IT and Educational Reform: the Impact of Digital Transformation on Educational Quality

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Abstract. The rapid development of Internet technology and digital transformation are profoundly affecting the global education system, promoting the deepening of education reform, and digital education has gradually become an important means to improve the quality of education. This paper aims to explore the application of Internet technology in education reform, and analyzes the impact of Internet technology on education quality in detail, including the improvement of teaching effect, the improvement of personalized learning and student achievement, the optimization of teacher-student interaction and classroom management, and the improvement of educational equity. In addition, the paper discusses the challenges of digital transformation, such as technological barriers and infrastructure issues, changing educational philosophies, privacy and data security issues, and equity in education. Through case studies of South Korea's smart classroom and China's online education platform, the effects and challenges of digital transformation in practical applications are demonstrated. In summary, this paper provides an in-depth analysis of the digital transformation of education, which is of great significance to help educators, policy makers and academic researchers understand its potential and challenges, and to provide theoretical support and practical guidance for educational reform.

Keywords: Digital Transformation; Educational Quality; Educational Reform

1. Introduction

With the continuous development of global society and economy, education, as the cornerstone of social progress, is facing unprecedented challenges and opportunities. In recent years, the rapid development of information technology, especially Internet technology, has promoted the digital transformation in the field of education and become an important driving force for educational reform [1]. The limitations of traditional education models are becoming increasingly apparent, and the information age requires education not only to improve quality, but also to adapt to diverse learning needs and changing social environments.

The rapid spread of Internet technology, particularly through online learning platforms, virtual classrooms and massive open online courses (MOOCs), is changing the face of education, improving its quality and broadening learning opportunities. This technology-driven education model breaks the time and space constraints of traditional education, enabling learners to learn autonomously anytime and anywhere. Especially in remote areas and resource-poor environments, digital transformation promotes the sharing and popularization of educational resources, providing more students with the opportunity to receive quality education.

At the same time, the application of Internet technology also makes education gradually personalized and accurate. With the aid of big data and artificial intelligence, education can provide tailored learning programs according to students' learning habits, abilities and interests, thereby enhancing students' autonomous learning ability and teachers' teaching efficiency. However, despite the positive changes brought about by these technologies, the education sector still faces many challenges [2]. Information overload may lead to the distraction of students' attention, and the unequal distribution of technological equipment may exacerbate the urban-rural education gap. In addition, differences in teachers' abilities in the application of information technology may also affect the overall effect of digital education reform.

2. Literature Review

2.1 The application of Internet technology in education. With the continuous advancement of information technology, the Internet has profoundly changed every level of education. The new mode of education, as shown in Fig. 1, has greatly expanded the boundaries of education and improved the penetration rate and accessibility of education.

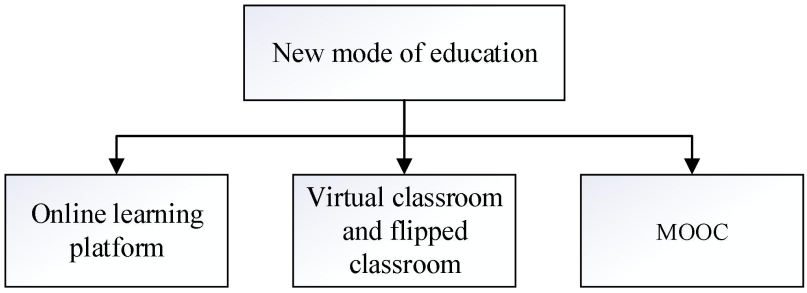

Figure 1. New mode of education

Online learning platforms (such as Coursera, edX, Khan Academy, etc.) have grown rapidly since the late 20th century and become an important part of the education landscape. These platforms provide a large number of learning resources, and students can choose learning content according to their personal interests and needs, breaking the restrictions of time and place, and being able to learn in a more flexible and autonomous way. Coursera, shown in Fig. 2, offers courses from top universities and institutions around the world that users can take anytime, anywhere, greatly improving the accessibility and autonomy of education.

