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The Impact of Teachers' Digital Competence on Teaching: Current Status, Influences and Future Recommendations

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Abstract. In today's society, digital technology has brought new paradigms to education and teaching, and enhancing teachers' digital competence has become a core issue of concern for the global education community and policymakers. This article focuses on teachers' digital competence, systematically exploring their multidimensional impact on teaching, current development status, and future improvement paths. There is a positive correlation between teachers' digital competence and teaching quality. The classroom of teachers with high digital competence can better improve teaching efficiency and attract students' interest in learning. However, most regions around the world still face problems such as insufficient hardware facilities, a lack of policy support, and imperfect teacher training systems. In response to these issues, this article suggests strengthening hardware investment and policy guarantees, while leveraging the demonstration effect of excellent teachers with digital capabilities, and driving the improvement of digital competence among teacher groups through imitative learning. Future research should focus on the impact of different cultural backgrounds on cultivating teachers' digital competence and the feasibility of improvement plans.

Keywords: Digital Competence, Digital Technology, Teaching Efficiency

1. Introduction

The development of science and technology has had many impacts on society. Various media have emerged, from radio and television to the internet and artificial intelligence. All these have brought new modes to teaching. Educators have realised that with the assistance of digital technologies, such as multimedia courseware and virtual laboratories, teaching quality can be improved. Thus, students' learning experience will be enhanced [1].

However, the application of digital technology in teaching still faces certain difficulties. During the COVID-19 pandemic, the vast majority of educators and learners had no option but to shift to online education. Although it promotes the spread of digital technology usage, it has also exposed issues about uneven digital competencies among teachers. Such issues are caused by multiple reasons, like the lack of resources or an imperfect training system [2].

The significance of improving teachers' digital competence has been repeatedly mentioned by the educational community and policymakers globally. Several countries have made plans to develop

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teachers' digital competence as a vital part of educational modernization. Therefore, to better deal with the challenges and opportunities brought by the technology revolution in education, it is important to have a better understanding of the significance of digital competencies to teaching. This essay will focus on the impact of teaching that comes from teachers' digital competence, the current situation, and advice for future development.

2. The impact of teachers' digital competence on teaching quality

By combining digital technology, the quality of education in new educational models can be improved. The specific manifestation of digital technology is different hardware facilities, such as computers, student tablets, and electronic whiteboards for teaching. The use of these devices requires proper training and understanding of usage guidelines. Therefore, the digital competence of teachers can be understood as whether they are proficient in these devices and understand the usage norms of these devices. For classrooms that already have complete hardware support, teachers' digital competence is considered to have a positive correlation with students' learning quality.

2.1. Innovate teaching methods

The improvement of students' learning quality through teachers' digital competence is considered to be achieved in two different ways. Firstly, from a direct impact perspective, teachers' digital competence is the core support for innovative teaching methods and improved content delivery efficiency. Teachers with excellent digital competence can flexibly use digital tools such as multimedia courseware and virtual laboratories to break the traditional one-way teaching mode in the classroom, visualize complex knowledge points, and concretize abstract concepts, making teaching content easier for students to understand; At the same time, with the help of the resource push function of online platforms, accurate matching of teaching content can be achieved, reducing the interference of invalid information and directly improving the quality of teaching. Indirect impact is achieved through improving the classroom experience to stimulate students' learning initiative, thereby improving the chain reaction of students' learning quality. Interactive classrooms constructed through digital means, such as online discussion forums and real-time answering tools, can effectively break the passive learning state of students and stimulate their willingness to actively participate in teaching activities; The increase in student participation will further enhance classroom interaction, promote deeper knowledge exchange between teachers and students, and among students, ultimately helping students deepen their understanding and absorption of knowledge, indirectly promoting the improvement of teaching quality.

A related study conducted in China is investigating this idea. By analyzing data from teachers and students from multiple universities, both direct and indirect impacts have been confirmed to exist [3].

2.2. Create new classroom models and increase student engagement

In addition to directly improving the quality of students' learning, teachers with good digital competence can provide students with a safe environment. For students living in the digital age, using the internet is an inevitable part of their learning and daily life. Therefore, ensuring network security is considered crucial [4]. A study on early childhood education in the Philippines provides relevant evidence. The teacher and student groups in this study come from kindergarten and first grade. This group of students has a relatively low level of awareness of network security. Research

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shows that teachers' digital ethics, digital cognition, and critical thinking can effectively avoid risks in digital teaching. Children in the preschool education stage have weak discernment abilities, and teachers need to screen compliant and high-quality teaching resources through digital cognition to avoid negative information affecting children; At the same time, with the awareness of digital ethics, regulate one's own digital behavior, ensure the standardization of the teaching process, and create a safe digital learning environment for young children [5].

Overall, digital education can create new classroom models and increase student engagement. With the help of modern tools, teachers can create an active classroom atmosphere that is different from traditional education. Meanwhile, digital education can also provide information and knowledge that is in line with the current social context. All of this requires not only the support of hardware devices, but also the digital competence of teachers.

