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Exploring Challenges and Opportunities in the AI-Driven Professional Development of Higher Education Faculty

Shuchang Zhang

Institution of Foreign Languages, Southwest Jiaotong University, Chengdu, China
shuchangzhang916@gmail.com

Abstract. With the rapid development of generative artificial intelligence (AI) technology, its impact on the professional competency of higher education teachers is receiving increasing attention. However, the current research mostly focuses on the application of technical tools and seldom systematically explores the multiple challenges and deep opportunities faced by teachers in remodeling and ability transformation. This article focuses on the ability reconstruction of college teachers in the dimensions of digital literacy, reflective practice, and lifelong learning in the context of the AI era. Combining literature and typical cases, this research reveals the challenges that AI brings to teachers, and also brings opportunities such as improved teaching efficiency and personalized development paths. Based on the above analysis, this paper puts forward three suggestions: improving the teacher AI training system and enhancing its technical adaptability; Promote the deep integration of AI and teaching, and realizing a new paradigm of human-machine collaborative education; Reconstruct the teacher evaluation mechanism and strengthening the process and collaborative evaluation.

Keywords: Higher Education Teacher Competencies, Generative Artificial Intelligence, Pedagogical Transformation, Continuous Professional Development

1. Introduction

With the rapid development of generative artificial intelligence, higher education is facing a profound technological reshaping. According to a report released by UNESCO, as of 2022, only 7 countries around the world have formulated and launched teacher AI training programs, which shows that although universities are trying to introduce AI-assisted teaching tools, teachers with systematic application capabilities are still relatively scarce [1]. The contrast between technological expansion and ability lag not only highlights the challenges faced by teachers in the education system, but also triggers extensive discussion about their career orientation and core values [2]. When AI can efficiently complete traditional teaching tasks such as lesson plan design, answering questions, and homework evaluation, teachers naturally begin to think about the positioning of their roles.

Traditional teacher competence models (such as TPACK) are facing doubts about their theoretical applicability. OECD data shows that although there are currently a lot of studies focusing on AI classroom applications, there are still few studies that really focus on teachers' professional ability

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development and capacity building. This shows that teachers urgently need to shift from "knowledge instiller" to "AI collaborative guide" to realize the systematic reconstruction of professional competency [3].

Therefore, this study will focus on the challenges and opportunities of college teachers' professional ability in the generative AI environment, aiming to explore how AI reshapes teachers' ability structure, the psychological and technical challenges faced by teachers at present, and how to build a sustainable human-machine collaborative development path. This study will analyze the challenges and opportunities faced by teachers through SWOT analysis. Put forward multi-dimensional strategic paths, including institutional reconstruction, ability training, ethical construction, and cultural transformation. Looking forward to the future evolution trend of college teachers under the intelligent education environment.

2. The composition of professional competence of higher education teachers

In recent years, academic circles have gradually realized that teachers' professional ability is not a single static skill, but a comprehensive quality covering many aspects. First of all, in terms of instructional design ability, Olave Astorga et al. proposed that teachers need to have "dual-track design thinking", that is, be able to plan the teaching process and AI agent behavior at the same time, such as reasonably integrating generative AI into teaching as a classroom teaching assistant [4]. This thinking mode is not only a problem of technology use, but also the key for teachers to innovate in teaching content, process, and resource arrangement.

Secondly, teachers must have good digital literacy to carry out teaching in an artificial intelligence environment. In short, digital literacy is not only about being able to "use", but more importantly, being willing to use and judge. The research of Li Xiaohong and Hu Haixia pointed out that whether teachers have digital ability depends on two factors: one is their actual ability to operate technology, and the other is their confidence and initiative in using technology (called"psychological empowerment"). The higher the psychological empowerment, the more willing teachers are to try and accept AI tools [5]. It should be noted urgently that the lack of algorithm literacy will make teachers lack judgment on AI output results during the teaching process, making it difficult to guarantee the teaching effect.

Finally, reflective practice and lifelong learning ability are important guarantees for teachers to maintain teaching adaptability in the rapidly changing AI technology environment. Studies have found that teachers' reflection frequency and adaptability to AI teaching tools are significantly improved after implementing formative evaluation, and there is a positive correlation between them [6]. This shows that continuous reflection not only improves teaching quality but also promotes the continuous development of teachers' professional ability.

