

Advancing AI Literacy in Higher Education Design Faculty

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Abstract: Against the backdrop of the rapid development of AI and its continuous penetration into education and design practices, improving the AI literacy of university design faculty has become a key factor in promoting educational innovation and enhancing the quality of talent cultivation. Due to differences in academic disciplines and variation in educational environments, and because design combines both artistic creativity and technical application compared with other subjects, university design faculty are in urgent need of pathways for improving their AI literacy that reflect their academic characteristics and practical relevance. Based on a systematic analysis of the current status of AI literacy among university design teachers, and drawing on TPACK theory, this paper aims to strengthen the integration of AI technology with teaching processes. It proposes a set of new pathways for improving AI literacy among design faculty. These pathways will enable design faculty to adapt to the demands of the digital intelligence era, guide them to make full use of AI resources, and continuously enhance their AI literacy, while jointly constructing an intelligence-enabled, practice-oriented, and sustainable framework dedicated to a new teaching ecology.

Keywords: AI literacy enhancement; University design faculty; Pathways



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1 Introduction

The rapid development of AI has profoundly impacted design education, driving not only iterative updates in design tools but also a restructuring of design thinking and teaching models. As the primary agents in design education, university design faculty are not merely conveyors of artistic design concepts but also guides of educational philosophy. Their AI literacy serves as a critical indicator of teaching quality.

In July 2025, the General Office of the Ministry of Education of the People's Republic of China issued the *Notice on Organizing and Implementing the Digital Empowerment Initiative for Teacher Development*, which explicitly called for “establishing a pathway for developing teachers’ digital literacy — guided by digital literacy standards, implemented through training and development, and characterized by application-driven practice and continuous improvement”

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(Ministry of Education of People's Republic of China, 2025). This policy provides a framework and action guide for enhancing the AI literacy of design faculty. It also underscores that improving teachers' AI literacy is an internal driving force for educational digital transformation, directly influencing the level of innovation and competitiveness in design education. However, despite previous research (Burgsteiner et al., 2016; Al-Zahrani & Alasmari, 2024), constructing a scientific and systematic pathway for enhancing AI literacy remains essential to fostering innovative development in the design discipline within the AI era and effectively serving national strategic goals.

2 Current Status of AI Literacy among Design Faculty in Higher Education

In recent years, international organizations have successively proposed core AI literacy frameworks oriented toward future development, pointing the way for the transformation of global digital education. For instance, the *AI Competency Framework for Teachers*, officially released by UNESCO in 2025 (UNESCO, 2025), serves as a global reference document for national AI literacy policies for educators, playing a significant role in promoting AI literacy education worldwide. This initiative also highlights the strategic importance of AI education on the international stage, while providing reference and direction for enhancing the AI literacy of design faculty in higher education. However, through a combination of literature review and online research, it has been found that design faculty in Chinese universities still face numerous difficulties and challenges in terms of AI literacy.

2.1 Outdated AI Knowledge and Conceptual Framework

Despite continuous iterations in AI technology, some design faculty in higher education still lag significantly in their understanding of AI. For example, a 2025 study by Jilin Academy of Sciences, which surveyed 12 different types of universities in Jilin Province, distributed 300 questionnaires and collected 253 valid responses. Additionally, in-depth interviews were conducted with 52 teachers who participated in the survey. Cross-validated multi-source data revealed that approximately 65% of the teachers were able to use basic intelligent teaching tools. In comparison, fewer than 20% were proficient in applying AI technology for teaching innovation. In actual teaching practice, only 40% of teachers actively addressed AI-related ethical issues (Yan, 2025). This lag not only severely constrains teachers' professional development but also affects the cultivation of students' interdisciplinary abilities, making it difficult to meet the demands of cross-disciplinary development. Some teachers' understanding of core AI concepts, technical logic, and cutting-edge trends remains superficial. They lack a systematic and structured knowledge framework, making it challenging to form an interdisciplinary cognitive system, particularly showing deficiencies in awareness and application of advanced technologies such as AIGC, multimodal interaction design, and intelligent human-machine collaboration.

