



Research Article

Design a Curriculum Model for Artificial Intelligence (AI) Literacy for Student Teachers at Farhangian University

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Abstract

The purpose of this study was to design a curriculum model for artificial intelligence (AI) literacy for student teachers at Farhangian University. A qualitative approach and meta-synthesis method were adopted. The research corpus consisted of articles from reputable journals and theses on AI literacy curricula for student teachers, using qualitative or mixed methods, published between 2015 and 2025. Purposeful sampling was employed. Inclusion criteria included thematic relevance, inclusion of research keywords, methodological quality, and data comprehensiveness. Following the PRISMA checklist and a two-stage screening process, 36 studies meeting over 80% of the criteria were included. Data analysis was conducted using Attride-Stirling thematic network method with MAXQDA 24 software. Trustworthiness was ensured through researcher self-review, data triangulation, and Cohen's kappa coefficient. A total of 175 basic themes, 37 organizing themes, and 10 global themes were identified as curriculum components: Curriculum Rationale, Objectives, Content, Instructor's Role, Teaching-Learning Activities, Time, Place and Space, Materials and Resources, Learner Characteristics, and Assessment and Evaluation. Given the model's comprehensiveness, it can serve as a foundational framework for AI literacy curricula for student teachers at Farhangian University.

Keywords: Artificial Intelligence; Artificial Intelligence Literacy; Student Teacher; Artificial Intelligence Literacy Curriculum; Farhangian University

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1. Introduction

The rapid advancement of AI-based technologies, including machine learning, big data analytics, and generative text systems, has transformed teachers' role from knowledge transmitters to facilitators of intelligent

learning. This fundamental transformation in the education system necessitates the training of teachers who not only use technology but also understand its nature, logic, limitations, and social and ethical implications (Tenberga & Daniela, 2024). Artificial intelligence, as one of the foundational and transformative technologies of the

twenty-first century, provides computers and machines with the capability to simulate human cognitive processes such as learning, understanding, problem-solving, decision-making, creativity, and autonomy. In fact, this technology refers to the ability of computational systems to perform tasks that traditionally require human intelligence. Common applications of AI include computer games, language translation, expert systems, and robotics (Russell & Norvig, 2021).

The development of AI literacy as a fundamental competency in the digital age has attracted the attention of researchers in educational sciences and technology. This concept goes beyond mere familiarity with AI tools and encompasses a set of multifaceted capabilities that prepare individuals for effective, critical engagement with this technology. Mills et al. (2024) define AI literacy as a set of knowledge, skills, attitudes, and values that enable individuals to use AI technologies in an informed, critical, and ethical manner. Based on the perspective of Long and Magerko (2020), AI literacy comprises capabilities such as understanding fundamental concepts, practical interaction, and ethical and critical evaluation of AI systems. This definition emphasizes the necessity of awareness regarding the limitations and inherent biases in algorithms. In the same vein, Ng and Chu (2021) define AI literacy as a combination of conceptual knowledge, technical interaction skills, and ethical attitudes for responsible application, which distinguishes it from other forms of digital literacy. Furthermore, research such as that by Touretzky et al. (2019) has emphasized the importance of this literacy in empowering individuals to participate in society in an informed manner, given that society is profoundly affected by AI

Given the growing importance of this technology in all areas of life and education, in recent years numerous studies have examined AI literacy, particularly among students and pre-service teachers.

2. Literature Review

Ng et al. (2025) propose a model with four main components for AI literacy curriculum for students, including: learning objectives, instructional strategies, AI tools and technologies, and assessment methods. Southworth et al. (2023) designed a comprehensive AI literacy framework for students comprising five main categories: AI fundamentals, applications, ethics and social impact, innovation and entrepreneurship, and career readiness. This model emphasizes experiential learning and interdisciplinary collaboration and aims to prepare all students, regardless of their academic discipline, for an AI-driven future. Findings from Salhab's (2024) research showed that university faculty have a positive attitude toward integrating AI literacy into the curriculum and recognize benefits such as increased teaching efficiency