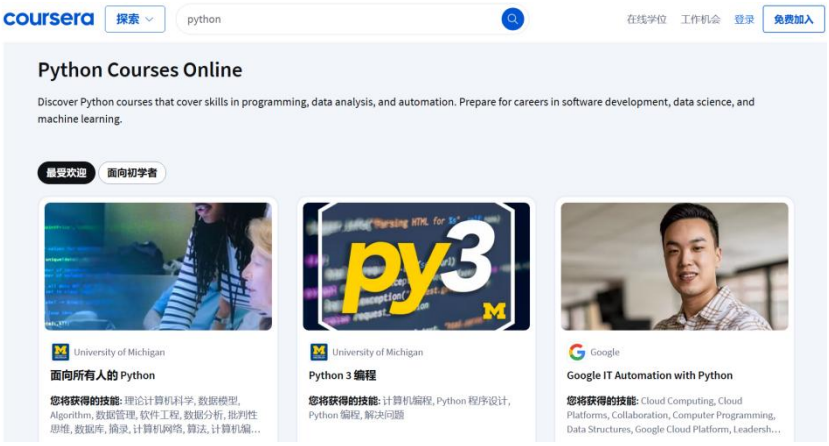

Figure 2. Coursera is an online learning platform

Virtual classroom and flipped classroom are two major innovations in the field of education in recent years. These new teaching models rely on Internet technology and combine classroom learning with self-study after class. Teachers are no longer the sole transmitters of knowledge, but the guides and mentors of students' learning. Through video conferencing, interactive tools and other technical means, virtual classroom enables students to participate in course learning remotely and interact with teachers and classmates in real time. Flipped classroom is to reverse the order of traditional classroom teaching and extracurricular learning. Students first learn basic knowledge by themselves through videos and online resources, and then have in-depth discussions and answer questions with teachers and classmates in class, thus improving the learning effect and initiative of students.

A MOOC (Massive Open Online Course) is a form of education that offers massive, open, free online courses over the Internet. The biggest feature of MOOCs is their openness, allowing anyone with an Internet connection to participate in courses at top universities around the world. Moocs not only provide learning resources for traditional disciplines, but also cover many emerging disciplines

and vocational skills training, becoming an important platform for global educational resources sharing.

The application of these Internet technologies has not only enriched the forms of learning, but also provided technical support for new educational models such as personalized learning and lifelong learning.

2.2 Definition and measurement of educational quality. The definition and measurement of educational quality vary according to different countries, regions, educational systems and times. Traditional definitions of educational quality tend to focus on academic achievement, test scores and students' mastery of knowledge. However, with the progress of society and the change of educational concepts, the measurement standards of educational quality have gradually diversified [3]. As shown in Fig. 3.

