


## Original article

# AI-empowered integrated reform of teacher education: The experience of a Chinese university

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### Abstract:

This article explores the experiences of East China Normal University (ECNU) in advancing the integration of teacher education reform through artificial intelligence (AI). In response to the demand for high-quality teachers in the intelligent era, the university has actively aligned with the national strategy for educational modernization. By optimizing enrolment mechanisms, constructing personalized training systems, and strengthening pre-service and in-service integrated training, ECNU has driven innovation in teacher education. The university implements an “excellence” educational philosophy, adopts a 3+1+X training model, encourages interdisciplinary learning, and integrates AI technology to enhance the entire teaching process. Additionally, ECNU emphasizes collaboration with primary and secondary schools, providing continuous professional development support for both pre-service and in-service teachers through its micro-certification platform and various branded programmes. ECNU has achieved significant results in AI-empowered teacher education, yet it faces challenges such as limited institutional resources, low motivation among teacher candidates to pursue teaching careers, and difficulties translating learning outcomes into practice. Moving forward, strategies such as optimizing university operations, redefining teaching methods, reshaping learning approaches for teacher candidates, and increasing government support will further advance the integration of teacher education reform. The experiences of East China Normal University offer valuable insights for the development of teacher education globally.

## 1. Introduction

Teacher education has gained increasing global attention (Maaranen et al., 2019). With technological advancements and educational transformation in the intelligent era, cultivating a high-quality teaching workforce has become a central issue in educational research and practice. Teacher education research began in the 1950s and gained widespread attention in the 1980s (Cochran-Smith & Fries, 2009). The book *Teacher education and the world: Changing policies and practices* (Darling-Hammond & Lieberman, 2012) emphasizes that the quality of the teaching workforce is key to educational quality in the twenty-first century. As a result, many countries have prioritized high-quality, professional teacher education as a strategic tool to enhance educational standards. China has also actively engaged in global teacher education reform. China’s

Education Modernization 2035 plan, issued by the State Council, explicitly states that building a high-quality, professional and innovative teaching workforce is a crucial task for achieving educational modernization (Ye & Law, 2009). However, despite policy adjustments in curriculum design, teacher training and information technology application, Chinese universities still face numerous challenges in the process of teacher education reform.

Historically, pre-service and in-service teacher training in China have been conducted by two separate systems, leading to a disconnect between pre-service preparation and in-service development. As a result, the integration of pre-service and in-service teacher education has become a fundamental direction in global teacher education reform (Avalos, 2011; Elmore, 2002; Ingersoll & Strong, 2009). However, the in-

tegration process often faces challenges such as fragmented systems, misaligned content, and insufficient personalization in teaching methods. The widespread application of artificial intelligence (AI) technology offers new solutions to these issues (Peng & Wu, 2024). Nevertheless, some universities have yet to integrate AI into teacher education practices effectively. East China Normal University (ECNU), one of China's six national key normal universities, has achieved significant results in integrating AI with teacher education. In 2024, the Ministry of Education announced exemplary cases of "AI + Higher Education" application scenarios, in which ECNU's teacher training case was selected, showcasing its leading practices in the deep integration of AI and teacher education.

ECNU has developed three distinctive features in its AI-integrated teacher education practices. Firstly, it has optimized its enrolment mechanisms, emphasizing students' digital literacy and comprehensive qualities to ensure that teacher candidates possess the foundational skills to become outstanding educators. Secondly, guided by the "excellence" educational philosophy, the university has established a systematic and hierarchical talent cultivation system through integrated undergraduate-Master's programmes and curriculum reforms. This system focuses on enhancing both professional competencies and educational quality, while strengthening the application of digital technologies. Thirdly, ECNU has innovated its teacher training and professional development systems by incorporating cutting-edge educational concepts such as digitalization, supporting teachers in continually improving their skills at various career stages to meet the demands of digital education. These reform initiatives have distinguished ECNU among Chinese universities and provided valuable insights for teacher education reform in the intelligent era.

This paper takes ECNU as a typical case to explore China's innovative experiences in integrating teacher education in the intelligent era. It analyses key issues in the current reform and proposes improvement measures and strategies, offering new perspectives for the integrated development of teacher education in the intelligent era.

