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# Literacy Reinvention and Empowerment Strategies for Instructors in the AI Era: A Systematic Literature Review

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**Abstract**

With the rapid development of artificial intelligence (AI) technology, the AI literacy of university instructors has become an important issue to be solved in the field of higher education. This study aims to systematically sort out the connotations and dimensions of AI literacy of university instructors, analyse its current situation and challenges, and propose targeted enhancement strategies. Through the systematic literature review method, this study comprehensively searched and screened the relevant literature during the period of 2010-2025, and used qualitative content analysis to code and thematically analyse the data. The findings indicate that AI literacy among university instructors covers four dimensions: technology application competence, ethical and social responsibility, pedagogical innovation and integration, and interdisciplinary competence. However, existing studies show that instructors have significant deficiencies in AI technology application and ethical perceptions, as well as significant differences in disciplinary backgrounds. Based on the literature analysis, this study proposes enhancement strategies such as optimising technology application competence, strengthening ethical education and social responsibility, promoting interdisciplinary cooperation, improving the training system, and strengthening policy support and resource investment. The study concludes that through systematic interventions, the AI literacy of university instructors can be effectively enhanced to promote the high-quality development of higher education in the era of AI.

**Keywords:** University Instructors, AI Literacy, Systematic Literature Review, Enhancement Strategies, Educational Innovation

## Introduction

*Background*

In the era of rapid development of artificial intelligence (AI) technology, the field of higher education is experiencing unprecedented changes.AI not only provides new technological means for education, but also brings profound impacts on teaching mode, curriculum design, learning evaluation, etc. (Qian, Cao, & Chen, 2025). As the core force of knowledge

dissemination and innovation, the AI literacy of university instructors has become a key factor affecting the quality of education and the future competitiveness of students. However, despite the great potential of AI technology application in education, university instructors currently still face many challenges in AI literacy. On the one hand, instructors' mastery of AI technology varies and their ability to apply the technology is insufficient; on the other hand, the complexity of AI ethical issues makes it difficult for instructors to effectively guide students to think critically during teaching (Holmes & Porayska-Pomsta, 2022). In addition, there are significant differences in AI literacy among instructors from different disciplinary backgrounds, which further exacerbates the unevenness in educational practices. Therefore, an in-depth study of the current status, challenges, and enhancement strategies of AI literacy among university and university instructors is of great significance in promoting the modernisation process of higher education.

*Purpose of the Study*

This study aims to comprehensively analyse the connotations and dimensions of AI literacy of university instructors, sort out its current situation and challenges, and propose targeted enhancement strategies through a systematic literature review. Specifically, the study will systematically sort out the connotations and dimensions of AI literacy among university instructors, and clarify its specific performance in terms of technological application, ethical cognition, pedagogical innovation, and interdisciplinary competence; analyse the current state of research on AI literacy among university instructors, and identify its differences and deficiencies in different disciplinary contexts; and put forward enhancement strategies based on the literature analysis to provide theoretical support and practical guidance for instructors training, curricular design, and educational policy making in higher education.

*Research Questions*

In order to achieve the above research objectives, this study will focus on the following core questions:

a. What are the connotations and dimensions of AI literacy among university instructors? What is its specific performance in terms of technology application, ethical cognition, teaching innovation and interdisciplinary competence?
b. How do existing studies describe the current status and challenges of AI literacy among university instructors? What are the differences in AI literacy among instructors from different disciplinary backgrounds?
c. Based on the analysis of the literature, how can we design strategies to improve AI literacy among university instructors? How feasible and effective are these strategies in practice?

*Significance of the Study*

Through a systematic literature review, this study, from the theoretical level, systematically combs the current research status of AI literacy of university instructors, providing a solid theoretical foundation for subsequent research. From the practical level, this study provides a scientific basis for the optimisation of the training system for university instructors, the innovation of curriculum design and the formulation of educational policies, which helps to promote the high-quality development of higher education in the era of AI. In addition, this study provides decision-making references for educational administrators and policy makers, helping higher education better adapt to the changes brought by AI technology. Through this study, we expect to provide support for the role transformation of higher education

instructors in the era of AI, to promote educational equity and innovation, and to cultivate high-quality talents who can adapt to the needs of the future society.