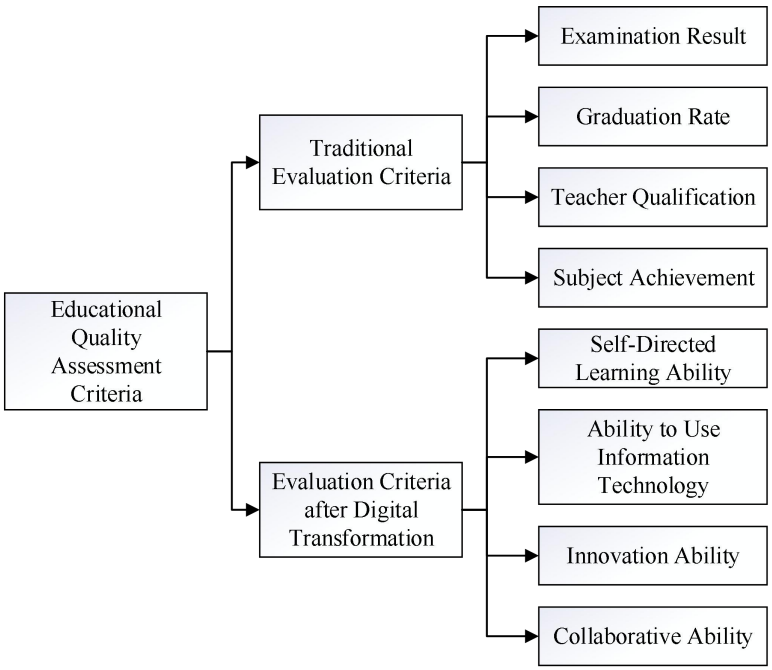

Figure 3. Evaluation criteria for educational quality

The traditional evaluation criteria of educational quality usually include students' test scores, graduation rates, teachers' qualifications, and academic scores. These standards emphasize the transfer of knowledge and the academic achievements of students, pay more attention to the input and output of knowledge, and consider less the learning process and quality development of students.

With the deepening of the digital transformation of education, the evaluation criteria of educational quality have changed. In addition to traditional academic results, students' independent learning ability, information technology use ability, innovation ability, collaboration ability and so on need to be considered. In addition, the popularity of online education platforms has made the evaluation of education quality more diversified, and students' participation, online learning progress, and interaction have also become new quality evaluation indicators.

2.3 Digital transformation and Education reform. Digital transformation is driving education reform globally, especially in the fields of higher education and vocational education [4]. Through the application of digital technology, some countries and regions have not only improved the utilization efficiency of educational resources, but also improved the equity of education. For example, Finland and Estonia have achieved remarkable results in the allocation of educational resources and innovation in teaching models through digital means, narrowing the education gap between urban and rural areas, regions and social classes. Developing countries such as China and India provide a large number of online education resources through Internet technology to help students in remote areas receive a better education.

Successful cases show that digital transformation helps to improve the quality of education and promote innovation in education [5]. However, digital transformation also faces challenges in some regions in terms of technology infrastructure, teacher training, student engagement, and more. Therefore, how to overcome these challenges and ensure the continuous improvement of education quality in the process of digital transformation is an important topic for future education reform.

3. Impact of Internet Technology on Education Quality

The rapid development of Internet technology has ushered in unprecedented digital transformation in the field of education. Through Internet technology, traditional education methods are undergoing profound changes, especially in improving teaching effect, realizing personalized learning, improving teacher-student interaction and promoting educational equity, Internet technology has played a huge role [6]. These changes not only changed the form of education, but also had a profound impact on the quality of education. This section explores how Internet technology can improve the quality of education in these four areas.

3.1 The improvement of teaching effect. The application of Internet technology has greatly improved the learning mode, enhanced the students' autonomous learning ability, and improved the availability of educational resources. The traditional education model usually relies on classroom teaching and teachers' teaching, while Internet technology enables students to conduct independent learning outside of class through online education platforms, virtual classes, educational videos, interactive learning tools and other forms. Moocs and various online learning platforms, for example, provide a wealth of course content that students can access anytime, anywhere, making up for the limitations of traditional classroom time.

In addition, Internet technology helps students broaden their horizons of study. Through the Internet, students can access high-quality educational resources around the world, especially course content from top universities, experts and scholars, and the popularity of these resources has greatly improved the accessibility of education. No matter where they are, as long as they have Internet access conditions, students can enjoy relatively fair educational resources, which has a significant role in eliminating the phenomenon of unequal educational resources.

The improvement of autonomous learning ability is also one of the positive changes brought about by Internet technology [7]. Through the online learning platform, students can choose courses according to their personal interests and progress, stimulate their learning motivation, and enhance learning efficiency through flexible learning methods. Interactive learning tools such as video courses, online tests and instant feedback enable students to monitor and adjust their learning progress at any time during the process of mastering knowledge, which not only improves the teaching effect, but also enables students to gradually develop the habit of independent learning [8].