## 2. Literature review

Teacher education is one of the core issues in global educational reform. Since the 1950s, research on teacher education has gradually emerged, gaining widespread attention in the 1980s with the deepening of educational reforms (Cochran-Smith & Fries, 2009). Darling-Hammond & Lieberman (2012) emphasize that teacher quality is key to improving educational quality. However, the advent of the digital era has brought numerous challenges to teacher education, giving rise to a global consensus on high-quality teacher education reform. Overall, global teacher education reform has exhibited the following trends. First, there is a practice-oriented shift. Research indicates that the core of teacher education lies in practical courses, mentoring, and teacher-student interactions, which help enhance teaching competencies and comprehensive quality (Clarke et al., 2014; Hoffman et al., 2015). Secondly, there is closer integration with basic education. Many scholars

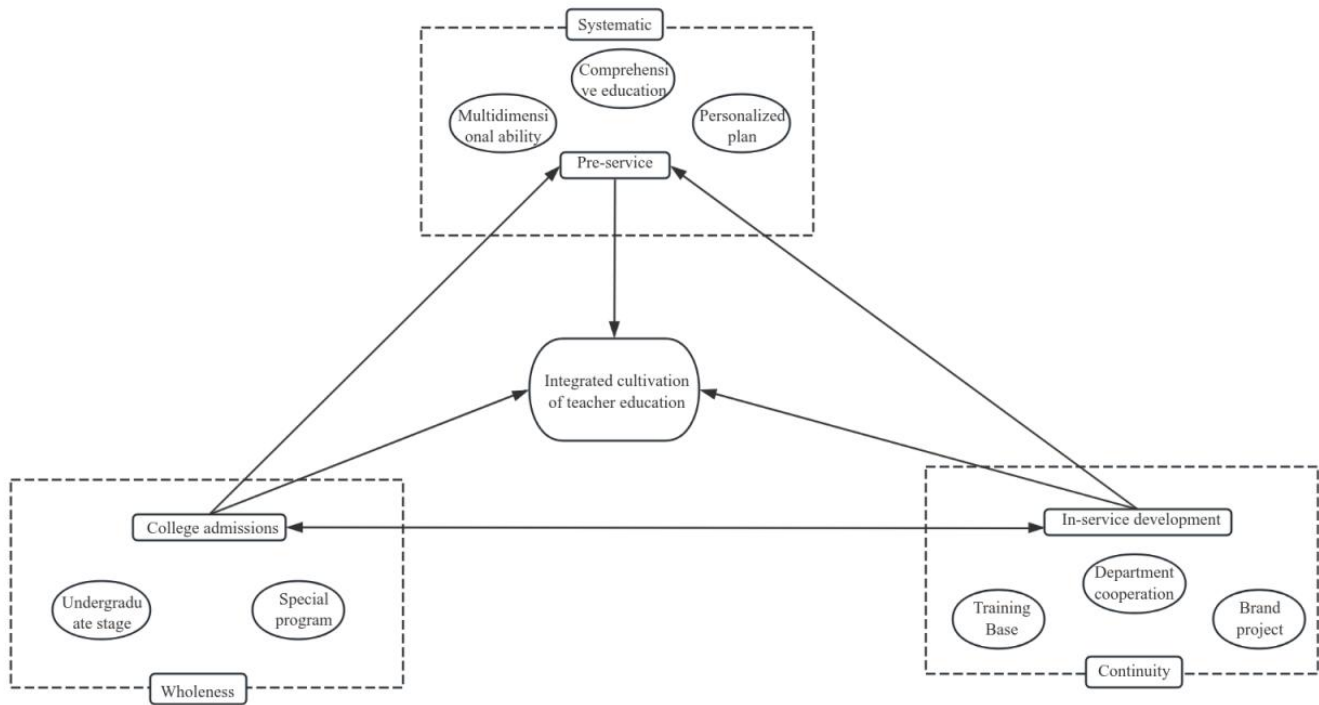
argue that teacher education institutions should move beyond traditional university classrooms and engage in practical settings within basic education schools to better adapt to educational needs and teaching practices (Darling-Hammond, 2006; McDonald et al., 2013). Thirdly, with the integration of digital technologies, the development of intelligent education has had multifaceted impacts on teacher education.

