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Research on the Significance, Practical Dilemmas and Implementation Paths of Enhancing Digital Literacy of Rural Primary and Secondary School Teachers in the Context of Digital Transformation of Education

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Abstract: *In the context of educational digital transformation, the promotion of digital literacy of rural primary and secondary school teachers has become a critical factor in promoting the modernization of rural education and achieve educational equity in China. This paper expounds the significance of improving digital literacy of rural primary and secondary school teachers, and points out that the current difficulties facing rural primary and secondary school teachers in improving digital literacy are uneven allocation of digital resources, lack of endogenous motivation of rural primary and secondary school teachers, and imperfect training and evaluation system of rural schools. On this basis, the paper puts forward strategies to optimize the distribution of resources, stimulate the endogenous motivation of teachers, and improve the training and evaluation system in rural primary and secondary schools, so as to facilitate the enhancement the digital literacy among teachers in rural primary and secondary schools.*

Keywords: *Education Digitization; Rural Primary and Secondary School Teachers; Digital Literacy*

1. Introduction

In the information age of the 21st century, the rapid development of digital technology has brought unprecedented changes to the field of education. With the integration and application of digital technologies, including big data, artificial intelligence and virtual reality in education, the ecological environment of teaching and the organizational form of classrooms have been changing, especially the emergence of generative artificial intelligence such as Chat GPT and Deep Seek, which has further accelerated the digital transformation of core literacy[1].

Within the context of digital transformation in education, research on digital literacy of primary and secondary school teachers can help them make better use of digital educational resources [2]. Rural education represents a "low-lying area" in the digital transformation of education. As the implementation subject of rural education, rural primary and secondary school teachers have long been in a "catch-up" position compared with urban teachers in terms of information literacy and digital literacy [3]. Therefore, enhancing the digital literacy of rural primary and secondary school teachers is not only crucial for adapting to the development of educational technology, but also vital for promoting the modernization of rural education, narrowing the urban-rural education gap, and achieving educational equity.

Based on this premise, this paper aims to deeply analyze the significance of the promotion of digital literacy of rural primary and secondary school teachers, explore the dilemma of the development of digital literacy of rural primary and secondary school teachers, and then propose the development path of promoting digital literacy of rural primary and secondary school teachers.

2. The Significance of Improving the Digital Literacy of Rural Primary and Secondary School Teachers Under the Background of Educational Digital Transformation

2.1 Improve Teaching Effectiveness and Promote High-Quality Development in Rural Education

In the digital age, there are many educational resources on the Internet. The improvement of digital literacy of rural primary and secondary school teachers can make better use of these resources and improve the quality of rural education. During the lesson preparation stage, these teachers can rely on digital algorithm technology to build a learner database and form accurate student portraits according to

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individual differences of students, such as learning characteristics, preferences, styles and needs. Therefore, it can help teachers to implement personalized after-school tutoring, ensure the pertinence and effectiveness of teaching activities, and truly achieve individualized teaching. During the teaching implementation phase, improved digital literacy enables rural primary and secondary school teachers to break through the limitations of traditional offline teaching. They can use advanced resources like digital education platforms and dual-teacher classrooms to carry out blended teaching. They can not only use conventional media such as video and audio, but also flexibly apply cutting-edge technologies such as artificial intelligence and virtual reality to innovate teaching methods, stimulate students' learning interest, improve students' learning participation and experience depth, and improve the overall teaching quality. In the teaching evaluation process, rural primary and secondary school teachers can rely on intelligent assessment tools to obtain and analyze students' learning data in real time. Based on these data, teachers can offer more targeted instruction to students, thereby further improving the effectiveness and quality of teaching, and infusing new vitality into the continuous high-quality development of rural education.

