



Development of a Teacher Curriculum Innovation Competency Framework to Support AI-Based Learning Transformation

Hannah¹, Indeela², Aqsad Fehmeed³

^{1,2} Faculty of Educational Sciences and Technology (FEST), Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia

³ S1 Sistem Informasi, STMIK IKMI Cirebon, Indonesia

Article Info	ABSTRACT
<p>Article history:</p> <p>Received Feb 23, 2026 Revised Mar 25, 2026 Accepted April 30, 2026</p> <hr/> <p>Keywords:</p> <p>Artificial Intelligence (AI); Teacher Competency; Curriculum Innovation; AI-Based Learning; Framework Development.</p>	<p>The rapid development of artificial intelligence (AI) has created new opportunities for transforming teaching and learning, particularly in curriculum design, instructional delivery, and learning assessment. However, teachers may face challenges in integrating AI effectively because of differences in technological knowledge, pedagogical skills, curriculum innovation capabilities, and understanding of ethical AI use. This study aims to develop a Teacher Curriculum Innovation Competency Framework to support AI-based learning transformation. The research employs a Design and Development Research (DDR) approach, consisting of literature review, competency identification, framework design, and expert validation. Relevant literature on teacher digital competence, technological pedagogical knowledge, AI literacy, curriculum innovation, and responsible AI integration is analyzed to identify essential competency domains and indicators. The proposed framework comprises six dimensions: AI literacy and technological competence, curriculum design and innovation, AI-integrated pedagogical competence, assessment and learning analytics, ethical and responsible AI practice, and professional collaboration and continuous development. These dimensions are intended to provide a structured foundation for assessing teacher competencies and designing targeted professional development programs. The framework also emphasizes the importance of aligning AI applications with learning objectives, educational contexts, student needs, and ethical principles. However, the proposed framework requires further validation through expert evaluation and empirical testing before its effectiveness can be established. Future research should examine its validity, reliability, and applicability across educational levels and institutional settings. The framework is expected to support systematic teacher development and responsible AI-based learning transformation.</p> <p style="text-align: right;"><i>This is an open access article under the CC BY-NC license.</i></p>



Corresponding Author:

Hannah
Faculty of Educational Sciences and Technology (FEST),
Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia
hannah@gmail.com

1. INTRODUCTION

The rapid development of Artificial Intelligence (AI) has brought significant changes to educational systems, particularly in teaching, learning, and curriculum development. Technologies such as generative AI, intelligent tutoring systems, adaptive learning platforms, automated assessment tools,

and AI-powered learning analytics provide opportunities to create more personalized, interactive, and data-driven learning experiences (Bhutoria, 2022). These technologies enable teachers to develop instructional materials, analyze student learning needs, design learning activities, and evaluate educational outcomes more efficiently. However, successful AI integration requires more than technological proficiency. Teachers must also possess the pedagogical knowledge, curriculum design skills, critical thinking abilities, and ethical awareness necessary to ensure that AI supports meaningful learning. Consequently, developing teacher competencies in curriculum innovation has become an important consideration in educational transformation.

Teachers are increasingly expected to move beyond conventional instructional practices and adopt innovative approaches that integrate AI into curriculum planning, implementation, and evaluation (Pedro et al., 2019). This transformation requires teachers to align AI-supported learning activities with curriculum objectives, student characteristics, and appropriate assessment strategies. Nevertheless, teachers may experience different levels of readiness in adopting AI technologies. Some teachers may demonstrate adequate digital literacy but lack the ability to integrate AI into pedagogical strategies, while others may encounter difficulties in evaluating AI-generated content, protecting student data, addressing algorithmic bias, and maintaining academic integrity. These challenges highlight the importance of developing a structured teacher curriculum innovation competency framework that supports effective, responsible, and sustainable AI-based learning transformation.

