Reconstructing the Connotation and Development Pathways of Teacher Competence in the Context of Digital Education

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Abstract: The digital transformation of education is reshaping teaching contexts, knowledge production, and teachers' professional development. Traditional teacher competence, mainly centered on subject knowledge, classroom instruction, and class management, can no longer fully respond to intelligent technologies, continuous learning data, and blended education. Drawing on teacher competence theory and research on teachers' digital literacy, this paper argues that teacher competence in digital education should not be reduced to technical operation. Instead, it should be reconstructed as a compound structure of "value guidance, technology integration, pedagogical innovation, data application, and collaborative development." Its core dimensions include digital ethical literacy, digital technology application, digital instructional design and innovation, data literacy, and lifelong learning and collaborative development. At present, its development is constrained by weak digital awareness, mismatched training, lagging evaluation mechanisms, and regional digital divides. Therefore, teachers' autonomous development, school support, policy guarantees, and evaluation reform should be jointly promoted, so that teachers can transform from technology adapters into designers, practitioners, and reflective professionals in digital education.

Keywords: Digital education; Teacher competence; Teachers' digital literacy; Connotation reconstruction; Teacher professional development

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1.Introduction

Educational digitalization has become a key direction for high-quality educational development. The application of artificial intelligence, big data, cloud computing, and learning platforms has extended teaching beyond traditional classrooms, making learning resources, instructional interaction, and educational evaluation increasingly data-driven, intelligent, and networked. The industrial standard Teachers' Digital Literacy issued by the Ministry of Education defines the basic requirements for teachers' digital competence in terms of digital awareness, digital knowledge and skills, digital application, digital social responsibility, and professional development [1,2]. As central actors in educational digital transformation, teachers' competence directly affects whether digital technologies can be translated into improved teaching and better educational quality.

However, many studies and practices still understand teachers' digital competence as the ability to use platforms, make courseware, or operate equipment. This instrumental view tends to obscure the deeper transformation of digital education. Digital education is not simply the online transfer of offline teaching; it involves the reconstruction of teaching goals, learning methods, resource allocation, teacher-student relationships, and educational ethics. Therefore, teacher competence should not be seen as traditional competence plus several technical skills, but should be systematically reconstructed around new digital scenarios, relationships, and risks. This paper addresses three questions: Why does digital education require the reconstruction of teacher competence? What are its core dimensions? How can teacher competence be improved in practice?

2.The Internal Logic of Reconstructing Teacher Competence

Teacher competence refers to the integrated structure of knowledge, abilities, attitudes, and values required for teachers to complete educational tasks and achieve educational goals. Traditional teacher competence emphasizes subject knowledge, pedagogical skills, professional ethics, and classroom management. These elements remain important in the digital era, but their modes of operation have changed. Ye Lan's research on teachers' professional qualities emphasizes that teacher development is not the accumulation of isolated skills, but the holistic formation of

knowledge, ability, emotion, and responsibility [5]. Digital education further strengthens this comprehensive requirement.

First, changes in teaching scenarios require teachers to shift from "knowledge transmitters" to "learning designers." In blended learning, smart classrooms, and online learning environments, teachers must not only deliver knowledge, but also design learning tasks, organize interaction, regulate learning pace, and improve instruction through learning data. Second, changes in resource forms require teachers to shift from "resource users" to "resource integrators." Massive digital resources expand teaching choices, but also bring problems such as uneven quality, unclear copyright boundaries, and insufficient contextual suitability. Teachers therefore need the ability to select, adapt, and develop resources. Third, changes in educational relationships require teachers to shift from "classroom managers" to "collaborative educators." Digital platforms make home-school-community communication, inter-school teaching research, and virtual learning communities possible, requiring teachers to work in more open networked relationships [6]. Finally, technological risks require teachers to shift from "tool operators" to "ethical gatekeepers." Student data protection, algorithmic bias, platform dependence, and digital copyright have become unavoidable professional responsibilities.

Thus, the reconstruction of teacher competence in digital education is not about adding fragmented technical skills, but about building a compound competence system centered on education, supported by technology integration, bounded by ethics, and sustained by continuous development.

3.Core Dimensions of Teacher Competence in Digital Education

Based on the standard Teachers' Digital Literacy and related studies on teachers' digital competence [7,8], teacher competence in digital education can be summarized into five dimensions.

First, digital ethical literacy is the bottom-line competence for digital teaching. It includes student data privacy protection, online behavior norms, copyright awareness, and the ability to identify algorithmic bias. As digital education expands teachers' access to student data and platform resources, a lack of ethical awareness may lead to data misuse, privacy leakage, or educational inequality.