However, the rise of intelligent education has posed new challenges to traditional teacher education models. Firstly, traditional models still dominate, many universities focusing on knowledge transmission in their curriculum design while neglecting practical application and the cultivation of innovative abilities (Ma et al., 2021). Secondly, there is a lack of practical experience, leaving teachers inadequately prepared for real-world teaching scenarios, particularly in digital contexts (Konig et al., 2020). Additionally, despite policy advocacy for the integration of digital technologies, many teachers struggle to achieve the policy goals of technology-enabled teaching due to insufficient training and practical experience, often leading to the misuse of technology and wasted educational resources (Bruggeman et al., 2021; McLennan et al., 2017). This is especially evident in the suboptimal outcomes of online teaching (Konig et al., 2020; Ma et al., 2021). Studies show that many teachers feel overwhelmed by technological changes (You & Choi, 2023), exacerbating the gap between policy intentions and practical implementation.

To address these issues, China has promoted teacher education reform through a combination of policy and practice. Firstly, it has introduced policies such as Education Modernization 2035 and the New Era Basic Education Strengthening Plan, emphasizing the enhancement of teachers' digital quality. Secondly, aligning with global trends, China has increasingly focused on the application of digital technologies in teacher education, raising the bar for teachers' technological competencies. ECNU, a pioneer in teacher education reform, has pursued the goal of cultivating high-quality excellent teachers. It has advanced an integrated undergraduate-Master's training model and deeply integrated AI into teaching and learning, fostering educators with AI teaching skills. This has provided a significant example for teacher education in the intelligent era (Ye & Law, 2009). This paper uses ECNU as a case study to examine its reform initiatives in the context of AI, offering insights and reflections for the integrated reform of teacher education.

## 3. Theoretical framework

In the 1960s, the distinguished French educationalist Paul Lengrand first articulated the concept of lifelong education, emphasizing that education should span an individual's entire lifecycle, encompassing both temporal continuity and spatial universality. This groundbreaking perspective laid a solid foundation for the subsequent theoretical development of integrated teacher education. In 1972, James Porter of the United Kingdom, in his work *The James Report*, proposed a three-stage teacher education model that includes personal education, preparatory education, and in-service education. This model explicitly defined the concept of integrated teacher



**Fig. 1.** From the Triple Helix to the Knowledge Triangle.

education for the first time, highlighting its characteristics of continuity and holistic integration. Subsequently, in 1975, the United Nations Educational, Scientific and Cultural Organization (UNESCO) advocated further strengthening the integration of teacher training and continuing education, significantly advancing the theory of integrated teacher education.

As a comprehensive educational concept, particularly in the digital era, integrated teacher education necessitates a focus on the coherence, holistic nature and systematic features of teacher education. Rooted in the philosophical foundation of lifelong education and the theoretical framework of teacher professional development, it aims to comprehensively plan pre-service training, induction and in-service professional development for teachers. This ensures that these three stages are interconnected yet distinct, forming a cohesive and coordinated teacher education system characterized by clear hierarchy, effective articulation and necessary flexibility.

Overall, the goal of integrated teacher education is to break down the barriers between pre-service, and in-service education, enabling the various components of the teacher education system to complement and coordinate with one another. This creates a highly integrated structure that, in practice, establishes a well-organized, scientifically grounded and efficiently managed training system for teachers. Therefore, the theory of integrated teacher education provides essential theoretical support for this study's in-depth analysis of teacher education reform, particularly focusing on the three core dimensions of teacher education: systematicity, holistic integration and continuity.

## 4. Methodology

Case study is a research method that involves in-depth analysis of specific phenomena to derive general conclusions from the behavioural patterns of individuals or specific groups (Yin, 2009). This study adopts a case study approach, selecting ECNU as the research subject. By combining qualitative and quantitative data, the study analyses the operational model of integrated teacher education at ECNU, with a focus on the impact of AI technology on teacher education and how ECNU leverages AI to promote personalized and intelligent development in teacher training.

### 4.1 Selection of research subject

The primary reasons for selecting ECNU as the case study subject include the following.

Firstly, ECNU is a leading institution in China's teacher education field, with extensive experience in teacher training and education reform, making it highly representative. In recent years, the university has achieved significant results in AI-enabled integrated teacher education, establishing a comprehensive digital teacher education system. Its experiences provide valuable references for other institutions.

Secondly, ECNU's reforms cover multiple aspects, including curriculum design, teaching models, evaluation systems, and integrated pre-service and in-service training. Studying its model helps summarize universal pathways for teacher education reform.