3.2 Personalized learning and student achievement. Personalized learning is another important aspect of the application of Internet technology in education. Internet technology allows educational content and teaching methods to be tailored to students' individual needs and interests, and this highly customized learning model has a direct impact on student achievement, motivation, and engagement.

Through artificial intelligence, big data analysis and other technologies, online education platforms can collect and analyze students' learning data in real time, identify students' learning blind spots and weak links, and automatically push suitable learning resources based on this information. For example, in subjects such as math and English, the platform can recommend moderately difficult questions based on students' actual level, or provide additional tutoring content for students with poor grades to help them improve gradually.

This personalized learning not only improves students' grades, but also stimulates their motivation and engagement. Personalized recommended learning content can make students maintain a higher interest in learning, and avoid the boring feeling brought by the teaching method of "one-of-a-kind" in traditional education. At the same time, since each student can learn at their own pace, this flexibility also helps to reduce students' learning pressure and improve learning efficiency.

Research shows that personalized learning can not only improve students' academic performance, but also promote their overall development to a certain extent. For example, the online platform can also recommend interdisciplinary learning content based on students' interests, such as programming, art design, etc., to further broaden students' knowledge and stimulate their multi-faceted learning interests and creativity.

3.3 Teacher-student interaction and classroom management. The application of Internet technology makes the interaction between teachers and students more frequent, convenient and efficient. In the traditional education model, the teacher-student interaction is usually limited to face-to-face communication in the classroom, which is limited by time and space. However, with the popularization of online discussion platforms, instant messaging tools, and technologies such as artificial intelligence tutoring, teacher-student interactions have become more diverse and flexible.

For example, online discussion platforms offer students more opportunities to interact with teachers. Outside the classroom, students can answer questions with teachers in real time through the platform, and participate in after-class discussions and thinking collisions. This flexible approach to communication not only increases the student's sense of engagement, but also allows students to continue to deepen their understanding of the course content outside of the classroom. At the same time, teachers can also monitor students' learning progress in real time through the platform, understand their learning difficulties, and adjust teaching strategies in time.

The tutoring system with artificial intelligence technology is also an important supplement to teacher-student interaction. AI tutoring can provide personalized teaching support according to students' learning situation, and help students conduct independent review and improvement. The AI system can feedback students' mistakes in real time, provide targeted explanations to students, and even generate customized learning plans for them, reducing teachers' work pressure and allowing teachers to focus more on students' higher-order learning needs and classroom management.

In terms of classroom management, Internet technology helps teachers better control classroom dynamics. Through real-time voting, questionnaire survey and classroom discussion tools, teachers can know the opinions and feedback of students in real time, so as to flexibly adjust the teaching content and methods, and improve the efficiency and quality of classroom teaching.

3.4 Educational equity. The role of Internet technology in promoting educational equity cannot be ignored. Especially in poor and remote areas, Internet technology provides new possibilities for equal distribution of educational resources [9]. In the past, due to geographical, economic and other factors, many students in poor areas were unable to access high-quality educational resources, and the popularity of the Internet has provided a practical way to solve this problem.

Through the Internet, students in poor areas can access quality courses from famous universities through online education platforms and enjoy equal learning opportunities with urban students. For example, many domestic and foreign universities and educational institutions have provided high-quality educational resources to schools in remote areas for free or at low cost through network broadcast, recording and broadcasting. This not only provides students with a wider learning space, but also helps to improve the overall education standard in these areas.

At the same time, Internet technology has also helped to make the distribution of educational resources more equitable. Through the intelligent management system, the education department can accurately allocate high-quality teachers and teaching resources to the places where they are most needed, reducing the imbalance of educational resources. Distance education and online training allow teachers to effectively guarantee the quality of teaching in remote areas, no longer limited by geographical location or teaching facilities.