2.2 Bridge "Digital Divide" between Urban and Rural Students and Foster the Growth of Rural Students

Due to factors such as remote geographical locations and limited economic conditions, rural students have formed a significant gap with urban students in terms of information acquisition and skill mastery, known as the "digital divide". Studies have shown that the "digital divide" in China's urban and rural basic education is reflected in both students and teachers [4]. The digital literacy of students is influenced by the level of teacher literacy, and the improvement of teachers' digital literacy provides a new way to effectively bridge the "digital divide" between urban and rural students. The student's digital literacy degree is related to the teacher literacy degree, the enhancement of teachers' digital literacy is a new approach to facilitate effectively the "digital divide" of rural students, and enable them to comprehensively utilize modern information technology and eliminate region restriction. Therefore, through the provision of rich digital learning materials (for example, online courses, digital textbooks, etc.), rural students are able to be equipped with the same quality learning resources with urban students, and thus expanding the range and possibilities of learning. Furthermore, improved digital education literacy also helps teachers guide students in ways of using digital tools appropriately and effectively for autonomous and interactive learning. For instance, by applying smart learning platforms such as National Primary and Secondary Schools Smart Education Online Learning Platform, students can learn by themselves according to their inclinations and requirements and enhance themselves in solving problems independently. More importantly, rural primary and secondary school teachers can more effectively shoulder their responsibilities and obligations in the digital society by the improvement of their digital literacy. They can guide students to establish correct network ethics and information security awareness, and teach them to protect themselves from harmful Internet information.

2.3 Build a Learning Community and Foster Professional Development of Rural Primary and Secondary School Teachers

Rural primary and secondary school teachers play a crucial role as promoters and practitioners in the digital transformation of rural education. In the era of educational digitization, rural teachers can facilitate their individual sustainable development by leveraging digital technologies and resources to meet their professional development needs [5]. However, the primary prerequisite is that rural teachers must possess an adequate level of digital literacy. Otherwise, the application of digital technology may become a burden rather than a driving force for their professional growth [6]. On digital platforms, teachers can overcome geographical constraints, connect with peers from other regions, and form learning communities. They can share teaching experiences and jointly explore educational issues. This cross-regional learning community not only provides valuable learning resources for rural primary and secondary school teachers, enabling them to master modern information technology and enhance their ability to utilize digital resources, but also offers emotional support, stimulating their enthusiasm and sense of belonging towards the educational cause. Furthermore, it enables them to achieve self-transcendence in educational philosophy and teaching methods, further promoting their professional growth.

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3. The Realistic Dilemma in Enhancing Digital Literacy of Rural Primary and Secondary School Teachers Under the Background of Digital Transformation of Education

3.1 Uneven Allocation of Digital Resources

In the process of improving the digital literacy of rural primary and secondary school teachers, the uneven allocation of digital resources has become a major bottleneck restricting the digital literacy of rural primary and secondary school teachers. This problem is not only reflected in the backward hardware facilities, but also involves the lack of software resources, technical support and other aspects. The lag of hardware facilities is a basic obstacle. The large-scale survey data of Zhang et al. on Western X province shows that the rural digital education has problems such as backward intelligent facilities, lack of digital education resources and uneven quality of resources [7]. Due to the remote geographical location and limited economic development level, many rural schools are faced with practical problems such as slow computer equipment update iteration speed, insufficient number, and unstable network signals. These hardware limitations make it difficult for teachers to get effective practice opportunities, let alone make full use of digital teaching resources to enrich teaching methods and content. Although the construction of digital teaching resources for basic education in China has begun to take shape, there are still serious problems in software resources, such as the homogenization of resources, uneven quality of resource supply across regions, and slow updates to resource content [8]. At the same time, the absence of a professional technical support team means that teachers encountering problems while using digital tools cannot receive timely assistance, thus affecting their enthusiasm and effectiveness in utilizing digital teaching methods.