Additionally, both authors of this paper have studied at ECNU and participated in related academic activities and

educational reform practices. Their deep understanding of the university's educational system, cultural environment and reform implementation enables a more accurate identification of strengths and challenges, as well as efficient data collection, enhancing the reliability of the research.

## 4.2 Data collection and analysis

The study employs three data collection methods—content analysis, field research and expert interviews—to ensure the breadth and depth of the data.

**Content analysis:** The study reviews policy documents, official reports and academic papers published by ECNU in recent years to extract the core model of AI-enabled teacher education. References include ECNU's annual education reform reports, AI-related research papers, and national education policy documents.

**Field research:** To obtain first-hand data, the research team conducted on-site investigations of ECNU's teaching platforms, curriculum systems and practical training bases from May to December 2024. Observations were made on the learning behaviours of teacher candidates in AI-assisted teaching environments, and data were collected through classroom observation records, interview transcripts and related course materials.

**Expert interviews:** Semi-structured interviews were conducted with five experts, faculty members and administrators from ECNU's Department of Educational Information Technology, School of Teacher Education, and School of Computer Science and Technology. The interviewees represented different ranks and research directions. The interviews focused on the application, effectiveness, challenges and improvement suggestions of AI technology in teacher training. The interview content was transcribed, coded, and analysed to identify key research themes, systematically examining the practical pathways and existing issues in AI-enabled integrated teacher education.

## 5. AI-enabled integrated teacher education model at ECNU

### 5.1 University admissions: Leveraging technology to promote educational equity

ECNU has consistently prioritized promoting educational equity in its admissions process, actively exploring the integration of technology and equity. Through initiatives such as the University Special Programme and the Excellent Teacher Programme, the university has created more opportunities for students from rural and impoverished areas to access high-quality educational resources. Specifically, the University Special Programme uses technological tools to accurately screen and disseminate information, helping students from rural and underprivileged regions secure opportunities for advanced education. The Excellent Teacher Programme, on the other hand, enhances the professional literacy of teachers in poverty-stricken and border counties in central and western China through remote training and online teaching resources, thereby promoting educational equity. In terms of undergraduate-to-

Master's transitions, the university has implemented an on-line application and approval system to ensure a transparent and clear pathway for advancement. Non-teacher education students can also apply to transfer into teacher education programmes (ECNU, 2022). Teacher education students are eligible for direct admission to Master's or doctoral programmes without entrance exams, reflecting national support for the development of the teaching workforce.

Notably, to advance the deep integration of education and AI further, ECNU established the Institute of Smart Education in 2020. Since its inception, the institute has focused on researching the convergence of education and AI technologies and launched a dual-degree programme in education and computer science for educational technology. This innovative initiative enables students to gain in-depth knowledge in education while mastering AI and information technology, cultivating them to become interdisciplinary educational technology professionals. Through the establishment of the Institute of Smart Education, the university has created a platform for the deep integration of education and technology, driving the widespread application of AI in educational practices.

### 5.2 Pre-service training: AI-enabled personalized cultivation of teacher candidates

Under the goal of cultivating excellence, ECNU has driven the transformation of education models in the intelligent era by integrating AI into professional development, teaching, evaluation and practical training. Firstly, to achieve its excellence-oriented educational objectives, the university has reallocated 20 per cent of class hours to support the AI-driven transformation of its curriculum. Through explorations and practices in AI-enabled professional development, AI-enhanced teaching, learning and evaluation processes, AI-supported practical training, AI-integrated teacher education, and AI-driven teaching management, ECNU has realized innovative changes in education and teaching, promoting the transformation and upgrading of excellence-oriented education models in the intelligent era (ECNU, 2024a). Secondly, the university emphasizes the cultivation of AI quality among teacher candidates. In response to the prevalent issue of high scores but low competence in higher education, Professor Qian Yingyi of Tsinghua University noted, "The cultivation of students' critical thinking mindset and habits, or mental models, should be set as a higher educational goal." (Qian, 2018, p. 16). To address this, ECNU revised its student training programmes, highlighting AI quality requirements and advancing a major + AI training system. This encourages the development of courses that integrate AI technology with disciplinary knowledge.