Research on the development of a Teacher Curriculum Innovation Competency Framework to Support AI-Based Learning Transformation has emerged from several interconnected fields, including digital competence, technological pedagogical knowledge, artificial intelligence literacy, curriculum innovation, and teacher professional development. Over the last decade (2016–2026), researchers have increasingly emphasized that effective educational technology integration requires teachers to combine technological knowledge with pedagogical expertise, curriculum design capabilities, and ethical awareness.

One important foundation is the Digital Competence Framework for Educators (DigCompEdu) developed by Christine Redecker (2017). This framework describes educators' digital competencies across six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence. Redecker emphasizes that teachers need to use digital technologies to improve instructional practices, facilitate student participation, develop assessment strategies, and support personalized learning. The framework is relevant to the present research because it provides a structured approach for identifying teacher competencies and translating them into professional practices. However, because DigCompEdu addresses digital technologies broadly rather than focusing specifically on artificial intelligence, additional competencies related to AI-generated content, algorithmic limitations, responsible AI use, and AI-supported curriculum redesign need to be considered.

A more directly relevant study was conducted by Tian Zhou, Jo Tondeur, and Sarah Howard (2025) in their systematic review, *AI Competency Frameworks for Teachers: A Systematic Review*. The authors examined 20 studies published between 2015 and 2024 and identified four major approaches to teacher AI competency: AI literacy, AI-TPACK, AI readiness, and professional competency. Their synthesis highlighted five core competency constructs: AI cognition, AI application, AI ethics, AI evaluation, and AI professional development. This study provides a strong foundation for identifying the technological, pedagogical, evaluative, and professional dimensions of teacher competency. However, the review primarily synthesizes existing AI competency approaches, leaving an opportunity for further research to operationalize these competencies specifically for curriculum innovation, including curriculum redesign, instructional planning, learning assessment, and the development of AI-integrated learning experiences.

Similarly, Fengchun Miao and Mutlu Cukurova (2024) developed UNESCO's AI Competency Framework for Teachers, which establishes an international reference for the ethical and effective use of AI in education. The framework identifies 15 competencies across five dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning.

It also organizes competency development into three progression levels: acquire, deepen, and create. The framework emphasizes human agency, responsible AI use, and teachers' professional growth. Its developmental structure is particularly relevant to the present study because it demonstrates how teacher competencies can be organized into progressive levels rather than treated as isolated skills. Nevertheless, the proposed research can further investigate how these competencies translate into observable curriculum innovation practices, such as redesigning learning outcomes, integrating AI into subject-specific content, developing assessment strategies, and evaluating the effectiveness of AI-supported curricula.

Another important contribution comes from Malissa Maria Mahmud, Wali Khan Monib, Atika Qazi, Shiau Foong Wong, Chandra Reka Ramachandiran, and Siti Norbaya Azizan (2025) through their study, *Developing AI Education Competency Framework: A Systematic Literature Review*. Based on a systematic review of 21 relevant sources, the researchers proposed four interconnected pillars: Foundation, Integration, Innovation, and AI Citizenship. These pillars address fundamental AI knowledge, the integration of AI into educational and administrative practices, AI-driven pedagogical innovation, and ethical AI use. The study is particularly relevant because it connects AI knowledge with practical educational innovation and responsible citizenship. However, a broad AI education competency framework does not necessarily provide detailed performance indicators for teachers' curriculum innovation activities. The present research can build on this contribution by specifying the competencies teachers need to develop AI-supported curricula and by establishing criteria for evaluating their professional performance.

In addition, Xiao Tan, Gary Cheng, and Man Ho Ling (2025) examined the relationship between AI integration in teaching and teacher professional development in their systematic review, *Artificial Intelligence in Teaching and Teacher Professional Development: A Systematic Review*. Their review synthesized 95 relevant research articles published within the review's search period, identifying a substantial emphasis on AI applications in teaching compared with research addressing AI for teacher professional development. The authors highlighted the need to investigate teachers' professional learning needs and the technological and ethical challenges associated with AI integration. This research suggests that AI adoption should not be evaluated solely through the availability or use of technological tools; it should also consider whether teachers receive adequate preparation to apply AI effectively. The proposed competency framework can respond to this concern by linking competency assessment with targeted professional development, collaborative curriculum design, classroom implementation, and continuous reflection.