3.2 Insufficient Endogenous Motivation of Rural Primary and Secondary School Teachers

The endogenous motivation for teachers' self-development refers to their inner drive for personal growth. Currently, a notable dilemma in enhancing rural primary and secondary school teachers' digital literacy is the lack of endogenous motivation. Firstly, in rural areas, teachers themselves lack knowledge and awareness of using digital tools. Some of them have misunderstandings about the understanding and application of digital teaching, believing that digital teaching simply involves the use of multimedia devices or online teaching resources, while neglecting the underlying teaching philosophy and methods. They regard it as an additional skill rather than an essential ability. Secondly, some rural teachers find it difficult to transition to the digital teaching field in a short period of time under the long-term constraints of local contexts and teaching habits [9]. They may prefer traditional teaching methods and believe that there is no need to rely on digital technology too much. This conceptual lag and inertia lead to a lack of willingness to actively promote digital literacy. Lastly, it is also closely related to their professional development environment. In rural areas, due to the relative scarcity of educational resources and limited career development opportunities, some teachers may feel uncertain about their career prospects, lacking long-term development plans and motivation. This uncertainty in career development makes them unwilling to continuously invest and strive in improving their digital literacy.

3.3 The Cultivation and Evaluation System in Rural Schools is not Comprehensive

A scientific and reasonable training and evaluation system is the key to develop teachers' digital literacy. At present, there are still difficulties in cultivating and assessing the digital literacy of rural primary and secondary school teachers in China. First of all, from the perspective of the training system, the significant difference between urban and rural areas leads to the structural imbalance of the existing system. In the urban education system, the cultivation of digital literacy has been deeply integrated into the daily teaching and research frameworks. Through various forms such as school-based research and teaching competitions, it has been systematically integrated into the entire process of teacher professional development, establishing a systematic training model. However, in rural areas, issues such as low training frequency and misalignment of supply and demand. Specifically, most of the existing training is arranged by the superior departments, without fully considering the hardware conditions, subject characteristics and actual level of teachers in rural schools. Moreover, the training content focuses on basic technical operations while neglecting the integration of teaching methods, often becoming a theoretical lecture rather than a practical teaching scene in rural areas. The training mode is still dominated by traditional centralized face-to-face teaching, lacking of personalized design and long-term support mechanism. Finally, the existing system has the problems of biased evaluation orientation and single method. The evaluation methods for assessing teachers' digital literacy are mostly rely on results-based evaluation, which mainly reflects the level of teachers' digital literacy in the form of scores through

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standardized tests. Such evaluation methods are not only divorced from the real educational context, but also ignore the generativity and process of the cultivation and development of digital literacy, The evaluation effectiveness is low, making it difficult to effectively fulfill the role of evaluation, thus preventing rural teachers from clearly understanding their own digital literacy levels.

4. Practical Paths for Enhancing Digital Literacy of Rural Primary and Secondary School Teachers in the Context of Digital Transformation of Education

4.1 Optimize the Supply Pattern of Digital Resources

Strengthening the digital environment construction of rural schools plays an indispensable role in stimulating the potential of teachers' digital literacy. The primary task is to reinforce the infrastructure supporting digital transformation in rural schools. It is necessary to leverage the wisdom and collective strength of the state, government, society, and other stakeholders to increase investment in digital infrastructure and associated technological products. This will ensure that rural schools are equipped with stable and efficient digital facilities while addressing issues related to equipment maintenance and software updates, thereby laying a robust material foundation for fostering the digital literacy of teachers in rural primary and secondary schools. Meanwhile, policymakers should fully consider regional differences, develop strategies based on local conditions, and ensure that every rural school receives digital support suited to its specific needs. Furthermore, rural primary and secondary school teachers should be encouraged to create digital teaching resources that meet the local educational needs. This requires rural schools to make full use of high-quality digital educational resources such as the National Smart Education Platform for Primary and Secondary Schools to promote digital teaching practices. Teachers are also encouraged to design characteristic digital teaching resources based on local educational practices, enhancing the applicability and effectiveness of these resources. Lastly, a professional technical support team should be organized to provide regular technical guidance to rural schools, and solve the practical problems that teachers encounter when using digital tools. Additionally, regular digital literacy training programs should be conducted, not only focusing on technical proficiency but also guiding teachers to understand the concepts and values of digital education and enhancing their teaching innovation capabilities.