2.2 Weak Integration of Intelligent Technologies

Design faculty cannot generally effectively integrate AI technology with design methodologies. As a result, the deep integration of AI and the design discipline remains in its preliminary stages, failing to form an interdisciplinary paradigm driven by "AI+Design". Significant shortcomings also exist in areas such as intelligent interactive interfaces, algorithm-based artistic creation, and data-driven design decisions. These deficiencies prevent the full realization of AI's application value in curriculum development and disciplinary innovation, thereby weakening the competitiveness of the design discipline in the process of digital transformation in education. An international survey on *Generative AI in Education* found that while 83%

of computer science teachers possessed technical comprehension skills, only about 10% of non-computer science teachers reached a comparable level (Ghimire et al., 2024). Although teachers in arts and humanities actively use generative AI, their understanding of its underlying logic and interdisciplinary applications is significantly lower than that of their counterparts in technical disciplines, further indicating a lack of capability in integrating intelligent technologies.

2.3 Lack of Practical Guidance and Innovative Experience

The 2024 Report *Digital Development of Chinese Universities* (The Science and Research Development Center of the Ministry of Education of the People's Republic of China, 2024), released by the Higher Education Scientific Research and Development Center of the Ministry of Education, pointed out several weaknesses in universities' digital transformation. Progress in emerging technologies remains uneven, support from smart teaching platforms is inadequate, digitalization does not yet cover the entire research process, and data is not applied in sufficient depth. These gaps slow the advancement of systematic research and leave faculty without enough opportunities to build up hands-on innovation experience, and the result is a limit on the steady output of new teaching and research achievements. When guiding students in coursework or graduation projects, teachers often fall back on explaining how to operate tools. What is missing is guidance on combining design thinking with intelligent algorithms. Unsurprisingly, students' use of AI tools often ends up producing outputs that look polished but lack real originality.

2.4 Limited Interdisciplinary Integration and Collaborative Capacity

Against the backdrop of AI's integration with multiple disciplines, design education in universities faces challenges due to a lack of interdisciplinary backgrounds and systematic collaboration mechanisms. Faculty members often struggle to promote cross-disciplinary integration between AI and fields such as art and design, the humanities and social sciences, and engineering. On the one hand, traditional disciplinary boundaries make it difficult for teachers to achieve deep integration of AI with art, design, and the humanities. On the other hand, design faculty tend to have low participation in interdisciplinary projects and research platforms, and the absence of systematic collaboration further restricts progress.

These shortcomings have limited the ability of design disciplines to achieve breakthroughs in the "AI+Design" era and have weakened AI's role in driving value creation in areas such as the digital economy and the cultural and creative industries.

3 Pathways for Enhancing AI Literacy Among University Design Faculty

The rapid development of AI is driving profound transformations in knowledge acquisition, practical application, and modes of innovation. In this new era, design faculty in higher education must actively enhance their AI literacy to meet the demands of intelligent education. Improving AI literacy involves not only technical competence but also pedagogical philosophy, teaching models, and disciplinary development strategies. It is therefore a multidimensional and systematic process, characterized by practicality, contextual relevance, and continuous development. Overall, the enhancement of AI literacy among design faculty can be pursued through the following pathways:

3.1 Establishing a Literacy Framework to Strengthen Information Ethics and Responsibility Awareness

In today's landscape, where AI drives design education, teachers are no longer merely traditional knowledge

disseminators but also leaders in intelligent ethics and social responsibility. Although the *Digital Literacy of Teachers* issued by China's Ministry of Education in 2022 defined a framework for teachers' digital literacy (Ministry of Education, 2025), the differences across academic disciplines and the variations in educational environments necessitate corresponding adjustments to specific digital literacy indicators. Building upon the TPACK theoretical framework (Koehler & Mishra, 2009) and the indicator system of *Digital Literacy for Teachers*, a new AI literacy framework for design faculty in higher education has been constructed. This framework is grounded in technological literacy, with value orientation and responsibility awareness as its core, emphasizing the establishment of a scientific and rational conceptual system and adherence to correct value guidance, aiming to promote the multidimensional and coordinated enhancement of AI literacy among design faculty.