## Methodology

This study adopts the Systematic Literature Review (SLR) method, which aims to comprehensively sort out and analyse the current research status, challenges and enhancement strategies of AI literacy among university instructors. The Systematic Literature Review method is a widely recognised research method in the field of educational research (Mustafa et al., 2024) through a rigorous process of literature search, screening, quality assessment and data extraction to ensure the scientific validity and reliability of the research findings.

### *Research Design*

The study followed the standard process of a systematic literature review, which consists of four stages: literature search, screening, quality assessment and data analysis. The goal of the study was to identify the core dimensions of AI literacy among university instructors, sort out their current status and challenges, and propose targeted enhancement strategies through systematic analysis. The core of the research design is to ensure the comprehensiveness of the literature search, the rigour of the screening, the scientificity of the quality assessment, and the depth and breadth of the data analysis.

## Literature Search

### *Database Selection*

The literature search covers the following authoritative academic databases: Web of Science, Scopus, ERIC, Google Scholar, CNKI. These databases cover high-quality research results in many fields such as educational technology, AI, and higher education, and can provide a comprehensive literature base for this study.

### *Keyword Setting*

To ensure the accuracy of the search results, the research team designed the following keyword combinations:

Subject terms: AI literacy, AI education, higher education instructors, instructor training, AI ethics, educational technology.

Synonyms and related words: Artificial Intelligence,AI,Higher Education,Teacher Competence,Ethics,Curriculum Integration.

Retrieval strategy: construct multidimensional retrieval formulas through Boolean logic combinations (AND, OR, NOT), e.g. (Artificial Intelligence Literacy OR AI Literacy) AND (Higher Education instructors OR Higher Education) AND (instructor Training OR Competence Enhancement).

### *Timeframe and Language*

The timeframe of the search is from 2010 to 2025, focusing on research results within the last five years to reflect the latest progress in the field. The language of the literature includes Chinese and English to ensure the international perspective and local relevance of the research.

*Search Process*

The literature search was divided into two stages: preliminary search and supplementary search. The preliminary search was conducted through the above databases, while the supplementary search was completed through reference tracing and grey literature search to ensure the comprehensiveness of the literature.

**Literature Screening and Quality Assessment**

*Initial Screening*

The initial screening process involves a preliminary assessment of the literature based on titles and abstracts to exclude studies that are clearly irrelevant to the research topic. This step aims to efficiently narrow down the pool of potential articles for further review. During this stage, two independent reviewers will carefully examine the titles and abstracts of all retrieved studies. Any studies that do not meet the predefined inclusion criteria, such as those that focus on unrelated topics or do not involve AI - related educational research, will be excluded. The reviewers will document the reasons for exclusion for each study, ensuring transparency and traceability in the screening process.

*Full - Text Screening*

Following the initial screening, the full texts of the remaining studies will be retrieved and subjected to a more comprehensive evaluation. This full - text screening process focuses on excluding studies with methodological flaws, incomplete data, or those that have been published multiple times. Two independent reviewers will read each full - text article in detail and assess its quality based on a set of predefined criteria. Studies that are found to have significant methodological issues, such as biased sampling, inadequate research design, or unreliable data analysis, will be excluded. Additionally, any studies with incomplete data or those that appear to be duplicate publications will also be excluded. The reviewers will again document the reasons for exclusion for each study, and any discrepancies between the reviewers will be resolved through discussion and consensus.

*Quality Assessment*

To ensure the scientific rigor and reliability of the included studies, a quality assessment will be conducted using the Critical Appraisal Skills Programme (CASP) tool. The CASP tool is a widely recognized and validated instrument for evaluating the quality of various types of research studies, including qualitative, quantitative, and mixed - methods studies. The assessment will cover several key aspects, such as the clarity of research objectives, the appropriateness of research methods, the rigor of data analysis, and the relevance and applicability of the study results. Two independent reviewers will use the CASP checklist to evaluate each included study, and any disagreements will be resolved through discussion or consultation with a third reviewer if necessary. Only studies that meet the predefined quality standards will be included in the final analysis, ensuring that the findings of this research are based on high - quality and credible evidence.

**Data Extraction and Analysis**

*Data Extraction*

Data extraction is a crucial process in systematic reviews, aimed at collecting relevant information from included studies and organizing it in a way that facilitates subsequent analysis and comparison. In this study, we will extract key information from the selected

literature, including the research background, objectives, methods, results, and conclusions. This process will be guided by a predefined data extraction template to ensure consistency and completeness. The extracted data will be organized into a standardized format, such as a data extraction table or a synthesis matrix, to support the analysis and synthesis of the findings (Pollock et al., 2023).

