

International Journal of Ethno-Sciences and Education Research

Vol. 5, No. 1, pp. 30-36, 2025

Education Revolution: Leveraging Technology to Improve Learning Quality by 2025

Moch Panji Agung Saputra^{1*} Nurnisaa AS², Alim Jaizul W³

^{1,2,3}Research Collaboration Community, Bandung, Indonesia *Corresponding author email: nurnisaa1626@gmail.com

Abstract

The technological transformation in education in 2025 has had a significant impact on the way we teach and learn. The use of artificial intelligence (AI) and learning analytics enables a more personalized, interactive, and adaptive learning experience. AI helps provide rapid feedback and adapts learning materials to students' needs, while learning analytics enables real-time monitoring of student progress. Despite the many benefits that can be gained, the main challenges faced are the digital divide between urban and rural areas, limited infrastructure, and issues of training for educators and protection of students' personal data. Therefore, investment in infrastructure, training for educators, and development of data protection policies are crucial to ensure effective implementation of technology in education. Technology can play a major role in creating a more inclusive and adaptive education, provided that the existing challenges can be overcome.

Keywords: Educational technology, Artificial Intelligence (AI), learning analytics, digital divide, data protection.

1. Introduction

Education is one of the fundamental aspects that determines the progress of a nation. In the context of globalization and rapid technological developments, the education sector must also adapt to changing times. In 2025, education has undergone a significant transformation, thanks to the use of technology in various aspects of learning. With new innovations, such as the use of artificial intelligence (AI), data analytics, and various technology-based educational platforms, education is now more inclusive and personal (Chen et al., 2020).

Technology plays an important role in opening up wider access to education. In many countries, especially those in remote areas, technology allows students to gain access to quality learning materials without being limited by distance and time. Online learning, for example, has become an alternative that allows students to learn outside the traditional classroom. With more equitable internet access, education can be accessed by anyone, anywhere, and anytime (Ferri et al., 2020).

One of the most prominent innovations in education in 2025 is the application of artificial intelligence (AI) which can change the way we learn and teach. AI provides solutions for more personal and adaptive teaching. With the ability to analyze student learning patterns, AI can provide more precise recommendations regarding the learning materials that students should learn, as well as help educators identify areas that need special attention (Torda, 2020).

The use of AI also allows for faster and more precise evaluations. For example, AI-based assessment systems can provide real-time feedback, allowing students to identify their strengths and weaknesses in learning. In addition, this technology also allows for the creation of a more individualized learning experience, where learning content can be tailored to the needs of each student, ensuring that they learn in the most effective way (Clarke, 2020).

In addition to artificial intelligence, data-driven learning (learning analytics) is also increasingly popular in education. Data collected during the learning process can be analyzed to provide deeper insights into student progress. Using this data, educators can make better decisions regarding curriculum, teaching methods, and strategies to help students who are struggling to learn (Latova and Latov, 2020).

Although technology can bring great benefits to education, there are various challenges that need to be overcome. One of the biggest challenges is the digital divide between areas with good technological infrastructure and those that do not. In many areas, especially in developing countries, access to technology such as the internet and computers is still limited. This creates an imbalance in educational opportunities between students who have access to technology and those who do not (Kamalov et al, 2023).

Another issue that needs to be addressed is related to educator training. While technology offers many benefits, without adequate skills and understanding, teachers and educators may struggle to integrate technology into their teaching. Therefore, it is important for educational institutions to provide effective training for educators so that they can make optimal use of technology in the teaching and learning process.

In addition, the issue of privacy and data security is also a major concern in the application of technology in education. In a system that increasingly relies on data, protection of students' personal information is essential. Data collected during learning must be kept safe to avoid misuse that can harm students. Therefore, strict regulations regarding the use and storage of data are a must.