To sum up, Internet technology has played a positive role in promoting the quality of education. From improving teaching effect, realizing personalized learning, promoting teacher-student interaction to promoting educational fairness, the application of Internet technology in the field of education has been deepening, helping education break through the shackles of traditional models. With the further development of digital technology, education in the future will pay more attention to individuation, diversity and equity, and promote the overall improvement of education quality.

4. Challenges in Digital Transformation

The emergence of online education, digital tools and platforms has revolutionized the mode of education. However, while these technologies offer great opportunities for education, many challenges remain in their implementation. The following will explore the potential challenges of digital transformation to the quality of education from four aspects: technical barriers and infrastructure issues, changing educational philosophies, privacy and data security issues, and educational equity issues.

4.1 Technical barriers and infrastructure issues. The implementation of digital education first faces the challenge of technical threshold and infrastructure [10]. In different regions, especially in places with a large gap between urban and rural areas, there are significant differences in the hardware facilities and network connection conditions of schools and students. For many students in remote areas or low-income families, the lack of stable Internet connection and suitable terminal equipment (such as computers, tablets, etc.) has become a major barrier to participation in online education. Even if some schools have certain hardware equipment and infrastructure, the speed of technology update is far less than the change in demand, which leads to some schools can only use outdated equipment, limiting the breadth and depth of technology application.

Teachers' digital skills are also an important factor restricting the digital transformation of education. Despite the increasing use of modern technology, many teachers lack adequate training and support in how to use digital tools to improve their teaching. The lack of understanding and application ability of new technology not only affects the teaching quality of teachers, but also makes the learning experience of students limited. Especially in rural and less developed areas, resources for training and support in digital technologies are even scarcer, further exacerbating the technology divide in education.

4.2 The change of educational idea. The digital transformation of education is not only the introduction of technology, but also the profound change of educational concept. The traditional teaching mode is teacher-centered, emphasizing knowledge transfer and classroom control, while the digital education emphasizes student-centered, interactive, personalized and autonomous learning [11]. This shift requires both teachers and students to adapt to new ways of thinking and working.

For many teachers, the transition to digital instruction can be a huge challenge. On the one hand, teachers may lack enough time and resources to redesign the curriculum and adapt to the new teaching mode; On the other hand, some teachers have reservations about the benefits of digital education, believing that traditional teaching methods are still the most effective way. Therefore, the transformation of teachers' educational concepts and technical literacy is a major problem in the digital transformation of education.

For students, digital education requires them to have higher self-management ability and learning motivation. In the traditional education model, students usually rely on teachers' guidance and classroom management, while in the digital learning environment, students need to rely more on their own learning ability and time management ability. However, not all students will be able to adapt to this transition, especially those who lack self-discipline or learning resources and may face reduced learning efficiency.

4.3 Privacy and data security issues. With the popularity of online education, the storage and management of students' personal data and learning records has become a growing problem. Digital educational tools and platforms collect a large amount of personal information, including students' learning progress, grades, interests, etc. However, the privacy and security of these data still have great hidden dangers [12]. In recent years, data leaks and privacy violations have frequently been exposed in the field of education, and the abuse and leakage of students' personal data has aroused widespread concern in the society.

Some online education platforms do not invest enough in data security and even fail to comply with relevant privacy protection regulations, leaving students' sensitive information at risk. In addition, while the use of data analytics can help educators tailor learning programs to students, it can also create a tendency to over-rely on data, ignoring the uniqueness and complexity of

individual students, thus affecting the quality of education. How to ensure data security and privacy protection while promoting the digitization of education has become an important issue to be solved urgently.

4.4 Educational equity problem. Internet technology offers new possibilities for universal and equitable education, especially in remote and poor areas, where digital education can provide learning opportunities for students who otherwise would not have access to quality educational resources. However, access to technology does not happen overnight, and there is still an imbalance in access to technology globally, which makes digital transformation likely to exacerbate inequities in education.