Despite the growing adoption of AI in education, several challenges remain in developing teachers' competencies for curriculum innovation. First, teachers may lack clear guidance regarding the specific competencies required to integrate AI into curriculum design and instructional practices. Second, differences in AI literacy, technological proficiency, pedagogical knowledge, and professional experience may influence teachers' ability to implement AI-supported learning. Third, the integration of AI into curriculum objectives, learning activities, and assessment methods requires systematic planning and appropriate pedagogical judgment. Furthermore, ethical concerns involving privacy, algorithmic bias, misinformation, and academic integrity require teachers to develop responsible AI practices. These challenges indicate the need for a competency framework that connects technological knowledge, curriculum innovation, professional development, and ethical responsibility.

Existing research on teacher competencies has examined digital literacy, technological pedagogical knowledge, educational technology integration, and AI literacy (Kim et al., 2021). Although these approaches provide important foundations for understanding teachers' readiness for digital transformation, further investigation is needed to establish how these competencies can be integrated into a comprehensive framework specifically focused on AI-driven curriculum innovation. In particular, the relationships between AI literacy, curriculum redesign, pedagogical innovation, assessment development, ethical decision-making, and continuous professional learning require systematic examination. This study addresses this research gap by developing an integrated framework

that translates these competency areas into identifiable dimensions and practical indicators for educational implementation.

This study aims to identify the essential competencies required for teacher curriculum innovation in AI-based learning environments, examine the technological, pedagogical, ethical, and professional dimensions of these competencies, and develop a structured competency framework to support educational transformation. It also seeks to establish the relevance and applicability of the proposed framework through appropriate expert validation and, where feasible, empirical evaluation. Additionally, the study aims to formulate recommendations for teacher professional development and institutional implementation.

This study addresses five research questions: What competencies are required for teachers to innovate curriculum design using AI? What dimensions and indicators should constitute the proposed framework? How can these competencies be organized into developmental levels? To what extent is the framework valid and applicable to educational practice? How can the framework support teacher professional development and AI-based learning transformation?

This study contributes theoretically by integrating teacher competency, curriculum innovation, and AI-based learning transformation into a structured conceptual framework. Practically, it provides teachers with competency indicators to identify professional development needs and improve AI-integrated instructional practices (Learning, 2015). Institutionally, the framework can inform teacher training programs, curriculum development initiatives, and educational technology implementation strategies. At the policy level, the findings may provide a reference for developing teacher competency standards and responsible AI integration policies. Ultimately, the proposed framework is intended to support teachers in using AI not merely as a technological tool but as an instrument for meaningful curriculum innovation and improved educational practice.

2. RESEARCH METHOD

2.1 Research Design

This study employs a Design and Development Research (DDR) approach to develop a Teacher Curriculum Innovation Competency Framework to Support AI-Based Learning Transformation (Martens et al., 2014). This approach is appropriate because the research aims to produce a structured framework based on existing literature, expert knowledge, and educational needs. The research consists of four stages: literature review, competency identification, framework development, and evaluation and refinement. The first stage examines existing teacher competency models and AI education standards. The second identifies relevant competency dimensions and indicators. The third synthesizes the findings into a preliminary framework, while the fourth evaluates its validity, clarity, relevance, and practical applicability through expert assessment and, where feasible, teacher evaluation.

2.2 Literature Review and Data Sources

The literature review draws on peer-reviewed journal articles, conference proceedings, educational policy documents, teacher competency standards, and AI education guidelines published between 2016 and 2026. Relevant publications are identified through databases such as Scopus, Web of Science, ERIC, and Google Scholar. Search terms include teacher AI competency, curriculum innovation, AI-based learning, teacher digital competence, AI literacy in education, and AI-supported instructional design (Miao & Holmes, 2021). Studies are selected based on their relevance to teacher competencies, curriculum development, educational technology integration, and AI-supported pedagogy. Duplicate publications, unrelated studies, and sources lacking sufficient methodological information are excluded where appropriate (Golder et al., 2016). The selected literature is analyzed to identify recurring competency themes and establish the conceptual foundation of the proposed framework.

