

An In - depth Exploration of the Impact and Current Status of Education Informatization 2.0 on the Cultivation and Development of Teachers' Digital Literacy

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Abstract: Against the backdrop of Education Informatization 2.0, teachers' digital literacy—key to educational digital transformation—involves dimensions like awareness, skills, and social responsibility (per Chinese and EU standards). While it drives role shifts (to learning facilitators) and innovation via digital tools, challenges include weak teaching innovation, tech dependency biases, and professional identity risks. Development varies: EU/US have mature systems, while China sees rural-urban/school-stage gaps (e.g., rural teachers lag in security/applications; university teachers strong in awareness, weak in skills). Solutions focus on standard frameworks, resource equity, and teacher initiative to align literacy with educational ecosystems.

Keywords: Educational Informatization 2.0; Digital Literacy of Teachers; Constituent Elements.

1. The Influence of Educational Informatization 2.0 on the Development of Teachers' Digital Literacy

(1) The Constituent Elements of Teachers' Digital Literacy

Teachers, as the core force driving educational digital transformation, shoulder the significant responsibility of cultivating innovative talents in the digital era. Therefore, against the backdrop of the Education Informatization 2.0 Action Plan, enhancing teachers' digital literacy has become a critical issue that demands urgent attention. The primary task lies in clarifying the specific constituent dimensions of teachers' digital literacy.

In their research, Wang Zhifan and Wu Xiaoying (2024) deeply analyzed the connotation of digital literacy and proposed a four-element framework for teachers' digital literacy: "digital awareness, digital knowledge and skills, digital teaching ability, and digital learning and innovation." To enhance citizens' digital capabilities and cultivate competitive European digital citizens, the Joint Research Center (JRC) of the European Commission released the *European Framework for the Digital Competence of Educators* in 2017. This framework outlines six core digital competence domains (e.g., professional engagement, digital resource management, teaching strategies, assessment practices, learner empowerment) and 22 specific competencies, structured vertically into six developmental levels (from "novice/explorer" to "leader/pioneer") (Redecker & Punie, 2017). Comparative analyses of seven EU member states' frameworks identified five core elements: digital teaching, content creation, communication, security, and assessment (Yan Guangfen & Liu Li, 2022), complementing Wang and Wu's four-element model. China's *National Standard for Teachers' Digital Literacy* (2022), influenced by UNESCO's Global Framework for Digital Literacy (2018) and the EU's updated DigComp 2.2 (2022), defines five primary dimensions (digital awareness, technical skills, applications, social responsibility, professional development),

guiding literacy cultivation and assessment (Ministry of Education, 2022; Zhao Hui et al., 2023).

Overall, although different countries vary in their descriptions of the constituent elements of teachers' digital literacy, evident overlaps and complementarities exist among them. Each framework has undergone targeted expansion and refinement in line with its national educational development context.

(2) The Positive Impacts of Education Informatization 2.0 on the Development of Teachers' Digital Literacy

Against the backdrop of the new era of Education Informatization 2.0, the digital technological revolution and industrial transformation are advancing at an unprecedented pace. Cutting-edge technologies such as cloud computing, metaverse, big data, artificial intelligence (AI), and 5G have deeply permeated daily life, work, and learning. Their profound integration with education and teaching is unleashing enormous potential to reshape the entire education system and ecological environment, opening up new pathways for the future of education (Dai Ling & Zhu Zhiting, 2023). Educational digital transformation not only presents unprecedented opportunities for enhancing teachers' digital literacy but also drives their transition toward digital teaching. In this process, teachers continuously hone their skills in effectively integrating teaching with digital technologies, enabling them to better adapt to the digital economy and lead innovative changes in education (Zhang Ranni, 2023). Meanwhile, educational digital transformation provides a broad stage for teachers to practice and improve their digital literacy. By constructing diversified digital platforms, it actively promotes teacher-centered community-based digital research and training activities, injecting new vitality into teachers' professional growth (Xing Xishen, Hu Jiayi, et al., 2022). With the rapid development of modern technologies, teachers can proactively learn and master advanced teaching tools to create more efficient and intuitive learning environments for students. This transformation not only shifts teachers' roles from mere knowledge disseminators to guides and partners in students' learning processes but also significantly enhances the flexibility and adaptability of

teaching, enabling teachers to better address the challenges of digital-era instruction and meet students' diverse learning needs (Liu Wentao, Ren Zhijiang, et al., 2024).

Overall, educational digitization profoundly influences the development of teachers' digital literacy at both the cognitive and behavioral levels. Teachers should actively embrace this transformation, rationally utilize modern teaching tools, and continuously enhance their digital literacy to meet the educational demands of the digital era and contribute more to students' all-round development.

(3) The Challenges Posed by Education Informatization 2.0 to the Development of Teachers' Digital Literacy

While the wave of Education Informatization 2.0 has opened up broad prospects and unprecedented opportunities for the development of teachers' digital literacy, it is accompanied by a series of non-negligible challenges. In their in-depth study, Zhao Hui, Hao Zhe, and colleagues (2023) explicitly identify three critical issues facing current open education teachers: insufficient teaching capabilities and innovative applications; incomplete digital management and evaluation systems for learners; and constraints on their own professional development. These challenges act as barriers, hindering teachers from fully leveraging modern teaching tools and thus impeding the comprehensive enhancement of their digital literacy. Scholars further note that the excessive intrusion of teaching technologies may lead to two extreme mindsets among teachers: over-reliance and rejection. On one hand, there is a cognitive misunderstanding of technological fetishism, where teachers develop utilitarian dependence on emerging technologies such as virtual classrooms and intelligent learning companions. On the other hand, technophobia manifests as an attitude of "unwillingness" and "fear" to adopt new digital tools. Both perspectives are extreme, deviating from a balanced approach to correctly recognizing and using modern teaching tools (Kang Xiuyun, Yu Xishui, 2024). Although the development of educational technology has not altered the essence and goals of education, its widespread application in educational settings may cause university teachers to question their professional roles and values, thereby shaking their confidence in professional development (Zhang Maocong, Li Yan, 2024).