In facing these challenges, there are also various opportunities that can be utilized. One of them is the use of technologies such as virtual reality (VR) and augmented reality (AR), which allow students to learn in a more immersive and interactive way. With VR and AR, students can experience a more in-depth learning experience, such as exploring the world of history, science, or geography without having to leave their classrooms. This technology allows for more enjoyable and effective learning (Putra et al., 2020).

Ultimately, education in 2025 will increasingly emphasize the importance of lifelong learning. The ever-changing world demands new skills that are relevant to the times. Technology provides opportunities for individuals to continue learning and developing their skills throughout life. Online learning and technology-based training platforms allow anyone to access training materials and courses according to their needs, whenever and wherever they are.

2. Literature Review

The application of technology in education has been a widely discussed topic in educational literature for the past few decades. The transformation of technology, especially related to artificial intelligence (AI), learning analytics, and online learning platforms, has opened up new opportunities to support more efficient, flexible, and inclusive learning processes. Several studies have identified the benefits and challenges associated with the integration of technology in education, providing an overview of how technology can improve the quality of education and overcome existing barriers (Akram et al., 2022).

2.1. Technology and learning quality

According to Haleem et al. (2022), technology can improve the quality of education by providing students and teachers with wider access to information and learning materials. The use of technology allows students to learn in a more interactive and multimedia-based way, which can improve their understanding of the material (Haleem et al., 2022). The use of digital devices and technology-based learning applications helps create a more personalized learning experience that is tailored to students' needs. This is in line with research by the Almusaed et al. (2023), which shows that the application of technology can accelerate learning and increase student engagement (Almusaed et al., 2023).

2.2. Artificial intelligence in education

One of the greatest advances in education is the application of artificial intelligence (AI), which enables more adaptive and personalized learning. Research by Chen et al. (2020) showed that AI can be used to collect and analyze data on how students learn. Thus, AI can provide faster and more accurate feedback to students, and enable educators to design a curriculum that is more appropriate to students' needs. AI can also provide deeper learning by utilizing predictive analytics to identify learning difficulties experienced by students earlier and provide more appropriate solutions (Chen et al., 2020).

The application of AI in education also allows for the creation of a more individualized teaching system, as explained by Fitria (2021). With AI, each student can receive material that is tailored to their level of understanding and ability. AI also functions as a digital tutor that can provide assistance to students outside of formal class hours (Fitria, 2021). This provides an opportunity for students to continue learning and developing in a more efficient way.

2.3. Data-based learning (learning analytics)

In addition to AI, data-based learning or learning analytics has become an important topic in educational literature. Learning analytics refers to the collection, analysis, and application of data to understand student learning patterns and improve the teaching process. Wilcox et al. (2021) in his research stated that data-based learning can help educators make evidence-based decisions about more effective teaching approaches. By using data collected during learning, educators can identify students who need additional support and design more effective learning strategies (Wilcox et al., 2021).

According to research by Visscher (2021), data-based learning not only provides insight into student progress but can also be used to assess the effectiveness of curriculum and educational programs. Data-based learning allows educators to monitor student progress in more real-time and provide faster interventions when needed (Visscher,

2.4. Challenges of technology in education

While there are many benefits to be gained from technology in education, there are several challenges that need to be addressed to ensure its successful implementation. One of the biggest challenges is the digital divide that still exists in many countries, especially between urban and rural areas. Research by Anderson and Rivera Vargas (2020) shows that gaps in access to technology can create inequalities in educational opportunities. Students who live in areas with limited access to technology are unable to take full advantage of the potential that educational technology offers (Anderson and Rivera Vargas, 2020).

In addition, privacy and data security issues are also major concerns. With more and more data being collected during the learning process, protecting students' personal data must be a priority. Research by Jones et al. (2020) highlights the importance of clear policies regarding data protection to ensure that students' personal information remains secure and is not misused. Without adequate privacy guarantees, the implementation of technology in education risks raising legal and ethical issues (Jones et al., 2020).