In terms of interdisciplinary quality, the university has introduced a micro-certification system for teaching competencies, addressing the challenges teacher candidates face in interdisciplinary learning and enabling course enrolment across different disciplines. For digital technology application, ECNU has developed intelligent teaching solutions, such as the online-to-offline (O2O) teaching model and fully active learning methods, to enhance students' digital technology

application skills (ECNU, 2022a). The university has adopted a 3+1+X training model. In the first three years, students primarily complete compulsory public courses, general education courses, broad discipline platform courses, core major courses, and some elective courses within their major, laying a solid foundation. In the fourth year, students can enrol in graduate-level courses or interdisciplinary courses. The X component encourages students to pursue Master's or doctoral studies, allowing them to tailor their development paths (ECNU, 2020).

During the training process, ECNU also focuses on AI-enabled teaching across all stages. To this end, the university has established the Future Learning Centre and a digital-intelligent textbook platform, integrating the Da Xia learning platform, the Little Lion three-dimensional adaptive learning system, and the Metasequoia Online full-chain online education platform. These platforms offer three key functions.

**Intelligent virtual students driven by large models.** By developing digital characters with diverse personalities and cognitive traits, the platform simulates real student behaviours and complex classroom interactions. Through multimodal data collection and analysis, it creates comprehensive profiles of teacher candidates' teaching abilities, teaching styles, psychological traits and physiological characteristics. This enables personalized recommendations for learning pace, resources and scenarios, facilitating advanced teaching practices.

**Educational large language model EduChat.** By incorporating Socratic teaching methods and psychological theories into the model, EduChat stimulates students' higher-order thinking skills, such as discussion, debate, evaluation and analysis, fostering independent learning and innovation.

**Intelligent evaluation of classroom teaching quality.** The system automatically extracts teaching and learning features to diagnose and provide feedback on 31 skill points across four dimensions: basic teaching skills, classroom questioning skills, instructional design skills, and digital teaching skills. This helps teacher candidates understand their mastery of these skills and make targeted improvements. Based on multimodal teaching process data, the platform generates multidimensional profiles and classroom diagnostics, forming a closed-loop training path of teaching practice-profile-diagnosis-recommendation. This approach effectively enhances teacher candidates' practical teaching abilities and digital teaching proficiency, addressing long-standing issues such as the lack of real classroom scenarios, limited internship opportunities, high trial-and-error costs, and insufficient systematic evaluation and personalized intervention (School of Computer Science and Technology ECNU, 2024).

### **5.3 In-service development: Digital intelligence-enabled integrated training and brand building**

ECNU places great emphasis on the integrated training of teachers across pre-service and in-service stages, particularly leveraging AI to support in-service development. The university provides diverse opportunities for advanced training and professional development. To this end, ECNU has established the Department of Basic Education and Lifelong

Education Development. Leveraging the resources of ECNU-affiliated schools, the department not only serves as a practical training base for teacher candidates but also utilizes the university's disciplinary strengths to support teachers' in-service growth. The university organizes teaching and research activities through both online and offline channels, such as the seminar on reading instruction in mixed-level English classrooms, providing teachers with a platform for professional exchange (Ministry of Education of the People's Republic of China, 2009).

To evaluate teachers' teaching competencies more scientifically, ECNU has launched a micro-certification platform. This initiative—part of the university's digital transformation efforts—promotes the integration of pre-service training and in-service professional development. The platform assesses the teaching abilities of both teacher candidates and early-career teachers, helping to analyse their professional behaviours, overall environment and developmental potential. This drives systematic improvements in the training system. As a teacher-training institution, ECNU supplies teachers to primary and secondary schools. Through the micro-certification system, these schools can gain insights into their teachers' development and implement targeted capacity-building measures. The data collected are then fed back to ECNU, serving as a reference for optimizing teacher training programmes. This creates a cyclical process, fostering an integrated system of pre-service and in-service teacher learning and evaluation (Yan & Li, 2023).

Furthermore, ECNU is committed to developing signature programmes that comprehensively serve in-service teachers at all levels. The university has successfully launched ten typical in-service training programmes, including the Education Brand Project, the University Visitor Programme for Primary and Secondary School and Vocational School Teachers, the National Advanced Teacher Training Programme, the Demonstration Open Course Construction for In-Service Teacher Education (Hundred Excellent Courses Project), the Personalized Self-Study Platform, the School-Based Research and Training Open Resource Library, the Teaching and Research Staff Enhancement Programme, the University Education Leadership Training, the Inclusive Education Teacher Advancement Project, and the High-End Short-Term Thematic Training Programme (ECNU, 2021a).