In some developed regions, Internet access and digital devices are almost ubiquitous, and students can enjoy high-quality online educational resources. However, in some developing countries or less developed regions, students do not have access to equal learning opportunities due to poor infrastructure, inadequate equipment and unstable networks. In addition, students from low-income families may not be able to buy the required digital equipment or pay for related online education due to family economic pressure, which inadvertently aggravates the unequal distribution of educational resources.

On the other hand, over-reliance on digital education may also overlook the role of non-digital educational resources, such as face-to-face teacher-student interaction and the development of social skills. Digital transformation may lead to the exclusion of some students who may not otherwise adapt or be able to adapt to online learning, creating new issues of equity in education. Therefore, how to balance the advantages of technology and the fairness of education is an important issue that must be considered in the process of education digitization.

Although Internet technology has brought unprecedented opportunities for the digital transformation of education, the technical, conceptual, privacy and equity challenges faced in the implementation process cannot be ignored. In order to improve the quality of education comprehensively, we must actively solve these problems, and carry out effective adjustment and optimization in the level of policy, technology and educational practice. Only through a comprehensive approach can we ensure that digital transformation truly promotes equity and innovation in education while improving the quality of education.

5. Case Studies

With the rapid development of Internet technology, many countries and regions in the world are actively exploring and implementing digital transformation in their education systems. In this process, some countries have achieved remarkable results in improving the quality of education, expanding educational resources and improving teaching results by introducing Internet technology. The following will explore how Internet technology can play a role in education reform through two specific cases.

5.1 Wisdom classroom in Korea. South Korea is one of the typical success stories of Internet technology application in the field of education. The South Korean government launched the "Smart Education" program in 2013 with the aim of reforming the traditional education system through information technology. By building digital campuses across the country, promoting smart whiteboards, interactive e-textbooks and one-to-one equipment, the program has greatly improved the interactivity of classroom teaching and students' sense of participation. Especially in preparation for the college entrance exam, "wisdom classroom" has become the norm in Korea. Smart classrooms not only enhance the interaction of teaching, but also help students learn according to their personal learning progress through data analysis and personalized learning platforms, promoting the overall improvement of students' abilities.

In the process, South Korea has also provided learning resources that are synchronized with the classroom through online education platforms. Through the platform, students can carry out extra-curricular extended learning, and teachers can track students' learning progress in real time and provide timely feedback to students. This way of integrating online and offline education, while

improving the quality of education, also makes education resources more evenly distributed to urban and rural areas and remote areas.

5.2 China's online education platform. China has also made remarkable progress in the process of digital transformation, especially in the application of online education platforms. Platforms such as "Good Future" and "Xueersi Online School" break the geographical restrictions and provide rich educational resources through innovative Internet education methods. These platforms not only provide students with online courses and tutoring, but also enable personalized learning with the support of big data and artificial intelligence.

For example, "Good Future" uses AI technology to customize learning plans for each student, monitor students' learning process, and adjust course content and progress based on students' learning feedback, improving the quality of education, as shown in Fig. 4. Thanks to these online platforms, students can learn flexibly according to their own time and interests, while enjoying a similar teaching effect to a traditional classroom. In addition, during the epidemic period, online education platforms played a crucial role in ensuring the continuity of education. Especially in the early stage of the epidemic, many students in remote areas had access to high-quality educational resources through the Internet, narrowing the education gap between urban and rural areas [13].