4.2 Activate the Intrinsic Motivation for Self-Development of Digital Literacy among Rural Primary and Secondary School Teachers

In the context of the digital transformation of education, enhancing the digital literacy of rural primary and secondary school teachers involves not only mastering external technological applications but also fostering internal motivation and conceptual change. Firstly, raising awareness of digital literacy among rural teachers is the basis for stimulating their intrinsic motivation. This can be achieved by organizing regular digital literacy training sessions and exchange activities, along with expert-led thematic lectures. Such approaches enable teachers to develop a comprehensive understanding of the essence, significance, and practical application value of digital literacy in modern education. Additionally, guidelines for improving digital literacy should be developed and distributed, explaining the fundamental principles and practical methods of digital teaching in clear terms. These materials aim to eliminate teachers' misunderstandings and doubts, and guide them to correctly view the necessity and urgency of digital literacy improvement. Secondly, establishing models of digital teaching can inspire intrinsic motivation among rural teachers. By exploring and promoting successful cases of highly digitally literate teachers in rural areas, demonstration classes and experience-sharing forums can be organized, allowing other teachers to see the actual results brought by the improvement of digital literacy. Furthermore, distinguished external digital educators can be invited to engage in exchanges with schools, offering on-site teaching and interactive discussions that broaden teachers' perspectives and stimulate their interest and enthusiasm in enhancing their digital literacy. Finally, optimize the professional development environment is essential to provide rural teachers with continuous learning and advancement opportunities. Increased investment in rural education should focus on upgrading teaching facilities and providing access to high-quality digital teaching resources. Special funds and reward systems should be established to offer both material and spiritual incentives to teachers who achieve outstanding results in improving their digital literacy, thereby enhancing their sense of professional accomplishment and honor.

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4.3 Innovate and Improve the Cultivation and Evaluation System of Rural Schools

In response to the structural contradiction between rural teachers' digital literacy training and evaluation system, it is necessary to construct a three-dimensional enhancement framework with demand-driven, hierarchical implementation and multiple evaluation. Firstly, based on the theory of teacher professional development and the transformation requirements of educational evaluation paradigms, a collaborative cultivation mechanism of "county-level coordination - school-based implementation" should be established, through which digital competency assessment tools can accurately diagnose teachers' development needs. Meanwhile, considering the particularities of rural educational scenarios, rural schools should offer digital local research courses tailored to differences in teachers' educational backgrounds and teaching experience, organize personalized teaching research, and achieve mutual promotion between teaching and research, thereby enhancing the quality and efficiency of education [10]. Secondly, in terms of the evaluation system, the functions of evaluation such as diagnosis, feedback and orientation should be fully exerted to enhance the pertinency and effectiveness of teachers' digital literacy development [11]. Regarding the reform of the evaluation mechanism, a diversified and dynamic evaluation system should be established, integrating process evaluation with outcome evaluation. Among them, process evaluation should prioritize the effectiveness of teachers' application of digital technology in authentic teaching scenarios, while outcome evaluation focuses on assessing the collaborative development level of digital literacy between teachers and students. Additionally, digital literacy evaluation indicators suitable for rural education characteristics should be developed, and establish an annual dynamic update mechanism.

5. Conclusion

Since the emergence of AI technology, information technology has been constantly updated and iterated. The development of technology presents both challenges and opportunities [12]. Faced with the strategic task of digital transformation of rural education, it is an important measure to strive to enhance the digital literacy of rural primary and secondary school teachers. For these teachers, fully grasping the power of information technology is not only essential for their professional growth but also crucial for better serving the growth and development of students, helping them advance further and more steadily on their future journeys. In response to the new demands for rural education development in the new era, efforts should be made to optimize the supply structure of digital resources, stimulate teachers' intrinsic motivation for self-growth and development, and improve the training and evaluation system. This will enable teachers to maintain their dominant position in the context of educational digitization and respond to various challenges brought by the digital transformation of education with a scientific attitude.

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