and better engagement with students. However, they cited limited technical knowledge of faculty, time constraints, and lack of institutional support as challenges to this initiative. Tadimalla & Maher (2024), in a study on designing AI literacy curriculum for all, suggest that curricula should be designed in a layered and interdisciplinary manner, such that foundational knowledge about AI principles is placed at early levels of education and then expanded to applied, social, and ethical topics, while intrinsic motivation elements and practical learning opportunities are strengthened throughout the learning pathway for pre-service teachers. Existing evidence indicates that the level of AI literacy among teachers and pre-service teachers in most countries is low (Sperling et al., 2024). In a study on AI literacy and the use of AI-based tools among teachers, it was found that general awareness of AI tools exists among teachers, but deep understanding of technical concepts or consistent use of them in instructional design is still limited; for example, approximately half of the teachers reported being familiar with AI tools, but practical use and mastery of AI concepts in teaching activities was lower than expected, and only a small portion of them had been able to effectively employ AI tools in their teaching programs (Traga Philippakos & Rocconi, 2025). The issue of AI literacy becomes even more significant when we recognize that many frameworks developed globally tend to define and prioritize patterns and technical and educational concepts from a "Western-centric" cultural perspective, which can lead to cultural, educational, and value differences in non-Western societies being overlooked; for instance, research critiques have shown that AI frameworks and tools can indirectly represent the perspectives and values of developed countries and consequently create cultural and educational injustice (Nyaaba et al., 2024). In the UNESCO model, the main emphasis is on global ethical thinking and data literacy. Moreover, research has shown that even in countries where national AI literacy frameworks have been developed, their implementation in teacher education curricula is not systematic (Mills et al., 2024). The reason for this is the lack of valid assessment tools, shortage of AI-aware instructors, and absence of indigenous models for designing educational programs in this area (Tenberga & Daniela, 2024).

Research shows that AI education in teacher training programs is often limited to short-term workshops or scattered topics in educational technology courses, and this type of training typically does not have a lasting impact on learners' attitudes and behaviors (Tadimalla & Maher, 2024). Results from Yim and Wegerif (2024) study showed that teachers have a positive attitude toward the usefulness and ease of use of AI tools, but challenges such as lack of content knowledge in the AI domain, infrastructure limitations, and concerns about student

distraction are major barriers to adopting these technologies. Araste and Khabazeh (2023) in a study aimed at the role of AI and transformation in higher education concluded that AI will have significant applications and achievements in teaching and learning. Nasirinejad (2024) in a research emphasized students' familiarity with basic concepts and points such as machine learning, natural language processing, understanding the social and ethical effects of AI technology in education, and practical application of AI tools in education, especially higher education. The results also showed that incorporating AI into the curriculum should be integrated across all courses in educational disciplines.

In Iran, preliminary research in the field of education and teacher training indicates that Farhangian University students' familiarity with AI fundamentals, ethical aspects, and its educational applications is very limited, and most of their knowledge is confined to superficial use of tools such as ChatGPT or automatic summary engines (Babae & Salehi, 2025). This situation reveals a serious weakness in training the next generation of teachers—a generation that should be the facilitator of technology-based learning in the smart schools of the future. On the other hand, in Iran's teacher training system, cultural aspects, professional ethics, and a human-centered approach to education hold a more prominent position. Therefore, direct transfer of models designed in other countries to Iran's educational context may face conceptual and practical challenges.

Despite the emphasis of high-level documents such as the "Fundamental Transformation Document of Education" on training technology-proficient teachers, to date no theoretical framework or indigenous model has been presented for explaining and promoting AI literacy among Farhangian University students. This gap causes future teacher training to suffer from inadequacies in terms of technological awareness, ethical analysis capacity, and critical understanding of emerging technologies. If this deficiency is not addressed, the gap between formal education and the technological realities of society will increase further. Therefore, the main problem of the present research is the design of an AI literacy curriculum model for Farhangian University students. The present research attempts to provide a coherent framework for developing future teachers' capabilities in the field of AI, based on conducted research, so that they can play an active role in guiding learning and ethical education of students in an AI-based educational environment.

3. Research Question

What elements and components constitute the AI literacy curriculum model for Farhangian University students?

4. Method

The purpose of this study was to design an AI literacy curriculum model for Farhangian University students using a qualitative approach. The research method was the six-stage meta-synthesis approach of Sandelowski & Barroso (2007), which includes: (1) problem statement and research questions, (2) examining source relevance, (3) quality assessment, (4) data analysis, (5) theme synthesis, and (6) validation of findings.

