, is available from the authors upon request for research purposes.

The survey instrument was newly developed for this study and designed to capture teacher perceptions across instructional design, implementation, and impact dimensions. Item development was guided by established frameworks in instructional design and teacher development (e.g., Shulman, 1987; Hattie, 2009; Tomlinson, 2001). To ensure content validity, a team of pedagogical experts reviewed the initial draft. Their feedback was used to revise item wording, structure, and coverage, and the revised version was then piloted with a small group of teachers to confirm clarity and relevance before full deployment. Construct validity was assessed through exploratory factor analysis, which revealed three stable dimensions. Internal consistency reliability was also established: all three subscales exceeded a Cronbach's alpha of 0.70, meeting the conventional threshold for acceptable reliability. Together, these procedures provide evidence for both the validity and reliability of the instrument.

3.3 Mode of administration

The survey was administered digitally through the eduki platform using a secure, invitation-only link. Participants were invited directly via the platform's internal messaging system, and all responses were submitted anonymously through an online survey form. The instrument was accessible on both desktop and mobile devices to accommodate different user preferences and working conditions. No incentives were offered, and no personally identifying information was collected.

3.4 Ethical considerations

This study was conducted in accordance with the European Commission's (2020) ethics guidelines for educational research and complied with national and institutional data protection regulations. All participants provided informed consent digitally before beginning the survey, and participation was entirely voluntary.

Survey responses were collected anonymously. However, participants had the option to voluntarily provide an email address if they wished to be contacted for future research participation or to receive information about potential teacher incentives. Consent for this purpose was explicitly obtained at the time of submission. Email

addresses were stored securely in a separate database, unlinked from survey response data, and were not used for any other purpose.

The study did not involve any collection of sensitive personal data as defined by Article 9 of the General Data Protection Regulation. No names, IP addresses, or identifying metadata were collected. All data were handled in accordance with GDPR Article 6(1)(a) regarding consent-based processing. Given the non-sensitive nature of the data and the low-risk design of the study, external ethics approval was not required under applicable institutional or national review frameworks.

3.5 Data collection timeline

Survey responses were collected over a 12-week period between October and December 2024. The instrument remained continuously accessible throughout this period, allowing participants to complete it at their convenience. All responses were timestamped and reviewed for completeness prior to analysis.

3.6 Analytical approach

The analysis followed a two-stage procedure. After initial descriptive statistics and data inspection, an exploratory factor analysis was conducted using maximum-likelihood extraction with Promax (oblique) rotation to identify response patterns within the 26 Likert-scale items related to teacher evaluations of instructional material quality. Factor extraction, rotation method, and criteria for inclusion were consistent with established psychometric standards and aligned with the study's exploratory nature. This method was selected to accommodate potential correlations between the factors.

In the second stage, a multivariate analysis of variance (MANOVA) was performed to examine whether teachers' factor scores differed significantly by career stage and subject domain. This analysis addressed the study's second and third research questions concerning developmental and disciplinary variation in quality evaluation approaches. All relevant assumptions for MANOVA were checked and met before proceeding with interpretation. The resulting factor structure is presented in Section 4, along with item loadings and thematic interpretation.

Prior to conducting the MANOVA, standard assumptions were examined, including normality of residuals, linearity, and homogeneity of variance-covariance matrices. No violations were detected, and the data met the assumptions required for valid interpretation of MANOVA.

4 Results

4.1 Factor structure and shared foundations of quality

The factor analysis revealed three distinct response patterns underlying teacher perceptions of instructional material quality. These response patterns are labeled: (1) Teacher perceptions of peer-created material quality, (2) Pedagogical and structural characteristics of high-quality materials, and (3) Teacher-centric considerations and practical benefits. The full pattern matrix and inter-factor correlations are presented in Table 1.

TABLE 1 Pattern matrix from exploratory factor analysis using Promax rotation.

Items	Perceptions of peer-created material quality	Characteristics high quality materials	Practical benefits
High-quality materials created by other teachers greatly improve my ability to deliver effective lessons.	0.40	0.03	0.03
High-quality materials created by other teachers contribute significantly to my professional development as an educator.	0.55	−0.05	0.00
High-quality materials created by other teachers should be easily adaptable to different learning contexts and student needs.	0.28	0.06	0.07
The most effective materials created by other teachers include a variety of quality assessment strategies (e.g., formative, summative, self-assessment).	0.47	0.03	−0.02
High-quality materials created by other teachers promote students' critical thinking and problem-solving skills.	0.47	0.03	−0.03
Effective materials created by other teachers have clear organization and structure that facilitate immediate and easy use in the classroom.	0.28	0.10	0.03
The visual design of materials created by other teachers has a significant impact on student engagement.	0.40	0.02	0.03
High-quality materials created by other teachers explicitly connect content to learning outcomes.	0.54	0.04	−0.06
The most effective materials created by other teachers promote both student learning and teacher professional development.	0.58	0.02	0.00
Materials created by other teachers are generally of higher quality than materials created by publishers.	0.38	−0.06	−0.04
Compliance with curriculum standards	0.00	0.66	−0.02
Stimulating and interactive content	−0.05	0.81	−0.01
Clear learning goals	−0.08	0.86	−0.03
Differentiation options	−0.14	0.86	0.03
Integration of technology	0.15	0.45	0.02
Cultural relevance and sensitivity	0.09	0.62	−0.01
Opportunity for students to collaborate	0.07	0.67	0.01
Integrated assessment tools	0.22	0.48	0.01
Ease of use	−0.05	−0.01	0.66
Match your teaching style	−0.04	0.00	0.71
Potential for student participation	0.05	0.00	0.74
Adaptability	−0.06	0.03	0.72
Support for different learning needs	−0.07	0.06	0.76
Inclusion of current research	0.14	0.03	0.49
Potential for your own professional development	0.25	−0.07	0.56
Time saving features	−0.09	−0.02	0.76
Correlations	1	2	3
Characteristics high quality materials	1.00		
Practical benefits	0.20	1.00	
Perceptions peer-created material quality	0.29	0.29	1.00

Bold values indicate factor loadings above 0.40, representing items that load substantially on each factor. Only loadings above this threshold are displayed to highlight the primary factor structure.