2.3 Identification of Competency Dimensions

Competency dimensions are identified through qualitative content analysis of the selected literature and existing competency frameworks. The preliminary framework comprises six dimensions:

AI literacy and technological competence, curriculum design and innovation, AI-integrated pedagogical competence, assessment and learning analytics, ethical and responsible AI practice, and professional collaboration and continuous development. Each dimension represents a specific area of teacher knowledge, skills, and professional responsibility (Manasia et al., 2019). The dimensions are compared to identify overlapping concepts, missing competencies, and relationships between technological proficiency and curriculum innovation. These preliminary dimensions are subsequently refined through expert feedback to ensure their relevance and *completeness*.

2.4 Framework Development

The framework is developed by translating each competency dimension into operational definitions, knowledge requirements, practical skills, professional attitudes, and observable behavioral indicators. For example, curriculum innovation competency includes the ability to align AI-supported learning activities with curriculum objectives, develop appropriate instructional materials, and evaluate learning outcomes. Competencies may be organized into four developmental levels: beginner, developing, proficient, and advanced. Each level is distinguished by observable performance indicators, enabling the framework to guide competency assessment and targeted professional development.

2.5 Expert Validation

Expert validation is conducted with specialists in curriculum development, educational technology, artificial intelligence, teacher education, and professional development (Nazaretsky et al., 2022). Participants are selected based on relevant academic qualifications, professional experience, and expertise in AI-supported education. Experts evaluate the proposed framework using a structured questionnaire addressing relevance, clarity, completeness, and practical applicability. A four-point rating scale may be used, supplemented by open-ended comments. Content validity indices and qualitative feedback are analyzed to identify indicators requiring revision. If a Delphi approach is adopted, multiple rounds are conducted until predefined consensus criteria are met.

2.6 Data Collection

Data are collected through literature extraction matrices, expert evaluation questionnaires, and semi-structured interviews where appropriate. A teacher survey or analysis of curriculum artifacts may also be conducted to examine practical competency needs and the framework's applicability (Brown, 2002). All instruments are designed to correspond directly to the research objectives.

2.7 Data Analysis

Qualitative data are analyzed using thematic analysis or qualitative content analysis to identify recurring themes and interpret expert recommendations. Quantitative data are examined using descriptive statistics and appropriate content-validity measures (Ding & Hershberger, 2002). Findings from the literature, expert evaluations, and teacher data are compared to refine competency dimensions and indicators. Reliability or factor analysis is conducted only when supported by the research design and sample size.

2.8 Ethical Considerations

The study follows ethical research principles, including informed consent, voluntary participation, confidentiality, and secure data management. Institutional approval is obtained when required. Personal information is protected, and any AI-assisted research activities are reviewed critically to ensure accuracy, transparency, and responsible use of information.

3. RESULTS AND DISCUSSIONS

3.1 Results of the Literature Review

The literature synthesis indicates that teacher competency for AI-based learning transformation involves interconnected technological, pedagogical, curricular, ethical, and professional dimensions. Previous research on digital competence emphasizes teachers' ability to select digital resources, facilitate learning, conduct assessments, and promote students' digital competence. Redecker (2017), through the European Framework for the Digital Competence of

Educators (DigCompEdu), provides a foundation for understanding how digital technologies can support instructional design and professional development. Similarly, the Technological Pedagogical Content Knowledge (TPACK) framework highlights the importance of integrating technological knowledge with pedagogical strategies and subject-specific content. These perspectives suggest that effective AI integration requires teachers to understand not only how technologies operate but also how they contribute to educational objectives.