*Analysis Method*

We will employ qualitative content analysis to analyze the extracted data. This method involves coding and theming the data to identify commonalities and differences across the studies. The analysis process will be rigorous and transparent, with detailed documentation of the coding and theming procedures. The goal is to synthesize the findings from the included studies and draw meaningful conclusions that address the research questions. The results of the analysis will be presented in a structured manner, highlighting the key themes and patterns identified in the data (Harwood & Garry, 2003).

Literature with high relevance was screened according to the research topic and research question. Initially, 131 pieces of literature were obtained, and the articles were screened by the researcher by reading the titles and abstracts in turn, and 61 pieces of literature in the duplicate category or of low quality were excluded, and 70 pieces were initially identified for inclusion. Then the researcher read the full text of the literature with unclear literature topics, and again deleted 27 pieces of literature that were not related to the research topic, and again compared the content of the articles, screened the articles that expressed similar views in content, and retained the articles with better quality, and finally included 26 pieces of literature (Figure 1).

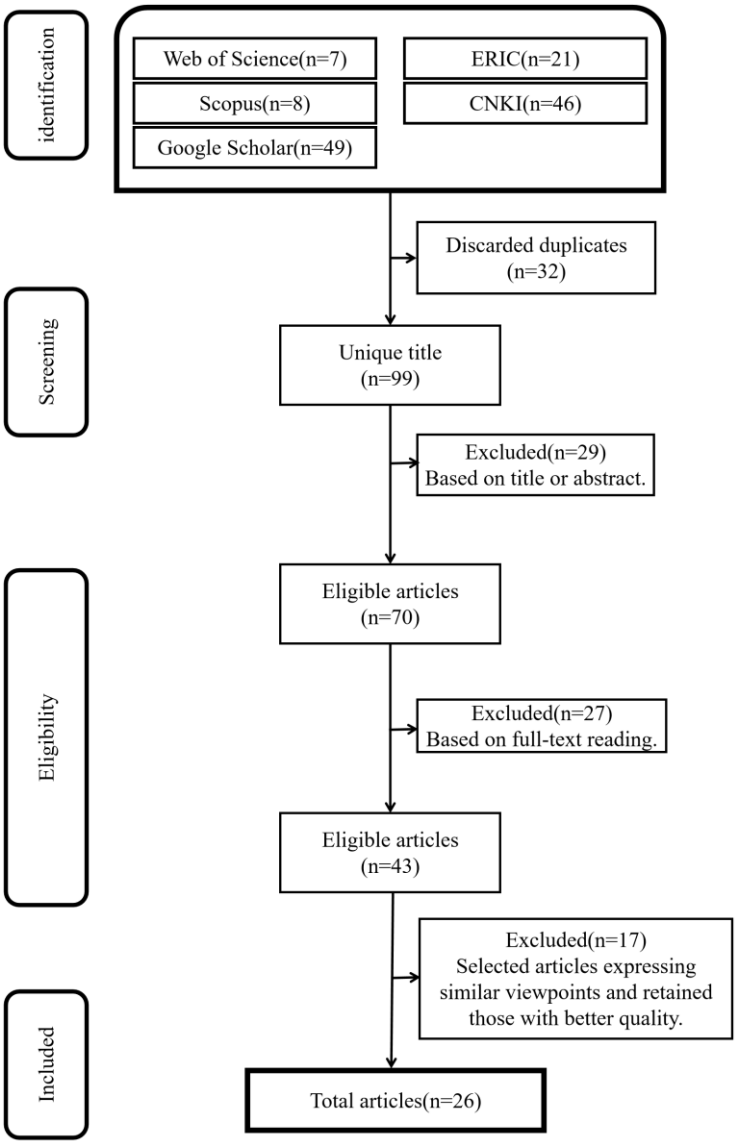


Figure 1 Literature search and screening

## Results

*Connotation and Dimensions of AI Literacy of university instructors*

Through systematic sorting of the existing literature, this study divides university instructors' AI literacy into the following four core dimensions: technology application ability, ethical and social responsibility, pedagogical innovation and integration, and interdisciplinary ability. Together, these dimensions constitute a necessary literacy framework for university instructors in the era of AI.