4.1.1 Factor 1: Teacher perceptions of peer-created material quality

This factor captures how teachers evaluate the overall quality and usefulness of educational materials created by other educators. It reflects subjective judgments about the instructional effectiveness,

professional relevance, and comparative value of peer-generated resources. The items describe various positive attributes and perceived impacts of high-quality materials created by other teachers. Each statement highlights a different facet of how such peer-created resources contribute to improved teaching effectiveness, student learning, and professional development. For instance, the items cover

pedagogical benefits such as enhancing lesson delivery, fostering critical thinking, and promoting student engagement, while also addressing practical considerations like adaptability, clear organization, and alignment with learning outcomes. Furthermore, the inclusion of items referencing professional growth and comparisons with publisher-produced materials reinforces the overarching theme of the value and authenticity attributed to teacher-generated resources.

4.1.2 Factor 2: Pedagogical and structural characteristics of high-quality materials

This factor captures the structural and pedagogical characteristics that teachers associate with well-designed, high-quality instructional materials. It reflects foundational elements of instructional design that support learning clarity, student engagement, and alignment with curricular expectations. The items in this factor represent key pedagogical and structural features that define effective educational resources. Each item addresses a fundamental aspect essential for successful teaching and learning, ranging from foundational elements like compliance with curriculum standards and clear learning goals to student-focused components such as stimulating content, differentiation options, and opportunities for collaboration. Furthermore, modern considerations including technology integration, cultural relevance, and integrated assessment tools reflect a comprehensive approach to what constitutes instructional quality. The coherence of this grouping suggests that teachers view inclusive, well-structured, and thoughtfully designed materials as central to classroom effectiveness.

4.1.3 Factor 3: Teacher-centric considerations and practical benefits

This factor reflects teacher-facing considerations related to the day-to-day use and professional relevance of instructional materials. It captures how teachers evaluate resources based on classroom adaptability, workflow integration, and alignment with their teaching practice. The items in this factor include practical benefits associated with adopting and using educational resources. Each one addresses how a material supports a teacher's workflow, instructional approach, and overall effectiveness. Practical features such as ease of use, time-saving potential, and adaptability were rated highly, alongside items referencing alignment with teaching style and support for differentiated learning needs. Broader professional considerations such as the inclusion of current research and potential for teacher growth were also represented. Collectively, these items describe how teachers interpret quality in terms of functionality, relevance, and the ability of materials to enhance their instructional experience.

The resulting factor structure reveals three distinct response patterns in how teachers evaluate materials: teacher perceptions of peer-created material quality, pedagogical and structural characteristics of high-quality materials, and teacher-centric considerations and practical benefits. The factors were moderately correlated ($r = 0.20$ – 0.29), indicating that while conceptually distinct, they reflect interconnected response patterns in how teachers evaluate instructional materials. This reinforces a layered understanding of quality evaluation in which teachers simultaneously attend to peer-created material assessments, pedagogical and structural design features, and practical implementation considerations when assessing the value of educational resources.

These response patterns reflect the survey structure, with Factor 1 capturing responses to items specifically about peer-created materials, Factor 2 reflecting evaluations of general pedagogical characteristics, and Factor 3 representing teacher-centric practical considerations.

4.2 Career stage differences in perceived quality

To explore how teachers' perceptions of instructional material quality vary across career stages, we conducted a multivariate analysis of variance (MANOVA) using responses from four self-identified experience groups (see Table 2). While the total number of responses was 2,102, differences in group sizes were due to incomplete or missing data from certain participants:

- Trainee teachers (<2 years), $N = 316$
- Early-career teachers (2–5 years), $N = 440$
- Mid-career teachers (6–10 years), $N = 233$
- Very experienced teachers (>10 years), $N = 586$

The overall MANOVA was statistically significant, indicating meaningful variation across groups:

$$\text{Wilks' Lambda} = 0.89, F(81, 4, 476) = 1.97, p < 0.001.$$

The MANOVA results reveal that teachers at different career stages evaluate material quality through notably different lenses. While all teachers value core features, the relative emphasis they place on specific dimensions shifts significantly as expertise develops, demonstrating that quality evaluation is a developmental competency rather than a fixed construct.

Univariate F-tests for each item were then examined to identify the specific dimensions that most strongly differentiated teacher perceptions of quality. These results are presented in Table 2, which reports mean squares, F -values, degrees of freedom, and significance levels across items.

The patterns in Table 2 reveal differential emphasis across the three quality dimensions. Items loading on Factor 1 (Teacher Perceptions of Peer-Created Material Quality) showed significant variation across career stages, with early-career teachers rating peer-created materials more highly for professional development ($F = 4.572, p = 0.003$) and lesson delivery ($F = 2.756, p = 0.041$). Items loading on Factor 2 (Pedagogical and Structural Characteristics) showed mixed patterns, with early-career teachers emphasizing curriculum compliance ($F = 2.624, p = 0.049$) and stimulating content ($F = 3.252, p = 0.021$), while foundational features like clear learning goals and differentiation options did not differ significantly by career stage. Items loading on Factor 3 (Teacher-Centric Considerations and Practical Benefits) showed the strongest career-stage effects, with experienced teachers prioritizing ease of use ($F = 3.841, p = 0.009$), technology integration ($F = 3.288, p = 0.020$), support for different learning needs ($F = 3.647, p = 0.012$), and inclusion of current research ($F = 5.259, p = 0.001$).