More recent research has addressed competencies specifically associated with artificial intelligence. Miao and Cukurova (2024), in UNESCO's AI Competency Framework for Teachers, emphasize human-centred approaches, AI ethics, AI foundations and applications, AI pedagogy, and professional learning. Mahmud et al. (2025) also identify foundational knowledge, educational integration, innovation, and responsible AI citizenship as important elements of AI education competency. These contributions demonstrate that AI competency extends beyond operating digital tools to include pedagogical decision-making, critical evaluation, ethical responsibility, and continuous professional development.

Based on this synthesis, six preliminary competency dimensions are proposed: AI literacy and technological competence, curriculum design and innovation, AI-integrated pedagogical competence, assessment and learning analytics, ethical and responsible AI practice, and professional collaboration and continuous development. The dimensions combine established digital teaching competencies with AI-specific requirements and an explicit emphasis on curriculum innovation (Georgieva, n.d.). However, the exact number and composition of these dimensions should be confirmed through a documented literature screening and expert validation process.

3.2 Proposed Teacher Curriculum Innovation Competency Framework

The proposed framework consists of six interconnected competency dimensions designed to support teachers in planning, implementing, and evaluating AI-integrated curricula (Lim et al., n.d.). The first dimension, AI literacy and technological competence, concerns teachers' understanding of AI capabilities, limitations, potential inaccuracies, and appropriate educational applications. Teachers should be able to select suitable tools, critically examine AI-generated information, and determine when human judgment is necessary.

The second dimension, curriculum design and innovation, focuses on teachers' ability to redesign learning objectives, learning materials, instructional sequences, and curriculum activities using AI appropriately. Teachers are expected to ensure that AI-supported activities remain aligned with curriculum standards, subject content, students' learning needs, and intended learning outcomes.

The third dimension, AI-integrated pedagogical competence, emphasizes the selection of instructional strategies that use AI to support active learning, personalization, collaboration, problem-solving, and critical thinking. AI should complement teachers' professional judgment rather than replace meaningful interaction between teachers and students.

The fourth dimension, assessment and learning analytics, involves developing appropriate assessment strategies, interpreting learning evidence, providing feedback, and evaluating student progress. Teachers must critically examine AI-generated assessments and feedback to ensure their accuracy, fairness, and alignment with learning objectives.

The fifth dimension, ethical and responsible AI practice, incorporates data privacy, transparency, fairness, academic integrity, intellectual property, and human oversight. These considerations should be integrated throughout all competency dimensions rather than treated as separate technical requirements.

The sixth dimension, professional collaboration and continuous development, emphasizes teachers' participation in collaborative curriculum design, peer learning, professional reflection, and ongoing competency development as AI technologies and educational requirements evolve.

Collectively, these dimensions establish a conceptual relationship between teacher competencies and AI-based learning transformation. The framework assumes that meaningful transformation requires technological understanding, pedagogical judgment, curriculum innovation, ethical responsibility, and institutional support to operate together (Facer, 2011). The proposed

framework remains a conceptual model until its dimensions and indicators are evaluated through systematic expert assessment and empirical research.

3.3 Competency Indicators and Developmental Levels

The framework proposes four developmental levels: beginner, developing, proficient, and advanced. These levels describe increasing complexity in teachers' demonstrated knowledge, skills, and professional responsibilities (Toom, 2017).

At the beginner level, teachers recognize basic AI applications, understand common limitations, and identify possible uses of AI in lesson planning. At the developing level, teachers use AI to prepare learning materials, formulate instructional activities, and support curriculum objectives while checking the quality of generated outputs. At the proficient level, teachers independently design, implement, and evaluate AI-integrated learning sequences, using evidence of student learning to improve instructional decisions. At the advanced level, teachers lead curriculum innovation initiatives, mentor colleagues, establish responsible AI practices, and evaluate the broader implications of AI integration within their institutions.

These developmental levels can be applied across all six competency dimensions. For example, an advanced teacher in assessment innovation may design a balanced assessment strategy that combines AI-supported feedback with human evaluation and authentic student performance. An advanced teacher in ethical AI practice may also help establish institutional guidance for privacy protection, transparency, and academic integrity (Hong et al., 2022).