To access credible research, the following databases were explored: Scopus, ScienceDirect, Emerald, Springer, ERIC, Noormags, Magiran, and the Iranian Research Institute for Information Science and Technology. The keywords "AI literacy" and "artificial intelligence" were searched in both Persian and English. Following a systematic search, 57 studies met the inclusion criteria. After a two-stage screening process based on the PRISMA statement (Moher, 2015) and quality assessment by two evaluators, 36 final studies were included in the meta-synthesis process. The collected data were analyzed using qualitative content analysis techniques, findings categorization, meta-summarization, and the Attride-Stirling (2001) method in MAXQDA24 software. Data credibility was ensured through self-review, data triangulation, and inter-coder agreement using Cohen's kappa coefficient. The research scope included credible articles and dissertations on AI literacy for teachers and students from 2015–2025. Data collection continued until saturation was reached.

5. Results

To answer the research question, the model components were identified using the meta-synthesis method through its six stages. In the first stage, basic themes related to the AI literacy curriculum were extracted. After multiple reviews of the studies and merging similar themes, 175 basic themes were identified, examples of which are presented in Table 1.

5.1. Analysis and Categorization Process

In the next stage, the extracted themes were categorized based on semantic similarity, and an appropriate name was selected for each category (Table 2). Then, considering the exploratory nature of the study, the metaphors and main themes in different reports were compared. Through in-depth study of previous sources and identification of their strengths and weaknesses, the researcher designed the AI literacy curriculum model in 37 organizing themes and 10 overarching themes (based on Akker's curriculum model). All basic, organizing, and overarching themes are presented in Table 2.

In this study, the meta-synthesis method was employed to present an AI literacy curriculum model for pre-service elementary teachers. The researcher extracted 243 basic themes, of which 175 themes relevant to the research topic were selected after careful review. These themes were categorized into 37 organizing themes, which were then classified into 10 overarching themes (ten main components of Akker's curriculum model).

1. Rationale: Philosophical, value-based, and scientific justification of the curriculum, Philosophical and value foundations, Guiding frameworks, Idealistic orientation.

2. Objectives: Expected outcomes and achievements, Cognitive and analytical competencies, Operational and technical competencies, Civic and ethical competencies, Professional teaching competencies, Strengthening knowledge and attitude foundations.

3. Content: Knowledge, concepts, skills, and their organization, Foundations and basic concepts, Core technologies and models, Applications and impacts, Ethical foundations and frameworks, Social and cultural

dimensions, Legal and political considerations, Critical and contextual literacy.

4. Instructor Role: Duties, behaviors, and instructor qualifications, Integration of technology and teaching, Educational leadership and practical wisdom, Creating learning environment, Facilitation and clarification.

5. Teaching and Learning Activities: Strategies and classroom interactions, Active and experience-based strategies, Interactive and dialogue-based strategies, Situation and reflection-based strategies, Innovative strategies.

6. Time: Time allocation and organization, Continuity and sustainability, Planning and integration.

7. Place and Space: Physical and virtual learning environment, Real and virtual learning environments, Interactive quality and accessibility, Environment security and ethics.

8. Materials and Resources: Tools, media, and supplementary content, AI tools and platforms, Advanced technologies.

Table 1. Sample of Basic Themes

No.	Code	Source	Evidence
1	Interactive tools for non-professional audiences	Long & Magerko (2020)	Interactive tools should be designed to be usable for non-professional users as well.
2	Gradual integration of AI tools in teacher education programs	Zhang et al (2023)	Gradual integration of AI in teacher education programs is more effective.
3	Presentation in a user-understandable format	Lee et al (2025)	Comprehensibility for users is a fundamental condition for technology acceptance.
4	Ethical evaluation	Zawacki-Richter et al (2019)	Ethical evaluation is an inseparable part of applying intelligent technologies.
5	Evaluating accuracy or reliability of outputs	Long & Magerko (2020)	The accuracy and reliability of AI outputs must be continuously evaluated.
6	Performance-based project evaluation	Nguyen & Le (2022)	Project-based assessment enables measurement of learners' actual performance.
7	Intelligent assessment	UNESCO (2021)	Intelligent assessment can provide immediate and appropriate feedback.
8	Learning assessment in AI curriculum	UNESCO (2021)	Learning in the field of AI requires appropriate assessment methods.
9	Testing and validation of AI tools	Mohd Zain et al (2024)	AI tools must be validated before educational use.
10	Testing and validation of algorithms before widespread implementation	Commission (2022)	Testing algorithms before widespread implementation is essential.