Specifically, at the theoretical level, faculty need to strengthen ethics education by guiding students to develop correct values and cultivating their awareness of information ethics, data security, and social responsibility. Teachers must consciously assume responsibility for information use in classroom instruction, research activities, and social services, actively reflecting on and addressing ethical issues in education. The *Guidance for Generative AI in Education and Research*, published by UNESCO (UNESCO, 2025), emphasizes that teachers should integrate AI usage norms, responsibility awareness, and academic integrity education into their teaching, fostering students' ability to make informed judgments and their sense of social responsibility in the context of technological learning. At the practical level, teachers should actively incorporate intelligent technologies into teaching and research. By mastering AI design tools, algorithms, and technical applications, they can enhance interdisciplinary integration and support innovative teaching and research practices. Dimensions of the AI literacy framework for design faculty are shown in Table 1.

Table 1 Dimensions of the AI Literacy Framework for Design Faculty

Dimension	Description
Information Ethics & Responsibility	Establish correct values, strengthen information ethics, data security, and social responsibility.
Technical Literacy	Master AI design tools, algorithms, and technical application capabilities.
Teaching Literacy	Understand and apply teaching methods and strategies supported by AI.
Disciplinary Literacy	Possess knowledge of the design discipline and interdisciplinary integration ability.
Comprehensive Practice & Innovation	Achieve integration based on the TPACK framework, promoting teaching innovation, research application, and social service.

3.2 Building an Interdisciplinary Training System to Enhance “AI+Art Design” Integration Capability

In the context of the digital-intelligent era, the integration of AI and the design discipline is not merely a technological overlay but also a reshaping of knowledge systems and thinking modes. In April 2025, the Academy of Arts & Design, Tsinghua University, conducted specialized training for in-service teachers on AI-empowered teaching and research, exploring new models for the integration of art and technology (The Academy of Arts & Design, Tsinghua University, 2025). In the same year, China Academy of Art, in collaboration with Zhejiang University of Media and Communications and Zhejiang University, co-developed the first-class course Artificial Intelligence and Digital Art, marking a new systematic and inclusive stage in the integration of AI and the design discipline, providing strong support for cultivating versatile talents suited to the demands of the digital-intelligent era (China Academy of Art, 2025).

Constructing an interdisciplinary cultivation system and integrating AI with art design has become the key to enhancing the comprehensive abilities of teachers in design disciplines. Through the building of this system, on one hand, it helps break down barriers between different subjects and enables teachers to develop both “design thinking + AI thinking”. On the other hand, it helps establish a new human-machine collaborative teaching model. By effectively

integrating information technologies from different fields, teachers can significantly enhance their practical innovation abilities, especially in intelligent design and generative creativity, and develop strong comprehensive literacy and technological leadership. This improvement not only promotes the deep integration of AI and design disciplines but also expands interdisciplinary boundaries, provides the foundation for building a new model of human-machine collaboration in teaching, and ultimately fosters the innovative development of human-machine collaborative education.

3.3 Improving Resource Platforms and Technical Environment

Universities need to integrate existing teaching and design practice resources and improve resource platforms and the technical environment to provide a foundation for an AI literacy enhancement system that meets personalized and diverse needs. In recent years, building intelligent design laboratories, data sharing platforms, and cloud-based teaching resource libraries has become one of the most important facilities for enhancing teachers' AI literacy. Currently, many Chinese art academies are actively exploring the construction of intelligent platforms. For example, the Central Academy of Fine Arts has continuously promoted the integrated development of "Art + Technology" in recent years, establishing the "Smart Creation Workshop" and founding the "School of Experimental Art and Science & Technology" (Central Academy of Fine Arts, 2025). It has built systematic resource platforms for cutting-edge directions such as AI and virtual reality, providing a powerful technical support environment for teachers to engage in interdisciplinary learning and research, enabling them to create personalized self-directed learning paths according to their own needs and interests.