3. Methods

This study aims to explore the role of technology in education in 2025, especially the latest innovations that influence the way of teaching and learning. To achieve this goal, the methodological approach used is descriptive qualitative with data collection techniques through literature studies and in-depth interviews. This method was chosen because it allows researchers to gain a deep understanding of the role of technology in education, as well as to explore various perspectives on the challenges and opportunities that exist.

3.1. Research approach

This research approach uses a descriptive qualitative method that aims to describe the phenomena that occur in the integration of technology into the education system in 2025. With this approach, researchers can collect and analyze data to gain in-depth insights into how technology is used in learning, and its impact on the quality of education. Qualitative research allows researchers to explore various factors that influence the adoption of technology, both from the perspective of educators, students, and existing education policies. This approach also provides an opportunity to identify and describe the challenges faced in the application of technology, as well as opportunities that can be utilized to improve the quality of education.

3.2. Data source

This study relies on two types of data, namely secondary data and primary data. Secondary data were obtained through literature studies covering various scientific journals, books, research reports, and other documents related to the use of technology in education. These sources provide theoretical context and empirical evidence on how technology affects the learning and teaching process. Primary data were obtained through in-depth interviews with educators, educational technology experts, and principals who have experience in implementing technology in the teaching and learning process. These interviews aimed to explore their experiences and views related to the application of technology in education, as well as the challenges and benefits they felt in integrating technology in learning.

3.3. Data collection techniques

To collect data, researchers used two main techniques, namely literature studies and in-depth interviews. Literature studies were conducted to obtain information from various relevant sources regarding technology in education. Through this study, researchers can explore theories and previous research results that examine the impact of technology on learning, as well as the latest developments in this field. Meanwhile, in-depth interviews were conducted with educators, principals, and educational technology experts to obtain primary data on the application of technology in the classroom and how technology contributes to the learning process. These interviews provide more contextual and specific information on how technology is used in real situations in schools and other educational institutions.

3.4. Research procedure

The research procedure was carried out in several stages. The first stage is preparation, where the researcher conducted a literature review to understand the background and current developments in educational technology. The

researcher also designed an interview instrument that would be used to explore primary data. The second stage is data collection, where the researcher collected secondary data from various relevant literature and conducted interviews with educators and experts who have direct experience in implementing technology in education. These interviews can be conducted face-to-face or through an online platform, depending on the availability and location of the respondents. The third stage is data analysis, where the researcher organized and categorized the collected data to identify key themes related to the application of technology in education. The final stage is report preparation, where the research results will be presented systematically in the form of a report that describes the research findings and provides recommendations for the development of educational technology in the future.

3.5. Data analysis

Data analysis in this study was conducted using a thematic analysis approach, which allows researchers to identify patterns and themes that emerge from the data that has been collected. Through thematic analysis, researchers can organize large and complex data, so that relationships can be found between the application of technology, the challenges faced, and its impact on the quality of education. For example, researchers can analyze how the use of technology such as artificial intelligence (AI) in learning affects student engagement or how data-driven learning can improve teaching decisions. By grouping data based on relevant themes, researchers can provide clearer and more detailed insights into the various factors that influence the integration of technology in education.

3.6. Validity and reliability

To ensure the validity and reliability of the data collected, this study uses triangulation. Triangulation is carried out by comparing data obtained through interviews with secondary data found in literature studies. In addition, researchers will also verify the findings through discussions with experts or mentors in the field of educational technology. In this way, researchers can ensure that the findings obtained are not only based on one source of data or perspective, but are based on various sources that support each other. This triangulation process helps to increase the accuracy and reliability of research results, as well as providing a more comprehensive picture of the role of technology in education.