## **6. Teacher education achievements and challenges: A case study perspective**

### **6.1 Achievements**

Digital platforms for teacher education have been widely applied. The university's digital platform has been utilized by the 2023 cohort of teacher candidates, covering virtual teaching practices in six subjects: primary school mathematics, high school mathematics, and middle school geography, physics, chemistry and information technology. It has also been implemented in majors such as psychology, educational technology, statistics, and software engineering for meta-space virtual teaching. Starting in the spring semester of 2025, the large-model digital human platform will be deployed in

smart classrooms on a large scale, gradually extending to over 5,000 teacher candidates across the university. Additionally, the platform has been adopted by Zhaotong University and Lijiang Normal University in Yunnan Province, exploring new models for teacher candidate training in the intelligent era (ECNU, 2024b).

AI and other digital technologies have been effectively integrated into the training programmes. The university has developed a new teacher education curriculum system comprising 68 educational research and extension courses and 31 subject-specific education courses, complemented by an enhanced practical teaching system. By appointing distinguished professors and part-time mentors from basic education, the university has strengthened the dual-mentor system, promoting the deep integration of AI technologies with teacher education (ECNU, 2021b). The university has also published several textbooks for teacher candidate training and contributed to the development of the Teacher Education Curriculum Standards by the Ministry of Education, providing a significant reference for teacher education in the intelligent era.

The cultivation of high-quality, digitally intelligent talent has yielded remarkable results. As a national institution for publicly funded teacher education, the university trained 9,393 publicly funded teacher candidates from 2007 to 2020, 6,130 of them teaching in central and western regions, becoming a vital force in basic education. For example, Nian Zhiwei, a 2016 graduate in physics education, utilized AI technologies to enhance his teaching quality, 26 of his students being admitted to Tsinghua University and Peking University (Wenhui Daily, 2020). ECNU's exploration and practices in AI-enabled teacher candidate training have received high recognition from the education community, making outstanding contributions to educational equity and balanced development.

## 6.2 Challenges

Reflections on the case study reveal that ECNU still faces numerous challenges in the field of teacher education, which also reflect the broader difficulties currently encountered in China's teacher education sector. These challenges are primarily manifested in the following three aspects.

Firstly, there is a limited supply of digital resources. Due to adjustments in institutional direction and constraints in faculty, funding and hardware, the digital development of teacher education colleges is restricted, making it difficult to meet the personalized development needs of teachers. Current teacher education often relies on simplistic, static and uniform training models, lacking personalized approaches. Additionally, the declining emphasis on teacher education at the national level, coupled with insufficient investment, has led normal universities to prioritize comprehensive development to improve rankings, resulting in a decrease in the proportion of teacher candidate enrolments. ECNU faces similar issues, a recent focus on science and engineering disciplines impacting its teacher education programmes.

Secondly, there is low motivation among some teacher candidates to pursue teaching careers. Currently, teacher education predominantly employs large-class lectures and knowledge-

based instruction, leading to low student engagement and diminished interest in learning. Factors contributing to a reluctance to enter the teaching profession include: (1) relatively low teacher salaries, with some regions offering wages below the national average, reducing the profession's attractiveness; (2) heavy workloads for teachers, exacerbated by the New College Entrance Examination reforms and the three-child policy, which have increased demand for teachers while their numbers remain insufficient, highlighting structural shortages; and (3) strained relationships between schools and families, with teachers frequently facing complaints, leading to high levels of stress. These issues discourage high-achieving students from enrolling in teacher education programmes, and some current students lose interest in pursuing teaching careers.

Thirdly, there are difficulties in translating digital-intelligent learning outcomes into practice. The ultimate goal of teachers' professional learning is to integrate theory with practice and to enhance their practical teaching abilities (Borko et al., 2010). However, there is often a disconnect between teacher candidates' learning outcomes and their actual teaching practices. Korthagen (2017) explains this phenomenon by noting that teachers' professional development has evolved from the 1.0 stage, which emphasized theoretical knowledge acquisition, and the 2.0 stage, which focused on practical knowledge learning, to the 3.0 stage, which stresses the integration of theory and practice. However, in practice, professional development often reverts to the 1.0 and 2.0 stages, characterized by expert lectures and skills training. This separation of theory and practice creates a misalignment between training objectives and development models, making it difficult for teachers to translate their understanding of knowledge and skills into practical competencies. Another contributing factor may be the influence of university faculty, who face intense academic evaluation pressures and often neglect the accumulation of practical teaching experience and understanding of basic education realities. This tendency affects the growth and development of teacher candidates, leaving them without effective guidance and support in integrating theory and practice, further exacerbating the challenges of translating digital-intelligent learning outcomes into practice.

