Pathways to Enhancing Pre-service Teachers' Practical Teaching Competence in the Context of Digital Transformation in Education

Abstract

Developing pre-service teachers' practical teaching competence contributes to the achievement of higher education institutions' educational objectives, the quality of teacher education, and progress in educational reform. Digital transformation in education makes it particularly timely to examine this competence and how it is developed. This paper discusses the need to develop practical teaching competence, the challenges involved, and possible ways to address them. Developing this competence supports the quality and effectiveness of teacher education, provides a foundation for teachers' professional development, and responds to pressing societal needs. Current challenges include an imbalanced curriculum, insufficient guidance during teaching practice, and inadequate support for practical training. To address these challenges, the paper recommends strengthening institutional planning, improving approaches to pre-service teacher education, and enhancing facilities and institutional support for teaching practice.

Keywords: digital transformation in education, pre-service teachers, practical teaching competence

Introduction

In 2022, the Ministry of Education announced the National Education Digitalization Strategic Action (Ministry of Education, 2022), setting a direction for changes in classroom teaching (Y. M. Li, 2024). The use of digital and intelligent technologies in teaching, management, and professional development is gradually transforming education (Huang et al., 2024), creating both opportunities and challenges (H. F. Li & Miao, 2020). The practical teaching competence that teachers acquire before entering the profession directly affects their subsequent teaching outcomes and reflects the quality of preparation provided by higher education institutions. Existing research identifies weaknesses in lesson delivery (Y. X. Shi, 2018), understanding of teaching (Yin, 2018), and support for students' learning (Hua et al., 2022). These findings warrant close attention from teacher education institutions. To prepare future teachers for digital transformation in education, institutions need to place greater emphasis on practical teaching competence. Such preparation is essential to meeting contemporary educational needs and advancing educational reform.

The Need to Develop Pre-service Teachers' Practical Teaching Competence in the Context of Digital Transformation in Education

The Educational Dimension: Supporting Improvements in the Quality and Effectiveness of Teacher Education

Pre-service teachers are at the centre of teacher education. As digital technology develops, it increasingly influences education and contributes to improvements in educational quality. Developing practical teaching competence is both a fundamental objective of teacher education and a means of preparing highly qualified teachers (B. Wang et al., 2013). For pre-service teachers preparing to work in primary and secondary schools, blended teaching offers institutions a way to align their preparation with digital transformation in education. This approach aims to make technology use more effective, responsive to instructional needs, and flexible. Technology can support each stage of teaching, from setting objectives and organising learning activities to delivering lessons and providing assessment feedback. At every stage, its functions need to match instructional needs. Training in digital

instructional design, data-informed assessment, and digital ethics is therefore an important part of teacher preparation. Developing these aspects of practical teaching competence helps prepare well-qualified teachers for basic education and supports digital classroom reform. Digital transformation can thus improve both the quality and effectiveness of teacher education.

The Teacher Dimension: A Prerequisite for Teachers' Professional Development

Higher education institutions specialising in teacher education bear much of the responsibility for preparing future teachers to respond to educational reform and development. Improving teaching quality requires a sound foundation in subject knowledge and strong practical teaching skills. Artificial intelligence introduces an additional dimension to this preparation. The familiar "teacher–student" model is giving way to a "teacher–artificial intelligence–student" model (J. L. Li, 2025). Teachers have opportunities to become more adaptable, but they must maintain their professional expertise in a changing digital environment while supporting students' development (He & Cao, 2026). In their future work, pre-service teachers will be able to use technologies such as intelligent content generation and machine learning to assist with routine or repetitive tasks. They therefore need to consider how their role may change as they move from directing instruction to working with intelligent systems. Attention to the benefits of digital technology must be accompanied by efforts to prevent and manage its risks. Used responsibly, these technologies can support pre-service teachers' professional development and well-being.

The Contemporary Dimension: An Urgent Response to the Demands of Societal Development

China has entered a new phase in the use of digital technology in education. The earlier focus on hardware platforms and technical support for teaching has expanded to encompass educators' beliefs and practices, educational structures and models, and teacher competence. Integrating technology with innovation in these areas offers a pathway to social progress and greater national capacity (Kang & Yu, 2024). At the institutional level, practical training helps develop pre-service teachers' overall competencies and improves their prospects for employment and further study. At the national level, stronger practical teaching competence contributes to national development and rejuvenation, as well as social harmony. Practical training also deepens pre-service teachers' understanding of their chosen profession and helps them adapt to social expectations and participate in society. In these ways, teacher preparation contributes to social development and progress.