TABLE 2 MANOVA results by career stage—items organized by factor.

Item	MS	F	df	Sig.
Factor 1: Teacher perceptions of peer-created material quality				
High-quality materials created by other teachers greatly improve my ability to deliver effective lessons.	1.295	2.756	3, 1,570	0.041
High-quality materials created by other teachers contribute significantly to my professional development as an educator.	3.459	4.572	3, 1,570	0.003
High-quality materials created by other teachers should be easily adaptable to different learning contexts and student needs.	1.788	3.351	3, 1,570	0.018
The most effective materials created by other teachers include a variety of quality assessment strategies (e.g., formative, summative, self-assessment).	3.535	5.210	3, 1,570	0.001
High-quality materials created by other teachers promote students' critical thinking and problem-solving skills.	1.254	2.136	3, 1,570	0.094
Effective materials created by other teachers have clear organization and structure that facilitate immediate and easy use in the classroom.	0.924	1.842	3, 1,570	0.138
The visual design of materials created by other teachers has a significant impact on student engagement.	0.135	0.221	3, 1,570	0.882
High-quality materials created by other teachers explicitly connect content to learning outcomes.	0.192	0.336	3, 1,570	0.800
The most effective materials created by other teachers promote both student learning and teacher professional development.	2.378	3.562	3, 1,570	0.014
Materials created by other teachers are generally of higher quality than materials created by publishers.	0.965	1.131	3, 1,570	0.335
Factor 2: Pedagogical and structural characteristics of high-quality materials				
Compliance with curriculum standards	2.431	2.624	3, 1,570	0.049
Stimulating and interactive content	2.909	3.252	3, 1,570	0.021
Clear learning goals	1.630	1.702	3, 1,570	0.165
Differentiation options	2.219	2.118	3, 1,570	0.096
Integration of technology	2.859	3.288	3, 1,570	0.020
Cultural relevance and sensitivity	1.226	1.301	3, 1,570	0.272
Opportunity for students to collaborate	0.865	0.954	3, 1,570	0.413
Integrated assessment tools	3.054	3.263	3, 1,570	0.021
Factor 3: Teacher-centric considerations and practical benefits				
Ease of use	3.317	3.841	3, 1,570	0.009
Match your teaching style	0.859	1.115	3, 1,570	0.342
Potential for student participation	0.143	0.198	3, 1,570	0.898
Adaptability	0.942	1.179	3, 1,570	0.316
Support for different learning needs	2.776	3.647	3, 1,570	0.012
Inclusion of current research	4.215	5.259	3, 1,570	0.001
Potential for your own professional development	0.282	0.363	3, 1,570	0.779
Time saving features	0.837	1.058	3, 1,570	0.366
Additional item				
My definition of quality teaching material has changed greatly over the course of my career	8.788	10.238	3, 1,570	0.000

Items are organized according to their factor loadings from the exploratory factor analysis. The item "My definition of quality teaching material has changed greatly" did not load strongly on any single factor and is presented separately.

The means and standard deviations for the higher and lower discriminating items across career stages are presented in [Table 3](#). These ratings offer a summary of how teachers at different experience levels rated key characteristics of teaching materials.

4.2.1 Variations across career stages

Nine of the thirteen core items showed statistically significant variation across teaching experience levels. These items predominantly related to aspects of personal growth and professional evolution, impact and effectiveness of the materials, as well as their adaptability to student needs, inclusion of current research, and overall practicality.

The items that differentiated the most across career stages included:

- Personal growth and evolution: e.g., "High-quality materials created by other teachers contributed significantly to my professional development as an educator."
- Impact and effectiveness of the materials: e.g., "The most effective materials created by other teachers promote both student learning and teacher professional development."
- Adaptability and response to need: e.g., "Resources relate to support for different learning needs."
- Inclusion and currency: e.g., "Inclusion of current research."
- Practicality and ease of use: e.g., "Ease of use."

In contrast, items that did not show significant variation across experience levels were more closely aligned with core pedagogical principles, general qualities, and logistical support. These included:

- Basic pedagogical principles: e.g., “Promotion of students’ critical thinking and problem-solving skills.”
- General qualities: e.g., “Cultural relevance and sensitivity.”
- Logistical supportive aspects: e.g., “Time-saving features.”

Thus, the discriminating items were more related to effectiveness, adaptability, personal impact, and the dynamic nature of teaching resources. On the other hand, the non-significant items, which mean there was no important differences across the four levels of experience, focused more on fundamental good practices, general qualities, or characteristics that are widely agreed upon and deemed essential but less impactful in differentiating teaching experience levels.

4.2.2 Average differences across career stages

The greatest average difference across the 13 most discriminating items was observed between early-career teachers (2–5 years) and both mid-career (6–10 years) and very experienced teachers (>10 years). The average mean difference between the early-career group and the more experienced groups was 0.10, in contrast to the smaller differences between early-career teachers and trainees (−0.04) and between mid-career and very experienced teachers (0.01).

The means, standard deviations, and effect sizes for the higher and lower discriminating items are presented in [Table 4](#). These ratings provide a summary of how teachers at different experience levels rated key characteristics of teaching materials.

4.2.3 Key themes in career stage variations

Seven items showed higher means for more experienced teachers compared to their less experienced peers. These items focused on dynamic, practical, and evolving aspects of teaching materials, as well as personal pedagogical development. These items reflect how materials and teaching strategies evolve as teachers gain experience.