## 7. Conclusion and discussion

### 7.1 Conclusion

Teacher education is a core component of teachers' competency development and an essential part of educational progress. Teacher education models vary from country to country, and it is greatly important for researchers, practitioners and policymakers to learn from each other's effective experiences (Darling-Hammond, 2017). This paper takes ECNU as an example to explore its innovative initiatives and achievements in reforming teacher education empowered by AI. In terms of enrolment, ECNU not only cultivates regular pre-service teachers but also undertakes multiple national special teacher training programmes and initiates a Bachelor's-Master's continuous training programme for pre-service teachers, clarifying the conversion path between pre-service and non-pre-service teacher students. To promote the

deep integration of AI and education, the university collaborates with the School of Computer Science and Technology to cultivate interdisciplinary talents. In pre-service training, ECNU emphasizes AI-empowered discipline construction, highlights pre-service teachers' AI literacy, adopts a 3+1+X training programme, and encourages interdisciplinary learning. By empowering the entire teaching process with AI, it enhances pre-service teachers' practical teaching abilities and digital teaching skills. In in-service development, the university attaches importance to the integrated construction of pre-service and in-service teacher education, explores information technology-driven educational learning communities and educational assistance projects within education groups, and provides continuous professional development support for teachers through a micro-certification platform. Despite the remarkable achievements of ECNU's teacher education model, it still faces challenges, such as limited development of the teacher education college, low student motivation for learning and teaching, and a disconnection between theory and practice.

## 7.2 Discussion

Clandinin and Husu (2017) state in the SAGE handbook of teacher education that the goal of teacher education research is not to provide answers or theories, but to deepen understanding of the complexities of teacher education practice and policy. Through a case study of ECNU, this paper systematically reviews its teacher training approaches, aiming to provide new directions for future teacher education. Based on this, we propose the following improvement suggestions.

Firstly, universities should prioritize digital development. They need to emphasize teacher education, strengthen the cultivation of students' practical teaching abilities, and incorporate digital competencies into the core content of teacher education (Gudmundsdottir & Hatlevik, 2018). Additionally, universities should enhance cooperation with primary and secondary schools, establishing partnerships to address the disconnection between theory and practice (Goodlad, 1994). Furthermore, they should diversify talent cultivation channels, encourage students to take courses through online platforms, virtual laboratories and other digital means, and improve the evaluation system by incorporating assessments of creativity and innovation, adopting diversified and visual evaluation methods.

Secondly, AI should empower teachers to reconstruct teaching. Future education should shift away from an overemphasis on scores and papers towards cultivating abilities. By leveraging the internet and big data, personalized learning diagnostics can be achieved, promoting the development of precision education. With the help of remote teaching technologies, resource constraints can be overcome, enabling small-class teaching. The focus of teaching should shift from teachers to students, emphasizing inspiration and guidance, and implementing experiential teaching (Grossman et al., 2009; Philip et al., 2019). The teacher education environment encompasses both university and primary/secondary school settings (Cochran-Smith et al., 2008). Teachers' educational and teaching skills should be acquired through mentorship learning

in the workplace rather than solely in university classrooms (Grossman & Loeb, 2008).

Furthermore, the learning approach for pre-service teachers should be reconstructed. Students should adapt to a blended learning model, with online teaching and discussions complemented by offline autonomous and experiential learning, integrating theory and practice. Drawing on the school-outdoor-family/dormitory (SOF) model, a ubiquitous learning environment should be formed. At the same time, emphasis should be placed on experiential learning, with students participating in primary and secondary school teaching activities to enhance their abilities through practice. Students should have the option to select their learning, focusing on in-depth study in their specialized fields while mastering fundamental knowledge.

Most importantly, government support should be strengthened. Educational reform requires adequate funding, and the government should increase investment in pre-service teacher training, improve teacher salaries, and elevate the professional status of teachers (Mansfield et al., 2016). Society should grant teachers more respect and understanding, establish good home-school relationships, and attract more outstanding talents to join the teaching profession.

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## Conflict of interest

The author declares no conflict of interest.

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