Note: This table represents a sample of the 175 basic themes extracted.

Table 2. Organizing and Overarching Themes

No.	Overarching Themes	Organizing Themes	Basic Themes	
1	Rationale of AI Literacy Curriculum	Philosophical and value foundations	Definition of AI literacy, ethics and professional wisdom, AI in service of humanity, balance between innovation and preservation of human values	
2		Guiding frameworks	Social justice, preservation of fundamental human rights, maintaining social cohesion, AI competency framework	
3		Idealistic orientation	Creating humanitarian ideas	
4	Objectives in AI Literacy Curriculum	Cognitive and analytical competencies	Understanding distinction between AI and non-AI systems, analyzing and evaluating AI performance, critiquing intelligent technologies, reasoning about AI's societal impacts, recognizing AI in everyday environments, critical analysis of algorithms	
5		Operational and technical competencies	Interacting with AI systems, building or modifying simple AI systems, skills in working with AI-based tools, preparing teachers for effective use	
6		Civic and ethical competencies	Active participation in digital society, responsible use, ethical inquiry, analyzing ethical consequences, responsible decision-making, informed interaction	
7		Professional teaching competencies	Preparing for future-oriented classrooms, strengthening teacher role, adapting to future professions, developing ability to ask important questions	
8		Strengthening knowledge and attitude foundations	Strengthening technological and AI knowledge, pedagogical literacy, technology adoption culture, increasing understanding and practical skills	
9		Content in AI Literacy Curriculum	Foundations and basic concepts	AI fundamentals, algorithm concept, AI functioning, understanding misconceptions and myths, basic principles and fundamental concepts
10			Core technologies and models	Machine learning, neural networks, data mining, natural language processing
11			Applications and impacts	Practical applications in various fields, educational applications, global impacts, impact on economy and human relationships, educational opportunities, curriculum planning possibilities
12	Ethical foundations and frameworks		Ethical use in personal and social life, ethics compliance, understanding ethical impacts and issues, awareness of ethical consequences	
13	Social and cultural dimensions		Understanding social issues, awareness of social and cultural consequences, socio-cultural impacts and transformations, social and cultural roots	
14	Legal and political considerations		Understanding legal issues, awareness of legal consequences, political impacts and transformations, political roots	
15	Critical and contextual literacy		Recognizing limitations and biases, knowledge of history and social context	
16	Teaching and Learning Activities in AI Literacy Curriculum	Active and experience-based strategies	Project-based learning, collaborative and problem-based learning, interdisciplinary projects, simulation, experiential learning opportunities	
17		Interactive and dialogue-based strategies	Interactive teaching, interactive scenarios, dialogue-based activities, critical dialogues, interaction with content and chatbots, teacher-student interaction, information sharing	

Table 2. Organizing and Overarching Themes(Continued)