The themes identified were:

- Teacher evolution and personal growth: Item 1 directly addresses the teacher’s personal development and changing understanding of quality over time.
- Practicality and implementation: Items 5 (Ease of use) and 7 (Integrated assessment tools) directly relate to the teacher’s practical application and usability of materials. Item 2, while about assessment strategies, also points to practical implementation.
- Modernity and adaptability: Items 3 (Current research), 4 (Technology), and 6 (Different learning needs) emphasize the need for materials to be up-to-date, technologically integrated, and flexible enough to cater to diverse learners.
- Core components of effective materials: Assessment strategies and technology integration are specific, fundamental elements of modern effective teaching materials.

In contrast, the items rated higher by early-career teachers than their more experienced peers primarily focus on the broader impact, utility, and characteristics of shared or external teaching materials (specifically those created by other teachers). These items emphasize

the consequences and benefits of utilizing well-designed, adaptable, and compliant materials, particularly those created by or influenced by other educators.

The key themes here included:

- Impact on students and teachers: Item 1 explicitly links materials to student learning and teacher professional development. Item 4 emphasizes improving the teacher’s delivery, and Item 6 focuses on teacher professional development.
- Versatility and quality of shared resources: Item 2 emphasizes adaptability to various contexts and student needs.
- Engagement and design: Item 3 points to a key characteristic of content that makes it effective.
- Alignment and professional benefit: Item 5 (Compliance) speaks to alignment with external requirements. Item 6 (Professional development) directly highlights the benefit to the educator.

4.2.4 Interpretation of findings

Experienced teachers focus on their personal journey with teaching materials, emphasizing the practical integration of modern components like assessment, technology, and research, as well as usability (“ease of use”). Their priorities shift toward how materials support their pedagogical evolution. For these teachers, it is about how they use and perceive evolving tools and approaches, with their definition of quality materials changing over time (“My definition changed”).

Early-career teachers focus on the broader impact of materials and how they support both student outcomes and professional growth. They emphasize materials’ flexibility, adaptability, and alignment with educational standards. Early-career teachers rated higher on features that relate to the outcomes and characteristics of materials, particularly those sourced from other teachers, regarding their impact on student learning, teacher development, and their inherent flexibility. For them, it’s about what effective materials, especially those created by other educators, achieve and how they are designed for broad impact and alignment with standards.

The clearest and most striking finding from this MANOVA is that teacher experience is a statistically significant discriminator not only in preferences for teaching materials but also in the definition of what constitutes quality. This shift in perception is not merely anecdotal; it demonstrates distinct patterns across career stages.

Early-career teachers prioritize aspects related to immediate usability and foundational support. They seek resources that directly facilitate their ability to deliver lessons and support their initial professional development. These teachers tend to focus on practicality and materials that provide clear guidance, adaptability, and immediate application.

On the other hand, more experienced teachers have a deeper, more nuanced understanding of quality. Their priorities resonate with items such as stimulating and interactive content, high-quality materials that promote both student learning and teacher professional development, and those that significantly contribute to their ongoing professional growth. As teachers gain experience, their focus shifts from basic functionality to leveraging materials for profound impact, alignment with their pedagogical values, and a comprehensive understanding of how resources can advance both student learning and teacher development.

This highlights the importance for platforms that provide teaching resources to adopt a nuanced approach to defining and delivering

TABLE 3 Means and standard deviations for higher and lower discriminating items related to teaching experience.

Items	Mean	SD
Items from Factor 1: Teacher perceptions of peer-created material quality		
Effective materials created by other teachers have clear organization and structure that facilitate immediate and easy use in the classroom.	4.32	0.709
The visual design of materials created by other teachers has a significant impact on student engagement.	4.15	0.783
High-quality materials created by other teachers explicitly connect content to learning outcomes.	3.85	0.756
High-quality materials created by other teachers promote students' critical thinking and problem-solving skills.	3.75	0.767
Materials created by other teachers are generally of higher quality than materials created by publishers.	3.22	0.923
Items from Factor 2: Pedagogical and structural characteristics of high-quality materials		
Differentiation options	4.14	1.025
Clear learning goals	4.13	0.979
Opportunity for students to collaborate	3.78	0.952
Cultural relevance and sensitivity	3.48	0.971
Items from Factor 3: Teacher-centric considerations and practical benefits		
Time saving features	4.00	0.889
Adaptability	3.69	0.894
Match your teaching style	3.68	0.878
Potential for student participation	3.66	0.848
Potential for your own professional development	3.32	0.880

quality. Quality is not a static concept; it is fluid and context-dependent, requiring an understanding not only of what constitutes quality, but for whom it is being defined at various stages of their teaching career.

4.3 Subject-specific variation in quality priorities

A second MANOVA explored subject-specific variation. Statistically significant multivariate effects were observed in Mathematics ($F = 3.437$, $p < 0.001$), German ($F = 2.856$, $p < 0.001$), Science ($F = 1.796$, $p = 0.007$), Visual Arts ($F = 1.929$, $p = 0.003$), Special Education ($F = 1.904$, $p = 0.003$), and Computer Science ($F = 2.127$, $p = 0.001$). However, no significant differences were found in Social Sciences, English, Sport, or Vocational and Technical Education.

These results are summarized in Table 5, which reports the Wilks' Lambda, Multivariate F -values, degrees of freedom, and p -values for each subject area. Additionally, Table 6 presents the means, standard deviations, and effect sizes for key dimensions related to teaching versus non-teaching responses across various subjects. As seen in the table, differences were observed in dimensions such as technology integration, materials quality comparison, and differentiation across subject areas.