Within this context, the international academic community is also actively exploring multiple pathways through which intelligent platforms shape education. At the 29th Global Chinese Conference on Computers in Education (GCCCE 2025), multiple experts discussed the theme "Embracing Frontier Technology: Cultivating the New Paradigm of Learners", proposed diverse insights, systematically presented new forms of education shaped by integrated intelligent technologies, and proposed diversified models through which intelligent platforms can support teacher self-directed learning and cross-boundary collaboration (Jiangnan University, 2025). This trend indicates that the future educational ecology in the digital-intelligent era will be more personalized and diversified.

Therefore, improving resource platforms and the technical environment is a fundamental step in constructing a new developmental ecology for the design discipline. It helps drive design faculty to continuously update their intelligent knowledge, teaching methods, and innovative practices, and to create a new form of education characterized by intelligent support, self-directed learning, and innovative practice, promoting the deep integration of AI and art education.

3.4 Promoting Industry-Education Integration and Building a Collaborative Development Mechanism

In the digital-intellectual era, the improvement in the AI literacy of high school teachers needs to be deeply connected with industrial development and social needs. It should promote the fusion of industry and teaching, the collaboration between colleges and companies, the sharing of project construction platforms, and the construction of coordinated mechanisms for development. These efforts encourage teachers to participate in practical projects and learn about frontier technologies and cases of application. In this way, they can accumulate more experience in design creation and finally realize the enhancement of their own AI literacy.

By 2023, China's Ministry of Education had expanded its "Industry-Education Integrated Enterprise" pilot program to cover over 3,000 companies (Zero Power Intelligence Group, 2025). Many of these enterprises have partnered with art and design institutions to launch interdisciplinary innovation projects. For instance, Beijing University of Posts and

Telecommunications and Huawei jointly launched an experimental course on “Intelligent Interaction Design”, which has not only strengthened instructors’ AI teaching capabilities but also boosted students’ innovation outcomes in smart product and human-computer interaction design — effectively building a collaborative development framework (Beijing University of Posts and Telecommunications, 2025).

The collaborative mechanism is primarily reflected in four areas: co-developed curricula, shared platforms, joint research, and talent co-cultivation. A notable example is Nanjing University of the Arts, which collaborated with Vertiv on the “Technology Future” cross-disciplinary project and successfully deployed the full-capacity “DeepSeek-R1” AI system (Sohu, 2025). This initiative is gradually building a comprehensive intelligent ecosystem that spans teaching, creative practice, and scientific research. Therefore, a well-structured collaborative development mechanism not only advances industry-education integration in design disciplines but also allows faculty to realize diverse value through educational and social contributions — ultimately fostering a harmonious development landscape connecting higher education and industry, academic disciplines and society.

4 Conclusion

With the continuous evolution of digital-intelligent technologies, the deep integration of AI and education has become an inevitable trend. Drawing on the TPACK framework and guided by the Teachers’ Digital Literacy indicator system issued by the Ministry of Education, this study constructs an AI literacy framework for design faculty. The framework outlines an enhancement pathway spanning multiple dimensions, including value guidance, interdisciplinary capacity building, resource platform optimization, and industry-education integration. This research not only provides a practical roadmap for improving AI literacy among design faculty in higher education but also offers theoretical foundations and concrete examples for the digital transformation of art education. By raising the AI literacy of design faculty, universities can better meet the demands of the digital-intelligent era, improve teaching effectiveness and satisfaction, and drive the reform and development of art education.

Abbreviations

AI: Artificial Intelligence

TPACK: Technological Pedagogical Content Knowledge

UNESCO: United Nations Educational, Scientific and Cultural Organization

GenAI: Generative Artificial Intelligence

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Author Contributions

Liying Deng is the sole author and contributes solely to this paper.

Conflicts of Interest

The authors declare no conflicts of interest.

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