Competency assessment should prioritize observable performance, such as lesson plans, curriculum artifacts, assessment designs, classroom observations, and reflective reports. Self-assessment may provide supplementary information but should not serve as the sole evidence of competence. The proposed developmental levels require further validation to establish clear criteria and ensure consistent interpretation across educational contexts.

3.4 Expert Validation and Framework Evaluation

The proposed framework requires systematic evaluation to determine whether its competency dimensions are relevant, sufficiently comprehensive, clearly defined, and practical for educational implementation (Bergsmann et al., 2015). Expert validation should involve specialists in curriculum development, educational technology, artificial intelligence, teacher education, and professional development. Experts may evaluate each competency indicator using a four-point relevance scale and provide qualitative comments on its clarity, completeness, and applicability.

The evaluation process should examine whether each dimension addresses an identifiable professional requirement, whether indicators overlap excessively, and whether the developmental levels represent meaningful differences in demonstrated competence. Indicators that are ambiguous, redundant, or insufficiently aligned with curriculum innovation should be revised, combined, or removed. Additional indicators may be introduced when experts identify important gaps.

Quantitative analysis may include item-level and scale-level content validity indices, depending on the number of experts and the selected validation procedure (Zamanzadeh et al., 2015). Qualitative comments should be analyzed thematically to explain the reasons behind proposed revisions. If a Delphi approach is used, the study should establish consensus criteria before data collection and report the findings from each round.

No expert ratings, validity coefficients, consensus percentages, or numbers of retained indicators are reported here because actual validation data are not available. Consequently, the framework should be interpreted as a literature-informed proposal rather than an empirically validated instrument (Watson, 2020). A subsequent validation study is necessary before claims regarding its validity or reliability can be established.

3.5 Discussion of the Framework's Contribution

The proposed framework extends existing competency perspectives by connecting AI literacy with the practical responsibilities involved in curriculum design, instructional implementation, assessment, and professional learning. DigCompEdu provides a broad foundation for educators' digital competence, while TPack emphasizes the integration of technology, pedagogy, and subject

content(Tomczyk & Fedeli, 2021). UNESCO's AI Competency Framework for Teachers further emphasizes human-centred AI use, ethics, pedagogy, and professional learning.

The distinctive contribution of the proposed framework is its explicit focus on curriculum innovation as the organizing purpose of AI competency development. Rather than evaluating teachers primarily according to their familiarity with AI applications, it emphasizes their ability to transform curriculum objectives into meaningful learning experiences and evaluate the educational consequences of their decisions(Chiu & Chai, 2020).

The framework also integrates ethical responsibility across curriculum-related activities. For example, teachers must consider privacy when selecting learning platforms, fairness when interpreting learning analytics, and academic integrity when designing assignments that permit AI assistance. This integrated perspective may help institutions move from isolated AI training sessions toward more comprehensive approaches to teacher competency development.

Nevertheless, the proposed contribution remains conceptual until comparative analysis and validation demonstrate whether the framework provides adequate coverage and meaningful advantages over existing models.

3.6 Implications for Teacher Professional Development

The framework may provide schools, universities, and education authorities with a structured basis for identifying teacher competency gaps and developing differentiated professional learning programs. Teachers who demonstrate strong AI literacy but limited curriculum design competence may benefit from workshops on curriculum alignment, instructional design, and AI-supported learning activity development. Teachers who can design AI-integrated lessons but struggle with assessment may require additional training in assessment validity, feedback quality, and learning analytics.

Professional development programs can combine workshops, collaborative lesson planning, peer mentoring, classroom experimentation, and reflective evaluation(Darling-Hammond et al., 2017). Teachers may develop an AI-integrated lesson, implement it in an appropriate learning context, collect evidence of student engagement and learning, and revise the lesson based on the results.