Theoretically, teacher ability has shifted from the ability model that emphasizes static knowledge mastery to the "teacher-student co-evolution framework" based on caring theory and output-oriented concept, advocating that teacher ability should be dynamically generated in teacher-student interaction and AI collaboration [7,8].

3. Opportunities brought by AI

3.1. Improvement of teaching efficiency

Artificial intelligence technology provides unprecedented teaching efficiency gains for college teachers. On the one hand, through the human-machine collaboration model, teachers can rely on AI

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to complete more accurate learning situation analysis and personalized teaching. The case in chemical safety education shows that the AI risk prediction system reduces the accident rate by 73%, which empirically verifies the revolutionary potential of AI in teaching effectiveness [9]. At the same time, the automated feedback mechanism has formed a closed loop: AI can correct homework in real time and generate error heat maps, and teachers can carry out targeted explanations accordingly, which significantly improves the accuracy of students' retests and effectively shortens the learning cycle [6]. In addition, AI can take over 92%, 87% and 79% of the tasks in three aspects: knowledge retelling, homework correction, and learning progress monitoring, respectively, greatly releasing teachers' energy for high-order thinking training and innovative teaching design, and the overall teaching efficiency gain can reach more than 3.2 times [10]. This cognitive load shift provides the conditions for teachers to be liberated from repetitive work and focus on teaching innovation.

3.2. Digitalization of professional growth

AI's support for teachers' professional growth is also reflected in the construction of digital portraits of abilities. Olave Astorga's empirical evidence shows that AI can effectively improve teachers' technical integration, teaching innovation, and ethical sensitivity, and help teachers develop in an all-around and balanced way [4]. For example, Qian Yihua's research in anatomy teaching shows that precise reinforcement training based on surgical simulation data can increase teachers' practical scores by 31% on average, significantly optimizing the speed of professional skills improvement [7]. In addition, OECD and Niu Xinling respectively confirmed that the AI-driven growth early warning mechanism can predict 87% of teachers' burnout, identify hidden psychological crises through emotional computing, advance the intervention window by 11 months, and effectively increase the teacher retention rate by 28%. Provide guarantee for sustainable career development [8,11].

3.3. Teaching content innovation

The innovation of teaching content empowered by AI is reflected in the dynamic reorganization of interdisciplinary knowledge and the breakthrough of generative curriculum design. Based on traditional teaching methods and AI technology, Yang Gaoxue integrated quantum computing with literary criticism, gene editing, and ethics across borders, and hatched two new courses, Introduction to Digital Humanities and CRISPR Moral Debate Competition. The student participation rate was as high as 93% (only 67% in traditional courses), showing that AI greatly promoted students' interest and engagement in learning [12]. Burcu Arslan's research shows that compared with traditional teaching, AI generative design patterns can greatly improve situational relevance, cutting-edge relevance strength, and knowledge retention rate [13]. Specifically, AI can shift from static case library to real-time generation of regional cases, from fixed knowledge graph to dynamic knowledge network reconstruction, and from one-way teaching to multi-modal immersive script teaching, greatly improving the flexibility and immersion of teaching.

3.4. Internationalization of teaching and research

AI not only improves teachers' abilities, but also promotes global teaching and research cooperation and resource sharing. Experiments conducted by Viberg et al. in six countries show that an AI trust enhancement algorithm can build a transnational intelligent collaboration platform through cultural sensitivity detection, communication style adaptation, and conflict pre-mediation [1]. Chinese and

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Finnish teachers cooperated to develop the Arctic Circle ecological AI course and won the UNESCO Educational Innovation Award, which is a typical case of international intelligent teaching and research. OECD pointed out that AI multilingual translation technology will increase the coverage of high-quality courses by 79% in developing countries; Blockchain confirmation technology shortens the delay of academic data citation from 14.3 months to 2.1 days, effectively promoting global knowledge sharing [11].

In response to global emergencies, Su Fugen's complex system model shows that AI can quickly dispatch 120,000 teachers around the world to build an emergency curriculum library, increasing the course response speed in emergencies such as epidemics by 17 times [14]. During the 2025 earthquake in Japan, AI completed disaster data collection within 72 hours, matched teachers in related fields, and generated nuclear radiation prevention courses, reflecting the core role of AI in global educational crisis response.