*Technology Application Ability*

Technology application ability is the foundational dimension of AI literacy for university instructors, involving instructors' mastery and application of AI tools. This includes the proficient use of technologies such as machine learning algorithms, natural language processing tools, and intelligent educational software (Wu, Hu, & Wang, 2022). Research states that instructors need to have basic programming skills, data analysis skills, and the ability to integrate AI technologies into their teaching (Miao & Cukurova, 2024). For example,

instructors can use AI tools to enable the design of personalised learning paths to improve teaching and learning (Wu et al., 2022). In addition, instructors need to acquire human-computer collaborative education capabilities, i.e., using AI technology to optimise the teaching process and improve teaching efficiency (Wu et al., 2022).

*Ethics and Social Responsibility*

Ethics and social responsibility is an important part of university instructors' AI literacy, which involves instructors' knowledge of and ability to respond to AI ethical issues (Bai, Liu, Li, Wang, & Wu, 2024). instructors need to understand the ethical risks of AI technology in educational applications, such as data privacy protection and algorithmic bias, and guide students to think ethically in their teaching (Huang, Zhang, & Liu, 2024). The study points out that instructors must be ethically aware when using AI tools to ensure that the application of technology meets the moral standards of the society. For example, instructors need to develop a prudent attitude towards the introduction of smart technologies into teaching sessions in practice to avoid excessive and inappropriate use of technology (Huang et al., 2024).

*Pedagogical Innovation and Integration*

Pedagogical innovation and integration competencies require instructors to be able to integrate AI technologies into curriculum design and teaching methods (Shan, 2025). This includes not only the use of AI tools to optimise teaching content, but also involves the exploration of personalised teaching, collaborative learning and innovative teaching models through smart technologies (Shan, 2025). For example, AI-driven education models can significantly enhance students' innovative thinking and critical skills through intelligent learning systems and personalised learning pathways (Shan, 2025). In addition, instructors need to tap into patterns and experiences of effective technology integration in teaching and learning, and proactively adapt to the human-computer collaborative teaching environment (Wu et al., 2022).

*Interdisciplinary Competence*

Interdisciplinary competence is one of the key dimensions of AI literacy for university instructors, which requires instructors to be able to collaborate with multidisciplinary fields such as computer science, ethics, and sociology (Shan, 2025). Research has pointed out that interdisciplinary collaboration can effectively enhance instructors' understanding and application of AI technologies (Shan, 2025). For example, in a biosensing technology course, AI technology was used to optimise the integration of knowledge across different disciplines, significantly enhancing synergy in interdisciplinary projects (Shan, 2025). In addition, instructors need to be equipped with 'AI+X' interdisciplinary knowledge structures to cope with the complex educational needs in the AI era.

Table 1
*Dimensional framework of AI literacy for higher education instructors*

| Dimension | Core Content | Key Competencies |
|---|---|---|
| Technology Application Ability | Mastery of AI tools (e.g. machine learning, natural language processing), programming and data analysis skills, and human-computer co-teaching skills | Using AI tools to optimise the teaching process, design personalised learning paths and improve teaching efficiency |
| Ethics and Social Responsibility | Data privacy protection, algorithmic bias identification, ethical issues guidance, social responsibility | Developing ethical awareness, guiding ethical thinking in students, and ensuring ethical use of technology |
| Pedagogical Innovation and Integration | AI into curriculum design, personalised and collaborative learning, innovative teaching models | Using AI tools to optimise teaching content, personalise teaching and enhance students' creative thinking and critical skills |
| Interdisciplinary Competence | Collaboration with multiple disciplines (computer science, ethics, sociology), 'AI + X' knowledge structures | Integration of multidisciplinary knowledge, interdisciplinary projects, and development of students' general literacy |

**Research Status and Challenges**

Through systematic combing of existing literature, this study finds that university instructors face the following four major challenges in AI literacy: insufficient ability to apply the technology, weak ethical cognition, significant disciplinary differences, and an imperfect training system. These challenges affect the effective application of AI technology and educational innovation of university instructors to different degrees.

*Insufficient Technology Application Ability*

The study points out that university instructors have significant deficiencies in the application of AI technology. Many instructors use AI tools superficially and lack in-depth programming and data analysis skills (Tan, Cheng, & Ling, 2025). For example, it has been pointed out that some university instructors have insufficient awareness of applying AI technology and their concepts are not updated in a timely manner, which makes it difficult to effectively apply AI technology in teaching (Mustafa et al., 2024). In addition, instructors face technical barriers in integrating AI technology into teaching, especially in the design of personalised learning paths and the application of intelligent teaching systems (Zhu & Nie, 2024).