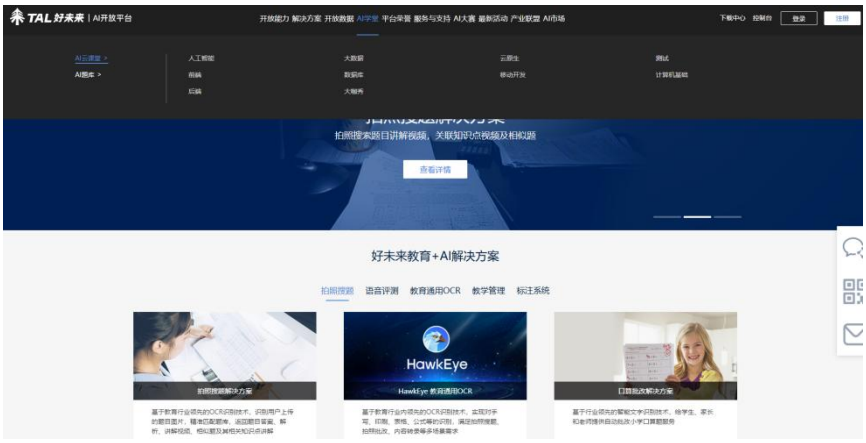

Figure 4. Good future online education platform

The combination of Internet technology and education reform not only improves the quality of education, but also promotes the development of educational equity. Successful cases show that digital education can effectively improve teaching interaction, personalized learning, and break geographical restrictions to provide more educational resources.

6. Summary and Directions

6.1 Summary. The application of Internet technology in education reform has a significant positive role, and has achieved initial results in improving the quality of education. First of all, the popularization of information technology makes the access to educational resources no longer limited by geographical location and time. Distance education and online learning platforms enable more students to enjoy high-quality educational resources, especially students in remote areas and developing countries, to receive high-quality courses on a global scale through the Internet platform. Secondly, the combination of big data and artificial intelligence provides more accurate analysis and decision-making basis for education. Through the data analysis of students' learning behaviors, progress and habits, educators can better grasp students' learning status, conduct targeted counseling and support, and thus improve the education effect.

On the other hand, the introduction of virtual reality and gamified learning makes students more engaged in the learning process, and the fun and interaction of learning has been greatly enhanced. Especially in complex and abstract subjects, virtual reality can provide students with practical operational experience and help them better understand and master theoretical knowledge.

However, the application of Internet technology in education also faces some challenges. The digital divide still exists, especially in low-resource areas, where the gap between students and teachers in terms of equipment, networks and technical support remains wide. In addition, how to avoid the fragmentation of educational content and how to ensure the security and privacy of students when using online learning platforms are also urgent problems to be solved in the future digital transformation of education.

Overall, Internet technology has greatly promoted education reform and improved the quality of education, and its personalization, flexibility and accessibility have brought new opportunities to the education field. With the continuous maturity and popularization of technology, the quality and fairness of education will be further improved in the future.

6.2 Directions Although this paper explores the main impact of Internet technology on education reform and education quality improvement, there are still some key areas that deserve further research and exploration.

First, the relationship between educational technology and students' psychological development is an understudied area. Although technology can provide students with a personalized learning experience, whether long-term reliance on Internet technology, especially online learning platforms, will affect students' mental health, social skills and emotional development remains to be explored. How to ensure the balance between mental health and interpersonal relationship while promoting students' academic performance is an important direction of future research.

Secondly, the integration of technology and the transformation of teachers' roles deserve attention. With the continuous introduction of AI, VR and other technologies, the role of teachers will no longer be the traditional knowledge imparted, but become the guide, helper and motivator of the learning process. However, how teachers adapt to this change, how to maintain high standards of educational quality in the new teaching mode, and how to improve their digital literacy, these issues still need further research.

Third, the issue of educational equity is still a major challenge in the application of Internet technology. Despite the convenience of digital technology for distance education, students in many regions still do not have equal access to online education resources due to differences in equipment, networks and other aspects. Future research can further focus on how to narrow the digital divide between different regions and different social groups, and how to improve equity in education globally through policy and technological innovation.

Finally, education data privacy and security issues also need to be further studied. With the digitalization and large-scale storage of educational data, how to protect students' personal privacy and prevent data leakage and abuse has become an important topic in the application of educational technology. It is of great practical significance to study how to use data analysis to improve education quality while protecting data privacy.

To sum up, future educational research should focus on exploring the impact of Internet technology from multiple dimensions, exploring the potential and limitations of technology application, and providing more useful reference and guidance for educators, policy makers and technology developers.

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