- **Technology integration:** While generally seen as important, its *relative value* differs. The lower rating in Computer Science is not necessarily a dismissal of technology itself but likely reflects a higher baseline expectation, a more critical perspective (they are experts in tech), or perhaps an internal critique of how "integration" is typically framed in this subject. Conversely, its

higher rating in Math, Science, and German suggests these domains actively seek to leverage technology to enhance learning.

- **Value of shared materials** ("materials rated by other teachers"): Computer Science teachers, perhaps due to the rapid evolution of their field or the prevalence of open-source resources, find value in peer-reviewed or community-validated materials. In contrast, Math and Visual Arts lean more on established pedagogical approaches or highly specialized/creative content.
- **Differentiation:** This is a core pedagogical principle, but its emphasis varies. Its higher importance in Math and Visual Arts could stem from the inherent diversity in student skill levels in these subjects, which often require highly individualized approaches. The lower emphasis in German might suggest a more structured, sequential learning path or a different pedagogical tradition.
- **Compliance with curriculum standards:** The high priority in Math and Visual Arts suggests these subjects might have more rigid or heavily regulated curriculum frameworks that teachers feel compelled to adhere to closely. The lower rating in Special Education implies that students' individual needs supersede strict adherence to general curriculum standards or that their curricula are inherently more flexible and individualized.

These subject-specific patterns demonstrate that "quality" is not only developmentally situated (varying by career stage) but also disciplinarily situated (varying by content area), requiring curriculum developers to attend to both dimensions when designing effective instructional resources. The major conclusion is that effective curriculum development, resource creation, and professional development strategies need to be highly tailored to these specific demands and pedagogical cultures of individual subject domains. A

TABLE 4 Means, standard deviations, and effect sizes for higher and lower discriminating items by teaching experience.

Items	N	<2 yr	2–5 yr	6–10 yr	>10 yr	Total	SD	d Exp–New
Items from Factor 1: Teacher perceptions of peer-created material quality								
High-quality materials created by other teachers greatly improve my ability to deliver effective lessons.	316	4.36	4.34	4.26	4.25	4.30	0.69	–0.28
High-quality materials created by other teachers contribute significantly to my professional development as an educator.	316	3.92	3.880	3.79	3.73	3.82	0.873	–0.33
High-quality materials created by other teachers should be easily adaptable to different learning contexts and student needs.	316	4.38	4.260	4.42	4.39	4.36	0.732	0.23
The most effective materials created by other teachers include a variety of quality assessment strategies (e.g., formative, summative, self-assessment).	316	3.34	3.290	3.29	3.46	3.39	0.827	0.15
The most effective materials created by other teachers promote both student learning and teacher professional development.	316	3.94	3.900	3.9	3.77	3.86	0.819	–0.20
Items from Factor 2: Pedagogical and structural characteristics of high-quality materials								
Compliance with curriculum standards	316	3.96	3.850	3.74	3.89	3.87	0.964	–0.19
Stimulating and interactive content	316	4.29	4.160	4.08	4.11	4.16	0.948	–0.28
Integration of technology	316	3.16	3.250	3.33	3.29	3.23	0.935	0.22
Integrated assessment tools	316	3.26	3.210	3.38	3.38	3.31	0.969	0.30
Items from Factor 3: Teacher-centric considerations and practical benefits								
Ease of use	316	3.68	3.670	3.82	3.84	3.76	0.932	0.33
Support for different learning needs	316	3.76	3.670	3.8	3.85	3.78	0.875	0.26
Inclusion of current research	316	3.16	3.140	3.27	3.34	3.24	0.899	0.35
Additional item								
My definition of quality teaching material has changed greatly over the course of my career	316	3.47	3.560	3.75	3.78	3.65	0.935	0.54

Items are organized according to their factor loadings from the exploratory factor analysis (Table 1). Effect sizes (d) represent Cohen's d comparing experienced (>10 years) to early-career (2–5 years) teachers. Only items showing the strongest discrimination across career stages are included.

“good” teaching material in Mathematics may embody different key characteristics than a “good” one in German or Computer Science.

5 Discussion

The results confirm that instructional material quality is a multidimensional, developmental, and curriculum-sensitive construct. Teachers converge around core response patterns when evaluating materials: teacher perceptions of peer-created material quality, pedagogical and structural characteristics of high-quality materials, and teacher-centric considerations and practical benefits. There are important changes in how teachers select and define quality relating to their experience, and the concepts of quality can differ across subjects. Crucially, quality evaluation approaches are not static; they evolve in parallel with teaching expertise and can vary across curriculum areas. The response patterns emerging from this study offer a flexible, empirically grounded framework for future resource development, teacher training, and AI-supported content personalization.

5.1 Quality is structured and observable, yet evolves with experience

The factor analysis revealed three distinct response patterns in how teachers evaluate the quality of instructional materials: (1) Teacher perceptions of peer-created material quality, (2) Pedagogical and structural characteristics of high-quality materials, and (3) Teacher-centric considerations and practical benefits. Together these response patterns reflect the layered ways in which teachers judge resources, combining judgments about peer-authored value, design integrity, and classroom practicality. Importantly, the three factors were moderately correlated, showing that teachers rarely view these criteria in isolation.

The MANOVA results then demonstrated that teachers’ emphases within these dimensions shift as their careers progress. Significant variation across career stages was not observed for all items, but emerged most strongly around features tied to professional growth, adaptability, and evolving pedagogical needs. For example, early-career teachers rated items related to peer-created materials especially highly, valuing their contribution to lesson delivery and professional

TABLE 5 Multivariate tests for subject-specific variation in teaching material quality by subject area.