Second, digital technology application competence is the basic ability to enter digital teaching scenarios. It includes the use of smart teaching platforms, online teaching tools, AI-assisted tools, and common digital devices, as well as the ability to solve general technical problems. Yet this competence should not remain at the level of operation; it should serve teaching goals, learning activities, and classroom interaction.

Third, digital instructional design and innovation competence is the key dimension. Teachers need to design integrated online-offline teaching processes according to curriculum goals and student differences, create digital learning contexts, integrate micro-lessons, cases, simulation resources, and project tasks, and promote autonomous, cooperative, and inquiry-based learning [9]. Its essence is to optimize teaching structures through technology, not to decorate classrooms with technology.

Fourth, data literacy is increasingly important. Digital platforms continuously generate data on learning time, assignment completion, interaction frequency, and assessment results. Teachers should be able to collect, interpret, analyze, and provide feedback based on data, so as to identify learning difficulties, adjust teaching pace, and offer personalized guidance. However, data cannot replace teachers' professional judgment. Data use must be combined with professional experience, student contexts, and educational values.

Fifth, lifelong learning and collaborative development competence reflects the dynamic nature of teacher competence. As digital technologies update rapidly, teachers need to renew their knowledge and skills through online training, virtual teaching research, inter-school collaboration, and professional learning communities [6,10]. They should also use digital platforms to strengthen home-school-community communication and build multi-actor support networks.

4.Practical Challenges

The digital transformation of teacher competence does not happen automatically. First, teachers differ significantly in digital awareness and ability. Some teachers still understand digital education as tool operation and lack initiative for pedagogical innovation. Older teachers, rural teachers, and some non-technical subject teachers may face technological anxiety and competence gaps [8]. Second, school training often fails to meet real needs. Many training programs rely on unified lectures and platform operation, lacking differentiated, practice-oriented, and subject-integrated design. As a result, teachers may "learn but fail to apply," or "use tools without using them well." Third, evaluation and incentive mechanisms lag behind. Teacher assessment still focuses mainly on workload, examination results, and research output, while digital instructional design, resource development, data application, and digital ethics have not been fully included, weakening teachers' motivation [7]. Fourth, digital support is uneven across regions and schools. Differences between eastern and central-western regions, urban and rural areas, and strong and weak schools still exist in equipment, platforms, resources, and training opportunities, creating new digital competence gaps [11]. Fifth, research and practice are not sufficiently connected. Some studies emphasize conceptual models and dimension lists, but respond inadequately to frontline teachers' real difficulties, making their proposed pathways too general for school-level action.

5.Development Pathways

Improving teacher competence requires avoiding the tendency to place responsibility solely on individual teachers. A coordinated support system involving teachers, schools, policy, and evaluation should be established.

First, teachers should strengthen autonomous development. They need to move from passive adaptation to active use of technology for teaching improvement. Teachers with weak digital foundations should first master platform use, resource acquisition, and basic data interpretation; those with stronger foundations should further improve blended instructional design, digital resource development, and the appropriate use of AI tools. Meanwhile, digital ethics should be treated as a professional bottom line.

Second, schools should build practice-oriented support systems. Training should not stop at one-off lectures, but should be differentiated according to teachers' foundations, subject features, and job needs. Its focus should shift from tool operation to solving teaching problems. Through case discussion, classroom observation, task-driven learning, peer support, and school-based teaching research, teachers' real application ability can be improved. Schools should also establish digital resource repositories, technical support teams, and teaching innovation communities.

Third, policy should strengthen guarantees and equity. Governments should refine standards, training requirements, funding mechanisms, and evaluation arrangements for teachers' digital competence development, especially supporting rural schools, disadvantaged schools, and special teacher groups. Regional teaching research communities, partnerships between high-quality and weak schools, online training platforms, and high-quality resource sharing can help narrow regional gaps [11].

Finally, teacher competence evaluation should be optimized. Evaluation indicators should include digital ethics, digital technology application, digital instructional design, data literacy, and collaborative development. Both process-oriented and outcome-oriented evaluation should be adopted. Evaluation should not merely rank teachers, but should support diagnosis, training, and professional growth. Only when evaluation, training, incentives, and development are integrated can teacher competence improvement become an internal driving force.

6.Conclusion

The reconstruction of teacher competence in digital education is essentially a redefinition of teachers' professional roles. Teachers can neither be replaced by technology nor remain confined to traditional teaching habits. In digital education, teachers should uphold educational values and professional judgment while improving

technology application, instructional design, data analysis, ethical governance, and collaborative development. This paper argues that teacher competence in digital education should be understood as a compound structure integrating traditional professional competence with digital literacy. Its improvement depends on teachers' autonomous development, school-based systematic support, sustained policy guarantees, and renewed evaluation mechanisms. Future research may use questionnaires, interviews, and case studies to examine differences in teachers' digital competence and explore new changes brought by the deep integration of AI into teaching.

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