3. Current status of teachers' digital competence

In order to systematically detect teachers' digital competence, professional systems have been developed, such as the DigCompEdu framework. This is the European Digital Competency Framework for Educators, released by the European Union in 2017, covering 6 major competency domains, 22 competency indicators, and 6 competency development stages. It is also equipped with online evaluation tools and is aimed at all levels and types of educators to guide them in using digital technology to optimize education and teaching, enhance their own and students' digital competence [6]. This framework has been used by researchers to assess teachers' digital competence. For example, a study on Vietnamese schools used this framework to analyze how teachers can improve teaching quality from six aspects [7].

However, the reason for limiting the ability of digital technology is not only due to the insufficient digital competence of teachers. Firstly, most parts of the world lack sufficient financial support to improve hardware facilities, and schools in lower or lower-middle-income countries may not be connected to the internet [8]. Meanwhile, in many countries, governments and schools have not provided sufficient policy support [9]. Taking the research conducted by Robandi et al. in Indonesia as an example. They conducted a questionnaire survey to investigate the reasons why digital education is difficult to carry out [10]. They found that, in addition to some teachers stating that they do not have sufficient ability to use digital devices, objectively speaking, inadequate infrastructure is a fundamental constraint: some schools lack sufficient computers, stable networks, and other digital devices, directly limiting the basic conditions for teachers to use digital tools. From a subjective and institutional perspective, the lack of policy support in schools weakens teachers' motivation to apply digital technology, which means that there is a lack of clear digital teaching incentive mechanisms and technical support systems, making it difficult for teachers to gain confidence and feel assured in applying digital technology.

The most critical issue is the lack of cultivation of teachers' digital competence, which is somewhat related to teacher vocational education [11]. The curriculum design flaws in the teacher education stage have led to a significant gap in the digital competence of future teachers [12]. Education practitioners may feel that they have not received comprehensive digital competence training during their training. At the same time, disciplinary differences are also very obvious. Dolezal et al.'s research found that if teachers have STEM or computer science backgrounds, their courses already include digital content, and they will have stronger digital tool operation abilities, as well as a deeper understanding of the teaching value of digital competence. On the contrary, teachers without these backgrounds generally have poor digital competence [12].

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Overall, the current teacher education curriculum has shortcomings in cultivating teachers with digital competence. For some education professionals without a background in science, mathematics, or computer science, using digital technology can be challenging. Secondly, even if teachers have good digital competence, they may still face situations without hardware facilities, which means they cannot utilize their digital competence. At the same time, they may also be afraid to use these new technologies in the classroom because schools and governments may not have adequate policy support.

4. Feasible solutions and future recommendations for enhancing teachers' digital competence

To address the current situation, the first step is to provide sufficient hardware facilities and comprehensive policy support. From an optimistic perspective, many countries around the world have already carried out relevant work. For example, Italy plans to invest funds to improve the inadequate facilities in domestic schools [9]. During the COVID-19 pandemic, as most people could only study from home, digital education began to be accepted by more people, providing a favorable social environment for the country to promote digital education. A digital education ecosystem similar to the DigCompEdu framework has been established in multiple countries to support teaching management, evaluation, and content distribution [9].

In response to the current situation of teachers' digital competence, cross-border research has proposed targeted improvement plans, with the core being the utilization of existing advantages. That is to say, by using teachers with excellent digital competence to drive other teachers to accept digital technology. This is a method of improving teacher performance while controlling costs. The study by Momdjian et al. found that the exemplary role of teacher educators is a core factor in enhancing the digital competence of teacher trainees, and its effectiveness is far superior to the traditional models of "direct teaching" and "integrated practice" [13]. This demonstration effect is that teacher trainees can directly feel how digital technology is applied in teaching and can directly imitate it. Another study conducted in China also confirmed the good performance of exemplary roles in cultivating teachers' digital competence [14]. The research results show that if pre-service teachers are in an atmosphere that encourages innovation (using teachers who actively apply digital technology as role models to drive more people to participate), they can better enhance their digital competence.

Based on the above research, in the future, schools and governments should provide better funding and policy support. At the same time, teachers' digital competence should also be cultivated through strengthening the curriculum and utilizing imitation effects.

5. Conclusion

Many studies have shown that by integrating digital technology, new educational models can effectively improve teaching quality and increase student engagement. There is a positive correlation between teachers' mastery of digital technology, digital competence, and teaching quality. Teachers with good digital competence can proficiently use technological facilities and also avoid the harm of online risks to students. However, due to the lack of hardware facilities and policies, and some teachers not having the opportunity to receive good digital competence training, the positive value of digital competence is limited. This is primarily due to deficiencies in the teacher training system, which currently neglects the training of teachers' digital competence. On the other hand, teachers are afraid to use new technologies in the classroom because there is no support from schools and governments. To address these issues, schools and governments should first provide economic and

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policy support, while improving the teacher training system and increasing training on digital technology. Teachers with high digital competence can also be encouraged to serve as role models and actively influence other teachers.

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