Multivariate tests	Wilks Lambda	Mult. F	df	p
Mathematics	0.943	3.437	27, 1,546	<0.001
Natural sciences	0.970	1.796	27, 1,546	0.007
German language	0.952	2.856	27, 1,546	<0.001
Social sciences	0.973	1.577	27, 1,546	0.030
English	0.976	1.388	27, 1,546	0.089
Other foreign languages	0.982	1.03	27, 1,546	0.422
Visual arts	0.967	1.929	27, 1,546	0.003
Sport	0.983	1.019	27, 1,546	0.438
Computer science technology	0.964	2.127	27, 1,546	0.001
Vocational technical	0.984	0.91	27, 1,546	0.599
Special education	0.968	1.904	27, 1,546	0.003

development. They also placed emphasis on stimulating content and alignment with curriculum standards. In contrast, more experienced teachers scored higher on items linked to practical benefits and modern features, such as ease of use, integration of current research, support for different learning needs, and the use of integrated assessment tools.

These findings are consistent with [Huberman's \(1989\)](#) career-cycle model and [Berliner's \(2004\)](#) distinction between novice and expert teachers, both of which emphasize that teacher priorities evolve with experience. Our results provide empirical confirmation that perceptions of material quality follow a similar developmental pattern. This also aligns with [Hargreaves and Fullan's \(2012\)](#) concept of professional capital, which highlights the growing agency and judgment teachers bring to their work as they advance in their careers.

These career-stage differences may reflect the changing demands and cognitive resources of teachers across the professional lifespan. Early-career teachers often experience high levels of uncertainty and time pressure, leading them to prefer materials that reduce cognitive load and offer clear structure. As teachers gain confidence and experience, they rely more on internalized pedagogical schemas and are better equipped to evaluate and adapt materials flexibly. Veteran teachers may also seek materials that align with their personal instructional values and enable creative or innovative teaching practices. This developmental progression parallels models of situated learning and expertise acquisition, in which professional judgment and resource use become increasingly context-sensitive and self-directed over time.

What this suggests is not that teachers at different career stages abandon one dimension of quality in favor of another, but that their interpretive focus within the shared framework shifts with experience. Novice and early-career teachers lean toward resources that provide external guidance and exemplars (Factor 1), whereas experienced teachers concentrate on items that allow them to streamline practice and integrate new ideas (Factors 2 and 3). Across all stages, however, certain foundational elements, such as clear structure, visual organization, and differentiation options, were rated highly, forming a shared baseline of what teachers agree constitutes “quality.”

In short, the evaluation of quality is both structured and developmental: teachers share a common framework, but their priorities within it evolve alongside their professional growth.

5.2 Strategic implications: one model, multiple entry points

The findings suggest that curriculum resource development should move away from a “one-size-fits-all” model and instead adopt a differentiated, layered strategy that reflects both the evolving needs of teachers across their careers and the specific demands of subject domains. While teachers share a common baseline definition of quality, the emphasis they place on particular features shifts with experience.

For early-career teachers, the items they rated most highly align with pedagogical and structural characteristics of high-quality materials. They valued clear goals, structured guidance, compliance with standards, and features that reduce preparation time. Such resources provide reassurance and confidence during the early stages of professional development, allowing teachers to focus on lesson delivery while gradually building pedagogical expertise.

For more experienced teachers, the higher-rated items clustered around teacher-centric considerations and practical benefits. These included ease of use, adaptability to different learning needs, integration of current research, and flexible assessment strategies. Veteran teachers are more likely to evaluate materials in relation to their own pedagogical values and professional growth, using resources as tools for refinement, innovation, and deeper impact on learning.

This evolution can also be interpreted through a Vygotskian perspective, where instructional materials act as mediating tools that support both student learning and teacher professional growth. The emphasis on adaptability and responsiveness in our findings further reflects [Tomlinson's \(2001\)](#) framework for differentiated instruction, which underscores the importance of flexible design in meeting diverse learner needs. Our results extend these theories by showing that differentiation is not only necessary for students but also for teachers themselves at different career stages.

Subject domain differences also matter. For example, Computer Science requires resources that go beyond generic technology integration, while Mathematics and Visual Arts emphasize differentiation, scaffolding, and compliance with curricular frameworks. In Special Education, flexibility and customization outweigh strict curriculum adherence, reflecting the centrality of individualized approaches.

To operationalize these insights, we propose a tiered or layered model of curriculum resource design that maps onto the three factors identified in this study:

- **Core layer** (Pedagogical and structural characteristics): Provides the essential, ready-to-use, compliant materials that establish clarity, coherence, and consistency. This layer supports novice and early-career teachers by offering a secure baseline of quality.
- **Adaptation layer** (Teacher-centric considerations and practical benefits): Offers modular components, customizable templates, and differentiated options that allow teachers to tailor resources to their

TABLE 6 Means, standard deviations, and effect sizes for teaching vs. non-teaching responses across key quality dimensions.