18		Situation and reflection-based strategies	Situational learning, case studies, reflection-based activities, reflectivity
19		Innovative strategies	Innovative learning, active methods, gamification, online space, problem-based curriculum, creative use of AI, cognitive engagement
20	Instructor Role in AI Literacy Curriculum	Integration of technology and teaching	Combining AI technology with teaching methods, designing AI-based pedagogy, integrating theory and practice
21		Educational leadership and practical wisdom	Maintaining teacher autonomy, attention to human role, professional judgment and wisdom, instructor accountability
22		Creating learning environment	Supportive environments, deep understanding of local, philosophical, cultural, and educational needs
23		Facilitation and clarification	Simple language, concrete and real examples, conceptual frameworks, adaptation to needs, comprehensible presentation
24	Learner Characteristics in AI Literacy Curriculum	Possessing basic knowledge and skills	AI knowledge and skills, conceptual, theoretical, and applied knowledge
25		Ethical and critical attitudes and dispositions	Ethical, critical, and positive attitudes toward AI, teachers' intrinsic motivation
26		Individual differences and needs	Matching diverse needs, attention to individual differences in adoption, control over learning path
27	Place Required in AI Literacy Curriculum	Real and virtual learning environments	Real educational settings, designing virtual learning environments
28		Interactive quality and accessibility	Interactive and comprehensible platforms, practical application in classroom
29		Environment security and ethics	Ethically safe environment
30	Time Required in AI Literacy Curriculum	Continuity and sustainability	Continuous and in-service learning, ongoing professional development
31		Planning and integration	Gradual integration of tools, developing phased programs, appropriate timing
32	Materials and Resources Required in AI Literacy Curriculum	AI tools and platforms	Interactive tools, learner analytics, chatbots, voice assistants, personalization and recommendation systems, educational platforms, image recognition, no-code programming
33		Advanced technologies	Virtual reality (VR), automated assessment tools, educational resources for ethical challenges
34	Assessment in AI Literacy Curriculum	Learning measurement methods and tools	Learning assessment, project-based performance assessment, tests, portfolios, measurable learning outcomes
35		Technical evaluation and validation of AI systems	Evaluating accuracy and reliability of outputs, testing and validating tools and algorithms, reviewing generated results

Table 2. Organizing and Overarching Themes(Continued)

36		Evaluation of qualitative dimensions and impacts	Ethical and intelligent evaluation, examining educational impacts, qualitative feedback	
37		Infrastructure development and assessment capacity building	Developing assessment frameworks, developing automated assessment tools	
No.	Overarching Themes	Organizing Themes	Basic Themes	
1	Rationale of AI Literacy Curriculum	Philosophical and value foundations	Definition of AI literacy, ethics and professional wisdom, AI in service of humanity, balance between innovation and preservation of human values	
2		Guiding frameworks	Social justice, preservation of fundamental human rights, maintaining social cohesion, AI competency framework	
3		Idealistic orientation	Creating humanitarian ideas	
4	Objectives in AI Literacy Curriculum	Cognitive and analytical competencies	Understanding distinction between AI and non-AI systems, analyzing and evaluating AI performance, critiquing intelligent technologies, reasoning about AI's societal impacts, recognizing AI in everyday environments, critical analysis of algorithms	
5		Operational and technical competencies	Interacting with AI systems, building or modifying simple AI systems, skills in working with AI-based tools, preparing teachers for effective use	
6		Civic and ethical competencies	Active participation in digital society, responsible use, ethical inquiry, analyzing ethical consequences, responsible decision-making, informed interaction	
7		Professional teaching competencies	Preparing for future-oriented classrooms, strengthening teacher role, adapting to future professions, developing ability to ask important questions	
8		Strengthening knowledge and attitude foundations	Strengthening technological and AI knowledge, pedagogical literacy, technology adoption culture, increasing understanding and practical skills	
9		Content in AI Literacy Curriculum	Foundations and basic concepts	AI fundamentals, algorithm concept, AI functioning, understanding misconceptions and myths, basic principles and fundamental concepts
10			Core technologies and models	Machine learning, neural networks, data mining, natural language processing
11			Applications and impacts	Practical applications in various fields, educational applications, global impacts, impact on economy and human relationships, educational opportunities, curriculum planning possibilities
12	Ethical foundations and frameworks		Ethical use in personal and social life, ethics compliance, understanding ethical impacts and issues, awareness of ethical consequences	
13	Social and cultural dimensions		Understanding social issues, awareness of social and cultural consequences, socio-cultural impacts and transformations, social and cultural roots	
14	Legal and political considerations		Understanding legal issues, awareness of legal consequences, political impacts and transformations, political roots	

Table 2. Organizing and Overarching Themes(Continued)