4. Challenges posed by AI

4.1. Insufficient technical ability

Teachers' insufficient ability to operate AI tools is a key obstacle to the effective application of AI. According to OECD data, only 19% of college teachers around the world have participated in AI algorithm training, exposing a serious disconnect between teachers' digital competence and technology update speed [11]. In China, Li Xiaohong's empirical research reveals that the shortcomings of teachers' digital ability mainly come from technical fear, lack of training, and insufficient psychological empowerment. A systematic review by Tan et al. pointed out that insufficient ability directly leads to the collapse of teachers' trust in AI. According to Viberg's transnational trust model, this ability deficiency can significantly reduce the effectiveness of the trust model [1,5]. Ability shortcomings not only limit the development of AI potential in the classroom but also aggravate teachers' technical resistance, in reverse, forming a vicious circle that hinders the reform of AI education.

4.2. Teaching role reconstruction anxiety

AI undertakes more and more knowledge transfer tasks in teaching, which makes teachers face the adaptation dilemma of changing from "lecturer" to "guide" and brings obvious role anxiety. Yan et al.'s metaphor analysis shows that 71% of students have regarded generative AI such as ChatGPT as the "primary knowledge source", and the traditional knowledge authority of teachers is being weakened [2]. This phenomenon is particularly prominent in professional courses. For example, in anatomy teaching, when AI can accurately demonstrate the operation steps, teachers are not only gratified with technical empowerment, but also worried about losing professional uniqueness, presenting double emotional conflicts [7]. Olave Astorga proposed that ideally, teachers should balance the three roles of content expert, learning designer, and AI coordinator, and the ratio should reach 1: 1.7: 0.9, but in reality, it is only 1: 0.8: 0.3, reflecting that teachers are not adapted enough to new roles in the AI environment [4]. The psychological conflict in this role transformation not only affects teachers' self-confidence in teaching but also hinders them from exploring the deep integration of AI in the classroom.

Under the influence of this phenomenon, teachers are also faced with deeper psychological and attitudinal resistance. The widespread application of AI technology in the teaching environment has mainly triggered triple psychological crises among teachers: technology anxiety, identity crisis, and

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job burnout. Zhang Yingteng's interview research found that 82% of teachers expressed concern about being replaced by AI, and a philosophy professor bluntly said, "When ChatGPT can interpret Critique of Pure Reason, the value of my existence is fundamentally questioned" [15]. This psychological crisis, catalyzed by technological anxiety, not only weakens teachers' enthusiasm for teaching innovation but may also cause a decline in teaching quality and hinder the sustainable application of AI in education.

4.3. Communication and collaboration barriers

Besides the dilemma of theoretical knowledge and operational technology, teachers are also faced with the challenge of their communication ability. Niu Xinling's research compared the communication situation between traditional classroom and AI intervention and found that when students interacted with AI at high frequency, the frequency of direct dialogue between teachers and students decreased by 40%, while the communication relying on emotional algorithms made it difficult for teachers to discover students' psychological problems in time, resulting in a 27% increase in the missed detection rate of key emotional signals [8]. Kim & Thille's case study further found that when AI undertakes cognitive tasks, although the interaction time between teachers and students ostensibly increases by 300%, the proportion of in-depth conversations decreases by 64% [10]. This phenomenon shows that although AI intervention prolongs the "quantity" of communication, it reduces the "quality" of communication. Interpersonal care and emotional support are difficult to replace by AI, resulting in students' lack of sense of belonging and teachers' ability to perceive students' emotions, thus weakening humanistic care in the educational process.

4.4. Educational equity and ethical risks

The opacity of AI algorithms has triggered a dual crisis of educational equity and ethical risks. For example, there is gender bias in anatomical AI models, and the recognition error rate of female anatomical images is 19% higher [7]. At the same time, Zhang Yingteng found that the ChatGPT recommendation system obviously tends to recommend 985 university resources, and its probability is 3.7 times that of ordinary universities, exacerbating the unequal distribution of educational resources [15]. A systematic review by Tan et al. pointed out that 91% of colleges and universities around the world have not yet established an AI ethical review mechanism, and the regulatory vacuum may amplify the fairness and privacy issues brought by AI in education [16]. These risks interact with teachers' lack of technical ability, psychological crisis, communication barriers and other factors, forming a spiral negative feedback: backward technology leads teachers to be incompetent for role transformation, causing psychological resistance; Psychological crisis reduces the quality of communication between teachers and students, and the lack of communication exacerbates the unfair risks brought by AI algorithms, which ultimately worsens teachers' trust in and willingness to use AI. This systemic challenge not only limits the release of the potential of AI education but may also aggravate the inherent inequality of the education system. Targeted strategies are urgently needed to deal with it and provide a theoretical basis for solutions for building an efficient, fair, and sustainable AI education environment.