*Weak Ethical Awareness*

Instructors in higher education are weak in terms of their awareness of and ability to cope with AI ethical issues. Studies have found that instructors are less aware of AI ethical issues and lack systematic ethical training (Kamali, Alpat, & Bozkurt, 2024). For example, research on the ethical governance of educational AI noted that instructors tend to ignore ethical risks such as data privacy protection and algorithmic bias when using AI tools (Holmes & Porayska-Pomsta, 2022). In addition, instructors' lack of competence in guiding students to think ethically may lead to ethical problems in teaching (Nguyen, Ngo, Hong, Dang, & Nguyen, 2023).

*Significant Disciplinary Differences*

There are significant differences in AI literacy among instructors from different disciplinary backgrounds. instructors from science and engineering disciplines perform better in technology application skills, while instructors from liberal arts and arts disciplines are more dominant in ethics and social responsibility (Hornberger, Bewersdorff, Schiff, & Nerdel, 2025). For example, research has noted that science and engineering instructors in interdisciplinary education models are more adept at integrating AI technology into curriculum design, while liberal arts instructors excel in ethics and social responsibility (Dabis & Csáki, 2024). Such disciplinary differences further exacerbate the imbalance in educational practices, highlighting the need for interdisciplinary collaboration (Shahid et al., 2024).

*Inadequate Training System*

The AI training system for university instructors lacks systematicity and relevance. Many training courses are outdated and fail to keep up with the latest developments in AI technology (Pereira, Hadjielias, Christofi, & Vrontis, 2023). For example, some researchers have pointed out that the insufficient AI knowledge base of university instructors is partly due to the lack of relevant courses and training in instructor education institutions (Mustafa et al., 2024). In addition, the training system fails to adequately take into account the needs of instructors in different disciplines, resulting in ineffective training (Aljemely, 2024).

*Suggestions for Enhancement Strategies*

In view of the challenges faced by university instructors in AI literacy, this study proposes the following five enhancement strategies, which aim to optimise instructors' technological application ability, strengthen ethical education and social responsibility, promote interdisciplinary cooperation, improve the training system, and strengthen policy support and resource investment.

*Optimising Technology Application Skills*

The technology application ability of university instructors is the foundation of their AI literacy. In order to enhance instructors' technology application ability, universities should design tiered and classified training courses, combined with online and offline blended learning modes, to ensure that instructors are able to master basic programming ability, data analysis ability, and the use of AI tools (Hasan & Khan, 2023). In addition, instructors need to be proactive in adapting to human-computer collaborative teaching environments by tapping into models and experiences of effective technology integration in practice (Järvelä, Nguyen, & Hadwin, 2023). For example, automated evaluation of students' assignments and work through intelligent evaluation tools improves the efficiency and accuracy of evaluation (Ito & Ma, 2025).

*Strengthening Ethics Education and Social Responsibility*

The complexity of AI ethical issues requires instructors to have a high degree of ethical awareness and social responsibility. For this reason, universities and universities should incorporate AI ethics into the instructor training system, and enhance instructors' ethical cognitive abilities through case analyses and discussions (Schiff, 2022). instructors need to guide students to think ethically in their teaching and cultivate their awareness of privacy protection and critical thinking (Fu & Weng, 2024). In addition, instructors should actively participate in training and seminars related to ethics education in order to enhance a prudent

attitude towards the introduction of smart technologies into teaching sessions (Yan & Liu, 2024).

*Promoting Interdisciplinary Collaboration*

Instructors need to have interdisciplinary skills and be able to collaborate with multi-disciplinary fields such as computer science, ethics and sociology. To this end, HEIs should encourage instructors to conduct collaborative interdisciplinary research and enhance their general literacy through interdisciplinary team projects (Rana, Aitken, & Chimoriya, 2025). For example, instructors can broaden their research horizons and promote disciplinary integration by collaborating with colleagues from different disciplinary backgrounds on joint research projects (O'Rourke, Crowley, & Gonnerman, 2016). In addition, universities and universities should establish interdisciplinary cooperation platforms to provide opportunities for instructors to communicate and collaborate (Ligtermoet, Munera-Roldan, Robinson, Sushil, & Leith, 2025).