15		Critical and contextual literacy	Recognizing limitations and biases, knowledge of history and social context
16	Teaching and Learning Activities in AI Literacy Curriculum	Active and experience-based strategies	Project-based learning, collaborative and problem-based learning, interdisciplinary projects, simulation, experiential learning opportunities
17		Interactive and dialogue-based strategies	Interactive teaching, interactive scenarios, dialogue-based activities, critical dialogues, interaction with content and chatbots, teacher-student interaction, information sharing
18		Situation and reflection-based strategies	Situational learning, case studies, reflection-based activities, reflectivity
19		Innovative strategies	Innovative learning, active methods, gamification, online space, problem-based curriculum, creative use of AI, cognitive engagement
20	Instructor Role in AI Literacy Curriculum	Integration of technology and teaching	Combining AI technology with teaching methods, designing AI-based pedagogy, integrating theory and practice
21		Educational leadership and practical wisdom	Maintaining teacher autonomy, attention to human role, professional judgment and wisdom, instructor accountability
22		Creating learning environment	Supportive environments, deep understanding of local, philosophical, cultural, and educational needs
23		Facilitation and clarification	Simple language, concrete and real examples, conceptual frameworks, adaptation to needs, comprehensible presentation
24	Learner Characteristics in AI Literacy Curriculum	Possessing basic knowledge and skills	AI knowledge and skills, conceptual, theoretical, and applied knowledge
25		Ethical and critical attitudes and dispositions	Ethical, critical, and positive attitudes toward AI, teachers' intrinsic motivation
26		Individual differences and needs	Matching diverse needs, attention to individual differences in adoption, control over learning path
27	Place Required in AI Literacy Curriculum	Real and virtual learning environments	Real educational settings, designing virtual learning environments
28		Interactive quality and accessibility	Interactive and comprehensible platforms, practical application in classroom
29		Environment security and ethics	Ethically safe environment
30	Time Required in AI Literacy Curriculum	Continuity and sustainability	Continuous and in-service learning, ongoing professional development
31		Planning and integration	Gradual integration of tools, developing phased programs, appropriate timing
32	Materials and Resources Required in AI Literacy Curriculum	AI tools and platforms	Interactive tools, learner analytics, chatbots, voice assistants, personalization and recommendation systems, educational platforms, image recognition, no-code programming
33		Advanced technologies	Virtual reality (VR), automated assessment tools, educational resources for ethical challenges

Table 2. Organizing and Overarching Themes(Continued)

34	Assessment in AI Literacy Curriculum	Learning measurement methods and tools	Learning assessment, project-based performance assessment, tests, portfolios, measurable learning outcomes
35		Technical evaluation and validation of AI systems	Evaluating accuracy and reliability of outputs, testing and validating tools and algorithms, reviewing generated results
36		Evaluation of qualitative dimensions and impacts	Ethical and intelligent evaluation, examining educational impacts, qualitative feedback
37		Infrastructure development and assessment capacity building	Developing assessment frameworks, developing automated assessment tools

9. Learner Characteristics: Grouping, characteristics, and social organization, Possessing basic knowledge and skills, Ethical and critical attitudes and dispositions, Individual differences and needs.

10. Assessment: Methods for measuring progress and achievements, Learning measurement methods and tools, Technical evaluation and validation of AI systems, Evaluation of qualitative dimensions and impacts, Infrastructure development and assessment capacity building .These ten overarching themes constitute the components of the AI literacy curriculum model for pre-service teachers.

5. Discussion and Conclusion

The primary research question sought to identify the components of an artificial intelligence literacy curriculum model for student-teachers at Farhangian University. To address this question, a meta-synthesis approach was employed, through which 37 organizing themes were extracted from 174 basic themes and subsequently classified into 10 principal components aligned with the Akker curriculum framework. These themes constitute the conceptual architecture of the proposed curriculum. The organizing themes function as conceptual links between the basic themes and the core components of the Akker model, systematically classified into ten main categories to ensure structural coherence in curriculum design.

A comprehensive analysis of the findings indicates that the proposed AI literacy curriculum model for student-teachers demonstrates extensive and meaningful alignment with mainstream theoretical literature and contemporary empirical research in the fields of education, teacher training, and technology. This alignment underscores the theoretical coherence and scientific validity of the presented model.