Overall, the deepening development of education informatization is a double-edged sword, bringing both limitless possibilities and numerous challenges to teachers. Regardless of their educational stage or geographical region, teachers are compelled to confront these challenges, proactively seek coping strategies, and continuously enhance their digital literacy to contribute more wisdom and strength to students' all-round development.

2. Development Status of Teachers' Digital Literacy

(1) International Status of Teachers' Digital Literacy Development

When discussing the development of standards and frameworks for teachers' digital literacy, the European Union (EU) stands as a notable model. As early as 2017, the EU introduced the DigCompEdu framework (European Framework for the Digital Competence of Educators), which not only provided a clear direction for EU member states to formulate their national standards for teachers' digital literacy but also established a highly operational reference system for subsequent training, evaluation, assessment, and certification

(Luo Li, 2024). Together with UNESCO's ICT Competency Framework for Teachers (ICT CFT, 2011) and the United States' ISTE Standards for Educators (ISTE-E, 2016), DigCompEdu constitutes three of the most influential international standard systems for teachers' digital literacy (Qiu Xiaochun & Xiao Longhai, 2021). Thus, it can be seen that developed countries have taken the lead in standardizing the cultivation of teachers' digital literacy. Through long-term in-depth exploration of both the theory and practice of teachers' digital literacy, they have successfully constructed relatively complete cultivation systems, resulting in an overall higher development level compared to developing countries. This status not only reflects developed countries' high emphasis on educational informatization but also offers valuable experience and insights: during the promotion of educational informatization, it is essential to prioritize the development of standards and frameworks for teachers' digital literacy, using standardized cultivation systems to guide the comprehensive enhancement of teachers' digital literacy (Luo Li, 2024).

(2) Domestic Status of Teachers' Digital Literacy Development

The development of teachers' digital literacy is not achieved overnight but is deeply influenced by multiple factors such as region and educational stage, presenting a diverse landscape. Scholars Yu Hao and Zhang Wenlan (2024) conducted an in-depth survey of 1,127 teachers from 19 rural primary and secondary schools in Henan Province, revealing that rural teachers generally have low digital literacy. This is evident in their weak awareness of digital social responsibility, insufficient digital application capabilities, inadequate protection of personal privacy and data security, and a lack of effective digital tools for comprehensive student evaluation. Key constraints include uneven resource allocation, incomplete policy implementation, insufficient motivation for school transformation in rural areas, and low internal drive for teachers' self-development, maintaining a significant gap between rural and urban teachers (Huang Qingshuang & Zhang Yan, 2024). Beyond urban-rural disparities, digital literacy also varies by educational stage. Research on rural early childhood teachers shows they can collect and use ready-made digital materials for basic teaching but lack the ability to independently develop curricula using modern information technology. Mismatches between training content and actual teaching needs severely limit their proficiency in information-based teaching (Li Chunhui & Ma Ji, 2022). Studies by Jin Zhijie and Chen Xing (2024) on primary and secondary school teachers indicate that their digital literacy is moderately developed overall, with structural differences but no significant gender disparities. Teaching stage is a key differentiator: junior high school teachers exhibit higher digital literacy than those in other stages, while school type and teaching experience also impact development. For university teachers, a survey of three undergraduate institutions found their digital literacy is moderately high, with strong digital awareness and ethical literacy, but weak digital knowledge and skills remain the weakest component (Jiang Miao & Li Jing, 2024).

Overall, from rural primary and secondary school teachers to their urban counterparts and university educators, distinct hierarchical differences in digital literacy levels emerge among different teacher groups.

3. Conclusion

As a core engine driving the systemic transformation of education, Education Informatization 2.0 has exerted comprehensive and profound impacts on the development of teachers' digital literacy. It not only reshapes the connotations and extensions of the teacher literacy structure but also poses multidimensional challenges for teachers to adapt to educational demands in the digital era. Regarding constituent elements, diverse frameworks for teachers' digital literacy have been established domestically and internationally. Although differences exist in descriptive dimensions, these frameworks all focus on core categories such as "digital awareness, knowledge and skills, instructional application, and social responsibility," reflecting the shared value orientation of technology-enabled education and adaptable adjustments to local practices. Such cross-systemic intersections and complementarities provide both international insights and local pathways for the standardized cultivation and evaluation of teachers' digital literacy.

In terms of technology-enabled empowerment, Education Informatization 2.0, through deepening the integration of emerging technologies such as cloud computing and artificial intelligence with education and teaching, has not only catalyzed teachers' role transformation from "knowledge disseminators" to "learning facilitators in the digital age" but also built a broad platform for the practical enhancement of their digital literacy by constructing digital research and training communities and innovating application scenarios for teaching tools. However, the double-edged effect of technology cannot be ignored: challenges such as lagging teaching innovation capabilities, cognitive biases of technological dependence or rejection, and crises of professional identity highlight the complexity and long-term nature of teachers' digital literacy development.

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