Item	Math	SD	N	Science	SD	N	German	SD	N	Compu	SD	N
Integration of technology												
Teaching	3.18	0.90	829	3.16	0.94	526	3.21	0.90	964	3.44	0.92	146
Not teaching	3.29	0.97	746	3.27	0.93	1,049	3.26	0.98	611	3.21	0.93	1,429
Total	3.23	0.93	1,575	3.23	0.93	1,575	3.23	0.93	1,575	3.23	0.93	1,575
Effect (Teaching— Not teaching)			−0.11			−0.12			−0.05			0.24

Item	Math	SD	N	Visual	SD	N	Comput	SD	N
Materials created by other teachers are generally of higher quality than materials created by publishers									
Teaching	3.21	0.89	829	3.16	0.90	622	3.39	0.93	146
Not teaching	3.23	0.96	746	3.27	0.94	953	3.21	0.92	1,429
Total	3.22	0.92	1,575	3.22	0.92	1,575	3.22	0.92	1,575
Effect (Teaching— Not teaching)			−0.03			−0.12			0.20

Item	Math	Std.	N	Visual	Std.	N	German	Std.	N
Differentiation									
Teaching	4.24	1.00	828	4.18	1.04	621	4.05	1.06	611
Not teaching	4.03	1.04	746	4.12	1.01	953	4.20	1.00	963
Total	4.14	1.02	1,574	4.14	1.02	1,574	4.14	1.02	1,574
Effect (Teaching— Not teaching)			0.21			0.06			−0.15

Item	Math	SD	N	Visual	SD	N	Special	SD	N
Compliance with curriculum standards									
Teaching	3.93	0.95	829	3.93	0.97	622	3.73	0.99	299
Not teaching	3.81	0.97	746	3.83	0.96	953	3.90	0.96	1,276
Total	3.87	0.96	1,575	3.87	0.96	1,575	3.87	0.96	1,575
Effect (Teaching— Not teaching)			0.13			0.10			−0.19

Effect sizes represent the difference between teaching and not teaching that specific subject.

classrooms. This layer aligns with the needs of teachers who seek efficiency, adaptability, and integration with their practice.

- Extension/innovation layer (Teacher perceptions of peer-created material quality): Encourages innovation, co-creation, and critical engagement with peer-authored resources. This layer reflects how experienced teachers use materials as a vehicle for professional growth, pedagogical reflection, and contribution to the wider teaching community.

By adopting this layered approach, resource developers can ensure that materials remain relevant and impactful across both career stages and subject domains.

Building on this framework, the findings carry practical implications for curriculum developers, instructional designers, and policymakers. For curriculum designers, the results suggest tailoring materials to teachers’ career stages: highly structured, ready-to-use resources for early-career teachers; adaptable, modular resources for mid-career teachers; and opportunities for innovation and co-creation for experienced teachers. For technology integration, designers should move beyond generic add-ons and ensure technology enhances

subject-specific pedagogy (e.g., visualization in mathematics, collaborative platforms in language arts). For policymakers, supporting differentiated professional development and providing access to tiered quality resources can align teacher growth with curriculum reform.

Overall, quality is not a single, universal construct but a dynamic one, requiring scaffolding for early-career teachers, adaptability for mid-career teachers, and opportunities for innovation and reflection for veteran teachers.

5.3 Rationale for quality assessment rubrics

As an example of integrating these varying notions of quality, the eduki Quality Assessment Rubrics (Garay Abad, 2025- validated by Prof- John Hattie) were developed as a practical application of the research findings presented in this study. Specifically, they draw directly from two of the most actionable dimensions from the factor analysis:

- Pedagogical and structural characteristics of high-quality materials

- Teacher-centric considerations and practical benefits

These dimensions were prioritized because they represent observable, teacher-relevant indicators of quality that can be evaluated across materials, teaching contexts, and author levels. The rubrics support not only better material choice but also guide the creation of effective resources by teacher-authors.

The rubric framework includes seven core dimensions that synthesize structural clarity, differentiation, adaptability, and usability, each selected based on their salience in the dataset and alignment with both academic literature and teacher-reported priorities:

- Learning goals and structural features—clarity of intentions, logical sequencing, and alignment with outcomes.
- Differentiation options—accessibility and responsiveness to diverse learner needs.
- Content engagement features—cognitive activation, depth, and opportunities for extended thinking.
- Collaborative features—support for interaction, group work, and peer learning.
- Contextual and cultural relevance—inclusivity, authenticity, and sensitivity to learner backgrounds.
- Time-efficiency features—readiness for classroom use, reducing preparation load.
- Teacher growth features—opportunities for reflection, adaptation, and professional development.

Together, these dimensions, along with their respective low–medium–high criteria, provide a structured yet flexible tool for operationalizing quality. The explicit criteria allow the rubric to function not only as a research-based framework but also as a practical guide for design improvement and peer evaluation. While the full criteria are not included here due to intellectual property considerations, they are available from the authors upon request for academic or research purposes.

The first factor in our model, teacher perceptions of peer-created material quality, reflects the critical subjective and evolving value of materials. However, because these perceptions are inherently context-dependent and less directly observable, this factor was not embedded in the initial rubric structure. Instead, the rubrics aim to support immediate evaluation and iterative improvement of materials, especially for teacher-authors seeking to enhance pedagogical usability and relevance.

It is also important to note that curriculum alignment was deliberately excluded from the rubric dimensions. While alignment to local or national standards is crucial in practice, teaching materials on international sharing platforms often transcend specific curricular frameworks. A resource created in one system (for example, Peru) may be adopted in another (for example, Italy), where detailed curricular mapping is neither feasible nor directly transferable. Instead, the rubric emphasizes competencies that are pedagogically robust and transferable across contexts—such as clarity, differentiation, and engagement—which underpin effective teaching independent of curriculum system. Curriculum alignment is therefore better treated as an implementation concern for teachers and schools, rather than as an intrinsic marker of material quality.

Importantly, the rubrics are not intended as a fixed scoring system, but as a developmental guide that reflects how teachers

interpret quality during planning and implementation. They offer a shared language for design improvement and peer feedback while remaining sensitive to variations in teacher experience. Their theoretical foundation ensures they are both research-aligned and practically scalable for use in digital marketplaces, author training, and internal content quality assurance.