*Improve the Training System*

The AI training system for university instructors needs to be further improved to meet the needs of instructors of different disciplines. The training content should keep up with the latest development of AI technology, covering basic technical knowledge, ethical issues, teaching applications and other aspects (Yan & Liu, 2024). Universities should introduce a variety of formats such as expert lectures, workshops and online courses to ensure the diversity and flexibility of training (El Galad, Betts, & Campbell, 2024). In addition, HEIs need to establish an assessment mechanism for instructors' AI literacy to monitor the effectiveness of training and continuously optimise the training content based on feedback (Qian et al., 2025).

*Strengthen Policy Support and Resource Input*

Policy support and resource input are the key guarantees for enhancing AI literacy among university instructors. Universities and universities should increase investment in AI education, improve the technical support system, and provide instructors with necessary hardware and software resources (Zambrano-Romero, Rodriguez, Pita-Valencia, Zambrano-Romero, & Moran-Tubay, 2025). At the same time, universities and universities should actively seek support from government and social resources to promote the application of AI technology in education (Beck, Stern, & Haugsjaa, 1996). For example, by cooperating with enterprises and establishing joint laboratories or training centres to provide instructors with a practical platform (Mohammadi, 2024). In addition, policy makers should introduce policies to encourage universities to conduct AI education research and instructor training programmes (Alqahtani & Wafula, 2024).

**Conclusion**

Through a systematic literature review, this study comprehensively analyses the connotations and dimensions of AI literacy among university instructors, compiles its current situation and challenges, and proposes targeted enhancement strategies. The results of the study show that AI literacy of university instructors covers four core dimensions: technical application ability, ethical and social responsibility, pedagogical innovation and integration, and interdisciplinary ability. However, existing studies show that instructors have significant deficiencies in AI technology application and ethical cognition, and there are obvious

differences in disciplinary backgrounds, and the training system needs to be improved. Based on the literature analysis, this study proposes strategies to optimise technology application capabilities, strengthen ethical education and social responsibility, promote interdisciplinary cooperation, improve the training system, and strengthen policy support and resource investment.

The implementation of these strategies is of great significance in promoting the high-quality development of higher education in the era of AI. By optimising the ability to apply technology, instructors are better able to integrate AI tools into their teaching practice and improve teaching efficiency and quality. Strengthening ethical education and social responsibility helps instructors guide students to think ethically during teaching and cultivate future talents with a sense of social responsibility. Promoting interdisciplinary cooperation can bridge the differences in AI literacy among instructors of different disciplines and promote disciplinary integration and innovation. Improving the training system and strengthening policy support and resource investment then provide a solid guarantee for the improvement of instructors' AI literacy.

Although this study has achieved some results in terms of systematicity and comprehensiveness, there are still some limitations. For example, the quality of some of the literature varies, and the geographical differences of the studies may lead to limited generalisability of the results. In addition, existing studies lack in-depth exploration of the long-term impact of AI literacy. Future research should further expand the scope of the literature search to focus on the differences in the literacy of university instructors in different countries and regions, as well as delve deeper into the long-term impact of AI technology in higher education, so as to provide a more comprehensive basis for the development of educational policies.

In conclusion, the AI literacy of university instructors is a key factor in adapting higher education to the AI era. Through systematic interventions, instructors' AI literacy can be effectively enhanced to promote the modernisation process of higher education and cultivate high-quality talents who can adapt to the needs of the future society.

This study offers a comprehensive analysis of AI literacy among university instructors, presenting a framework that integrates technical skills, ethical considerations, teaching innovation, and interdisciplinary collaboration. Our systematic review identifies significant gaps in current research, such as the uneven distribution of AI literacy across disciplines and the inadequacy of existing training programs. These findings not only underscore the urgent need for tailored professional development but also provide a roadmap for future research and policy initiatives.

This research makes a significant contribution to the existing body of knowledge by addressing a critical gap in the understanding of AI literacy among university instructors. Theoretically, our work advances the field by synthesizing diverse perspectives on AI literacy into a cohesive framework that can guide future research. This framework not only captures the multifaceted nature of AI literacy but also highlights the dynamic interplay between technical proficiency and ethical considerations in educational settings.

In a practical context, our findings have immediate implications for higher education institutions worldwide. By identifying the specific challenges faced by instructors in different disciplines, we provide a basis for designing targeted training programs that address these disparities. Furthermore, our emphasis on interdisciplinary collaboration and policy support offers a strategic approach for institutions to enhance their teaching quality and prepare students for an AI-driven future. This study thus serves as a bridge between theoretical insights and actionable strategies, ensuring that the benefits of AI technology are realized equitably across all educational domains.

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