The rationale component of the proposed AI literacy curriculum model is consistent with human-centered, ethics-oriented, and critical approaches to engaging with technology. Contemporary scholarship in AI ethics and education emphasizes the imperative of preserving human dignity, teacher agency, and social responsibility in the development and deployment of intelligent technologies (UNESCO, 2023). The prominent inclusion of ethical components, digital justice, and critical literacy within the proposed model indicates that it transcends merely technical and instrumental approaches, situating itself within critical educational philosophy and critical literacy frameworks reinterpreted in the context of artificial intelligence (Freire, 2018; Selwyn, 2019; Kellner & Share, 2007). The objectives component of the proposed model aligns with emerging research advocating for a reconceptualization of the teaching profession in the age of AI. According to these perspectives, the future teacher is characterized not merely as a technology user, but as a social impact analyst, teaching designer, and ethical agent (Darling-Hammond et al., 2020). The organization of competencies within this model—spanning cognitive, operational, ethical, professional, and attitudinal dimensions—corresponds to international frameworks of teachers' digital competence and transformative teacher education approaches (Fullan, 2015). Regarding content, the alignment of the proposed model with the existing literature is particularly salient in its emphasis on the interdisciplinary, contextualized, and critical nature of AI literacy education. Recent studies demonstrate that instruction in AI concepts proves effective and sustainable when integrated with real-world applications, social implications, and ethical considerations (Luckin 2018; Holmes et al., 2019). The content structure of the proposed model, which positions technical concepts alongside social, cultural, legal, and political dimensions, resonates with these integrative approaches and prevents

the reduction of AI literacy to mere technical content instruction. At the level of teaching and learning strategies, the proposed model aligns with a broad spectrum of contemporary theoretical frameworks and empirical evidence emphasizing active, experiential, interactive, and reflective learning. Evidence-based research has demonstrated that project-based and problem-based methodologies yield significantly deeper and more transferable learning outcomes compared to traditional transmission models (Freeman et al., 2014). Furthermore, the emphasis on critical dialogue, peer learning, and professional reflection represents a logical extension of social constructivism and critical pedagogy within digital and intelligent environments (Korthagen, 2017). The model's alignment with prior scholarship is also noteworthy at the level of instructional design and technology integration. The deliberate and purposeful employment of intelligent technologies within the model corresponds with contemporary reinterpretations of the TPACK framework in the AI era, emphasizing pedagogically grounded and meaningful technological integration (Mishra et al., 2023). This approach continues the constructivist tradition of Papert, who conceptualized technology not as a vehicle for content transmission, but as an environment for knowledge construction (Papert & Harel, 2020). Finally, the alignment of the proposed model with existing literature is evident in the components of time, environment, learner characteristics, and assessment. The emphasis on gradual, spiral, and lifelong learning corresponds with curriculum design theories and professional learning frameworks. Additionally, the movement toward formative, data-informed, and multidimensional assessment aligns with contemporary approaches to assessment for learning and responsible AI governance in education (Leslie, 2019). Notwithstanding efforts to achieve comprehensiveness and rigor, the present study encountered certain limitations, including: restricted access to indigenous and Persian-language sources in the field of AI literacy, the study's focus on primary school student-teachers limiting generalizability to other educational levels, and reliance on the meta-synthesis methodology, which is contingent upon the quality and diversity of prior studies. However, the proposed model not only aligns with the established body of knowledge in education and technology, but also advances beyond many existing models through the coherent integration of philosophical, pedagogical, ethical, and technological dimensions, thereby presenting a comprehensive and up-to-date framework for AI literacy curriculum design at Farhangian University. This level of theoretical and empirical alignment reinforces the scientific credibility, reliability, and practical applicability of the model across diverse educational contexts. Accordingly, it is recommended that Farhangian University adopt the curriculum model developed in this

study as a comprehensive conceptual framework for designing courses related to AI literacy. As this model is the product of a systematic meta-synthesis of prior research, it may serve as a "reliable roadmap" to inform curriculum planning decisions across various educational settings. The findings may also inform the design of in-service training programs for faculty members and practicing teachers, such that each identified component (objectives, content, strategies, assessment, etc.) is developed as discrete yet interconnected instructional modules.

Future research should empirically test and validate the proposed model through experimental, design-based, or case study methodologies within Farhangian University. Further inquiry may also explore the development of dynamic and adaptable curricula responsive to emerging technologies, the creation of assessment instruments based on model components, in-depth qualitative examination of each model dimension, investigation of the social, cultural, and psychological implications of AI integration in education, and the integration of AI literacy with other domains including digital literacy, media literacy, and data literacy.

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Authors Contribution

All the authors have participated sufficiently in the intellectual content, conception and design of this work or the analysis and interpretation of the data (when applicable), as well as the writing of the manuscript.

Conflict of interests

The author states that there is no conflict of interest.

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