Looking forward, the quality of peer-created materials could be further strengthened through structured peer-review mechanisms and iterative improvement processes. Digital platforms might implement community-based feedback systems where materials are reviewed using rubrics such as the one described here, allowing teacher-authors to refine resources over time based on formative input. Additional features, such as author profiles, collaborative design tools, and quality badges, could support transparency and trust in shared materials. These approaches would allow for scalable, teacher-led quality assurance while retaining the authenticity and creativity that make peer-created materials valuable. By embedding continuous feedback into the platform or professional development context, such systems can support sustainable quality growth across author communities.

5.4 Limitations and future research

This study offers a large-scale, empirically grounded model of how teachers conceptualize instructional material quality, but several limitations should be acknowledged.

First, the sample for this study was limited to German-speaking teachers from Germany, Austria, and Switzerland, recruited via the eduki platform. While this provided access to a large and engaged population, it also introduces cultural and systemic homogeneity that may limit generalizability. Teachers in other countries may conceptualize material quality differently due to variations in curriculum frameworks, accountability systems, or professional cultures. Future research should replicate this study across diverse linguistic and cultural contexts to evaluate the broader applicability of the findings.

Second, although the survey instrument was constructed from prior theoretical frameworks and reviewed for clarity, it remains a self-report measure. Teacher perceptions do not always align directly with classroom practice or student outcomes. Self-report data may be influenced by factors such as social desirability bias, response framing, or personal reflection accuracy. While the statistical findings are internally consistent, the external validity of these perceptions, particularly their relationship to classroom impact, requires further investigation. Future research should triangulate these findings with observational data, classroom artifacts, or student achievement results, and ideally adopt a mixed-methods approach to strengthen the overall rigor and interpretive power of this model.

Third, the study focuses on teacher-generated materials and their quality in the context of lesson planning and delivery. While this aligns with the operational focus of many digital platforms and marketplaces, it does not encompass broader forms of curricular resource development, such as textbook authoring or full-program design. The extent to which these quality dimensions transfer to other material types remains an open question.

Finally, while this study identifies statistically robust response patterns and career-stage preferences, it does not yet evaluate how the use of higher-quality materials, as defined here, influences sustained teacher effectiveness or measurable student learning outcomes. This remains a critical next step. Future research should explore how the three-cluster model of material quality can inform classroom feedback systems, AI personalization tools, and teacher professional development programs. It should also be noted that the factor structure may partly reflect the survey's design, as items were grouped by theme (peer-created materials, design characteristics, and teacher-centric considerations). While this alignment is informative, future studies should continue to test whether these patterns replicate with different item framings or alternative measurement approaches.

6 Conclusion

This study provides a scalable, evidence-based framework for understanding how teachers perceive the quality of instructional materials. By analyzing responses from over 2,000 educators across four career stages, we identified three distinct response patterns in how teachers evaluate materials: teacher perceptions of peer-created material quality, pedagogical and structural characteristics of high-quality materials, and teacher-centric considerations and practical benefits.

Our findings highlight that the concept of quality shifts with experience. Early-career teachers place greater emphasis on structured, ready-to-use features that reduce preparation demands, while more experienced teachers prioritize adaptability, integration of current research and assessment, support for diverse learning needs, and alignment with personal pedagogical values. Quality perceptions also vary across subject domains. Characteristics such as technology integration, differentiation, and curriculum compliance take on different importance depending on the subject, which underscores the need for tailored resources that reflect both career stage and disciplinary demands.

The *eduki* Quality Assessment Rubrics, developed from these insights, translate the research into a practical tool for evaluating and refining materials. Drawing on the factors related to pedagogical and structural characteristics of high-quality materials and teacher-centric considerations and practical benefits, the rubrics provide observable, actionable criteria that support teacher choice and guide author design. While the more subjective factor of teacher perceptions of peer-created material quality is acknowledged, it is not embedded in the rubric due to its context-dependent nature.

Overall, these results argue for a differentiated, layered approach to curriculum resource development that considers teachers' career stages and subject domains. Designing resources that align with these evolving definitions of quality can increase usefulness, adoption, and impact, improving teaching and learning outcomes for educators and students alike.

Beyond classroom practice and curriculum development, these findings carry broader implications for educational policy. Policymakers designing national teacher development programs can use the differentiated model of material quality to support career-stage-sensitive resource provision and training. For example, induction programs might prioritize structural clarity and

support for standards alignment, while later professional learning could focus on adaptable resources and professional judgment. The three-cluster model also offers a scalable framework for informing AI-driven personalization systems, national resource portals, or international material-sharing initiatives. Embedding teacher-centered quality criteria into these systems can help ensure that material design evolves in line with pedagogical values and professional growth needs across contexts.

Data availability statement

The datasets generated and analyzed during the current study are not publicly available due to participant privacy protections and institutional data policies, but anonymized aggregate data may be available from the corresponding author upon reasonable request and with appropriate ethical approval.

Author contributions

LG: Conceptualization, Investigation, Resources, Funding acquisition, Supervision, Writing – original draft, Data curation, Project administration, Writing – review & editing, Methodology, Formal analysis. JH: Visualization, Data curation, Methodology, Validation, Supervision, Writing – review & editing, Formal analysis.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This work was supported by Lehrerkolleg LK GmbH as part of their internal educational impact research initiative. The funder was not involved in the study design, collection, analysis, interpretation of data, the writing of this article, or the decision to submit it for publication.

Acknowledgments

The authors would like to thank the educators who participated in this study for their valuable insights and contributions. We also acknowledge the support of the *eduki* platform, and the teams involved, for facilitating data collection, translation and feedback.

Conflict of interest

LG is employed by Lehrerkolleg LK GmbH.

The remaining 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.

Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. Generative AI was used to assist with summarization,

restructuring content, and formatting references. All research findings, analysis, and interpretations were conducted and verified by the authors.

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