Current Challenges in Developing Pre-service Teachers' Practical Teaching Competence in the Context of Digital Transformation in Education

Imbalances in the Curriculum

Curricula for pre-service teachers have evolved with the introduction of digital and intelligent technologies. In many universities, however, the traditional emphasis on subject theory persists, while practice-based courses account for a relatively small proportion of the curriculum. This imbalance limits opportunities to develop practical teaching competence. Some courses do not adequately support the objectives of teacher education programmes (Q. Wang, 2022), and theory continues to take precedence over practice (Xia, 2016). Gaps in course provision and weak connections between courses are particularly pronounced (Chen, 2023). Inadequate staffing, limited time, and insufficient opportunities for practice present further challenges. When practical training receives too little time and support, pre-service teachers struggle to connect theory with practice. These constraints hinder the development of practical teaching competence and related professional attributes.

Insufficient Preparation through Teaching Practice

Pre-service teachers gain practical experience through teaching practicums, school observation placements, and social practice activities. Although these are important components of teacher preparation, the training and guidance provided remain insufficient. Staffing for practical training is inadequate, and assessment methods lack variety. Placements rarely expose pre-service teachers to the full range of teaching responsibilities, such as managing a class, designing tests, and serving as a homeroom teacher. Advanced academic qualifications do not necessarily translate into strong practical capabilities: many university teachers possess the former but lack the latter. Dedicated teams of supervisors for teaching practice are also in short supply (Zhang & Sun, 2014). These conditions make it difficult to provide effective guidance. Assessment is predominantly summative, with insufficient use of formative assessment during teaching practice. This imbalance limits institutions' ability to evaluate practical learning outcomes comprehensively.

Inadequate Support for Pre-service Teachers' Practical Training

The conditions in which practical training takes place are essential to its success. Funding, stable placement sites, and effective supervision and support determine whether activities can proceed as planned. Inadequate supervision may lead pre-service teachers to take teaching practice less seriously, causing their work to fall below the required standard. Insufficient funding can disrupt planned activities, while the lack of stable placement sites can weaken pre-service teachers' motivation to participate (L. Shi, 2012). These constraints undermine learning through practice (H. R. Wang, 2010). They also make practical activities more difficult to organise, affecting institutions' teaching schedules and overall teaching quality.

Pathways to Enhancing Pre-service Teachers' Practical Teaching Competence in the Context of Digital Transformation in Education

Strengthening Strategic Planning to Set a Clear Direction for Competence Development

The introduction of artificial intelligence is bringing about a paradigm shift in teaching environments and practices (Peng & Yang, 2026). Pre-service teachers need to identify the aspects of practical teaching competence that require improvement and determine how to develop them. Institutional planning should address these needs in the context of digital transformation in education. Defining training content, developing improvement plans, and revising the practice-based curriculum can provide a clear direction for competence development. Assessing current needs first requires a clear understanding of what practical teaching competence entails. Questionnaires and digital assessments can help identify pre-service teachers' strengths and weaknesses. Institutions can then select and refine training content in response to these findings, while also considering national priorities. Improvement plans should reflect the underlying principles and components of practical teaching competence, suit local conditions, and specify the support available to ensure effective implementation.

Improving Approaches to Pre-service Teacher Education to Support Competence Development

Teaching practicums and practice-based instruction have become important means of developing pre-service teachers' teaching skills as educational reform has progressed (Ding et al., 2026). Approaches to this preparation should reflect the requirements of different subjects and accommodate pre-service teachers' varied needs through differentiated provision. Partnerships with placement schools can support jointly organised practical training both on and off campus. By broadening the settings in which pre-service teachers gain experience, these partnerships can strengthen their adaptability. Management and supervision should extend throughout the placement period. Institutions should appoint supervisors with substantial professional experience to provide regular guidance and support

for the development of practical teaching competence. Refining assessment tools, criteria, and methods can also generate evidence to inform competence development. Collaborative learning communities offer further opportunities for pre-service teachers to develop this competence. Institutional support should be complemented by self-directed learning and peer learning. Sustained collaborative inquiry and practical work are essential to their shared professional development.

Strengthening Facilities and Institutional Support for Teaching Practice

Artificial intelligence performs well when addressing familiar, clearly defined questions. Its responses rely on optimisation and imitation based on existing data; in this sense, it constitutes "Adaptive Intelligence" (Biesta & Zhao, 2025). Developing practical teaching competence therefore requires attention to both physical resources and institutional support. Teaching practice in digital environments provides an important opportunity for pre-service teachers to apply and improve this competence. Teacher education institutions should continue to improve the facilities and digital environments available for teaching practice, including smart classrooms and integrated interactive touchscreen devices. They can also introduce artificial intelligence models, AI-powered courseware creation tools, and repositories of digital teaching resources. These resources provide a foundation for pre-service teachers' participation in digital transformation in education. However, institutional rules and guidance alone cannot ensure improvements in practical teaching competence. Institutional arrangements should also strengthen pre-service teachers' intrinsic motivation to improve. This requires clear and consistent incentives and a system for certifying practical teaching competence that includes data analysis among the areas assessed. Institutions should regularly recognise outstanding teaching practice among pre-service teachers and share their achievements as examples of good practice. These achievements should serve as an important basis for decisions on promotion in professional rank and the recognition of qualifications.

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