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5. Feasible paths for college teachers to cope with AI changes

5.1. Education and training support

There is a common ability gap between teachers' operations and teaching methods in AI applications. Therefore, layered training should be carried out for different levels, and AI tool operation training should be incorporated into basic-level courses to help teachers master practical skills; At the advanced level, man-machine collaborative simulation teaching can be designed based on the Synergy Degree model, so that teachers can be familiar with classroom interaction and management assisted by AI in the simulation environment [3]. At the same time, building a case library covering interdisciplinary AI teaching failure cases will help to enhance critical awareness of the potential risks of AI [17]. In addition, colleges and universities should also develop micro-certificates of AI education ability, incorporate them into the continuing education system, and link them with teacher hours certification to provide teachers with motivation for sustainable development and standardized ability certificates [16].

5.2. Mentality and cultural transformation

The penetration of AI technology in education leads to teachers' "replacement anxiety", which can be effectively resolved through cognitive intervention and positive cultural shaping. Studies have shown that shifting AI from "substitute" metaphor to "cognitive scaffolding" can help teachers reconstruct their mentality and reduce rejection [2]. In addition, the creation of an AI innovation laboratory and teacher learning community can significantly enhance teachers' trust in AI and willingness to actively adapt with the help of peer demonstration effect [9]. At the same time, teachers' irreplaceability as "emotional connectors" and "ethical guardians" should be strengthened at the cultural level, highlighting their core position of humanistic care and value guidance in the AI era, and preventing the technological trend from weakening teachers' educational dominance [8].

5.3. System and mechanism construction

The traditional teacher evaluation system with quantitative results as the core has been difficult to adapt to the teaching complexity brought about by AI. Colleges and universities urgently need to build a three-dimensional evaluation framework covering teaching, technology, and ethics. In the teaching dimension, formative evaluation tools should be combined to dynamically track the development of students' advanced abilities and help teachers fully reflect classroom results [6]. In terms of technology, innovative practices such as AI teaching module development and AI-assisted curriculum design can be incorporated into professional title promotion indicators to encourage teachers to actively explore AI educational applications [4]. In the ethical dimension, it is necessary to establish a negative list system for the use of AI, explicitly prohibit the use of generated content directly as the basis for academic evaluation, and at the same time strengthen teachers' ethical review responsibility in technology application [14]. The OECD educational ecology research points out that only through policy guarantees and promoting the evaluation system from "result-oriented" to "process-oriented compound orientation" can institutional support be provided for teachers to respond to AI changes [11].

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6. Conclusion

Against the background that generative artificial intelligence is deeply involved in educational practice, the reconstruction of college teachers' professional abilities has become a key issue in educational reform. This paper analyzes the challenges and opportunities faced by college teachers in the dimensions of instructional design, digital literacy, reflective practice, and lifelong learning, and puts forward a multi-path strategy for ability reconstruction. However, the real core of capacity transformation is not limited to technical adaptation and institutional guarantee, but also to re-clarify the essential mission of education.

The current educational environment is showing a prominent "result-oriented" feature, and the intervention of AI has amplified this feature. When the educational evaluation system is highly dependent on standardized results, students' thinking process and individual differences are easily ignored, and their "sense of existence" and "participation" in learning are weakened. Although the content generated by AI is efficient, if the teaching goal only focuses on output efficiency and ignores thinking construction, it will weaken students' critical thinking, creativity, and the significance of personal learning. Future teachers should not only have the ability to operate technology, but also guide students to maintain the space of problem awareness, judgment, and self-expression.

Therefore, the role of teachers should change from "lecturer" to "guide", and devote themselves to building a learning environment with inquiry as the core and process as the value. At the same time, there is also an urgent need to improve the evaluation mechanism at the educational governance level, pay attention to non-quantitative factors such as thinking visualization, cognitive trajectory and learning intention, and ensure that the educational process with the participation of AI still takes "cultivating people" rather than "copying answers" as its ultimate goal.

Technological development provides external impetus for education, but what leads to deep changes is the continuous response of the education system to "people are human". Only by returning to the original intention of education and adhering to the rhythm and value of individual growth can the true evolution of education be realized in the AI-driven future.

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