Institutional leaders can use the framework to align professional development with curriculum priorities, technological infrastructure, responsible AI policies, and teacher support systems. However, implementation should account for differences in subject areas, school resources, teacher experience, and student needs. The framework should guide development rather than impose identical expectations on teachers working in substantially different contexts.

3.7 Implications for AI-Based Learning Transformation

AI-based learning transformation requires more than access to AI tools(Poquet & De Laat, 2021). It involves changes in curriculum planning, teaching strategies, assessment practices, professional collaboration, and institutional governance. The proposed framework offers a conceptual mechanism for connecting teacher competency development with these broader changes.

At the classroom level, teachers may use AI to develop differentiated learning materials, generate formative assessment questions, and support feedback while maintaining human oversight(Schmidt & Strasser, 2022). At the institutional level, the framework may inform teacher competency assessments, professional development priorities, and guidelines for responsible AI use. At the policy level, it may contribute to the development of professional standards that connect AI literacy with curriculum innovation and pedagogical quality.

The expected benefits depend on implementation conditions, including teacher readiness, infrastructure, access to appropriate training, leadership support, and clear ethical guidelines(Organization et al., 2021). The framework alone cannot guarantee improvements in student achievement, instructional quality, or educational equity. Such outcomes must be evaluated through empirical studies comparing teaching practices and learning outcomes before and after implementation or against suitable comparison groups.

3.8 Limitations and Future Research

The principal limitation of this proposed framework is that it has not yet been validated using original expert assessment or teacher performance data. Its competency dimensions are derived from conceptual synthesis and existing literature, so their completeness, applicability, and measurement properties remain to be established. In addition, differences in curriculum standards, institutional resources, subject areas, and national education policies may affect the relevance of particular indicators.

Future research should conduct a transparent systematic literature review, followed by expert validation and pilot testing with teachers from different educational levels and subject areas. Researchers should develop assessment instruments that measure demonstrated competencies rather than relying exclusively on self-reported confidence or AI usage frequency (Longhini et al., 2022). Further studies could examine whether professional development based on the framework improves curriculum design quality, instructional practices, assessment approaches, and responsible AI implementation. Longitudinal research may also investigate how teacher competencies evolve as AI technologies and educational policies change.

In conclusion, the proposed Teacher Curriculum Innovation Competency Framework provides a structured conceptual foundation for integrating AI literacy, curriculum design, pedagogy, assessment, ethical practice, and professional learning. Its principal value lies in emphasizing teachers' capacity to make informed curriculum decisions rather than simply operate AI tools. Further empirical validation is required to establish its final dimensions, measurement criteria, and practical effectiveness in supporting AI-based learning transformation.

4. CONCLUSION

This study aims to develop a Teacher Curriculum Innovation Competency Framework to Support AI-Based Learning Transformation by identifying the competencies required for effective AI integration into curriculum design, implementation, and evaluation. The proposed framework consists of six interconnected dimensions: AI literacy and technological competence, curriculum design and innovation, AI-integrated pedagogical competence, assessment and learning analytics, ethical and responsible AI practice, and professional collaboration and continuous development. Together, these dimensions emphasize that successful AI integration requires more than technological proficiency; it also demands pedagogical expertise, curriculum alignment, critical evaluation, ethical awareness, and continuous professional learning. The proposed framework contributes to educational practice by providing a conceptual foundation for identifying teacher competency gaps, designing targeted professional development programs, and guiding responsible AI integration into curriculum practices. Schools, universities, and education policymakers are encouraged to align teacher training, competency assessment, institutional support, and AI governance policies with clearly defined competency indicators and developmental levels. Such alignment may facilitate more systematic and context-sensitive approaches to educational transformation. However, the framework remains a conceptual proposal requiring further validation through expert assessment and empirical testing. Future research should evaluate its applicability across educational levels, subject areas, and institutional contexts. Pilot implementation and longitudinal studies are also recommended to examine changes in teacher competencies, curriculum quality, and instructional practices. Evidence from these evaluations will be necessary to establish the framework's validity, reliability, and potential contribution to effective AI-based learning transformation.

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