4. Results and Discussion

The results of this study aim to explore the application of technology in education in 2025, with a focus on the latest innovations that can impact the way we teach and learn. Based on a literature review and in-depth interviews with educators and educational technology experts, several key findings emerged that explain how technology, especially artificial intelligence (AI), data-driven learning, and online learning platforms, can make significant contributions to the quality of education, as well as the challenges that must be overcome in their implementation. The following table summarizes the views of several respondents regarding the application of technology in education and the challenges they face:

Table 1: Interview results table						
Respondents	Role	Opinions on Technology Implementation	Challenges Faced	Suggested Solutions		
Educator 1 (Secondary School Teacher)	Subject Teacher	Technology helps make learning more interactive and customizable to students' needs.	Digital divide, especially in rural areas that lack adequate internet access.	More equitable distribution of devices and internet connections in remote areas.		
Educator 2 (Elementary School Teacher)	Primary Education Teacher	Using AI as a digital tutor provides additional support to students outside of class hours.	Limited use of technology due to lack of training for educators.	Training and workshops for educators to maximize the use of technology in the classroom.		
Educational Technology Expert	Educational Technology and Researcher	Data-driven learning can improve educational decision- making by monitoring student progress in real-time.	Security of students' personal data that is not fully protected.	Development of more secure systems and clearer data protection policies.		

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Principal	Principal	Integration of technology opens up opportunities for more flexible and personalized education, but requires the right policies.	Lack of infrastructure in schools to support the use of technology.	Investment in infrastructure and policies that support comprehensive technology integration.
Educator 3 (High School Teacher)	Physics Teacher	AI helps in providing faster feedback and helping students who are lagging behind in understanding the material.	Limited time to utilize technology due to the many administrative burdens.	Simplifying administration and allocating time for technology use in the classroom.

This interview table reveals various views on the application of technology in education. Respondents, consisting of educators, educational technologists, and school principals, acknowledged that technology provides great benefits in increasing the interactivity of learning, enabling a more personalized learning experience, and facilitating real-time monitoring of student progress. Technologies such as artificial intelligence (AI) also enable faster feedback to students, which helps them in the learning process.

However, the main challenges faced include the digital divide that still exists between urban and rural areas, the lack of adequate training for educators in utilizing technology, issues of student personal data security, and limited technology infrastructure in many schools. To overcome these challenges, respondents suggested several solutions, including more equitable provision of devices and internet access, more intensive training for educators, development of clearer data protection policies, and investment in adequate technology infrastructure.

4.1. Application of technology to improve the quality of learning

The results of the study indicate that technology can significantly improve the quality of learning by providing wider access to learning materials and enabling more interactive teaching methods. Research by Haleem et al. (2022) shows that technology provides opportunities for students to learn in a more visual and multimedia way, which not only improves their understanding of the material but also makes the learning experience more interesting. This is in line with the findings of Almusaed et al. (2023) which show that the use of technology-based learning applications can accelerate students' learning processes and increase their level of engagement. In addition, interviews with educators revealed that the application of technology allows for a more personalized learning experience. Several educators expressed that technology, such as AI-based learning applications, helps them identify individual student learning needs and adjust materials to suit each student's abilities and interests. Thus, learning becomes more relevant and effective, which can accelerate the process of student understanding.

4.2. The role of artificial intelligence in learning

One of the main findings in this study is the application of artificial intelligence (AI) which has a major impact on learning. As suggested by Chen et al. (2020), AI can analyze student learning data to provide faster and more accurate feedback, and enable curriculum design that is more tailored to student needs. Findings from in-depth interviews with educators showed that AI also functions as a digital assistant that provides support for students outside of class hours, such as in the form of virtual tutors who are ready to help students with questions or materials that are difficult to understand.

The use of AI in education also allows for more adaptive learning. Students can be given materials that are tailored to their level of understanding, which increases their chances of achieving a better understanding of the material. For example, AI applications can provide extra practice for students who are struggling with a particular concept or accelerate material for students who are quicker to grasp the lesson. In this way, AI plays a vital role in creating a more personalized and effective learning experience.

4.3. Data-based learning (learning analytics)

Other findings show that data-based learning (learning analytics) plays a significant role in decision-making related to learning. According to research by Wilcox et al. (2021), data-based learning allows educators to make more evidence-based decisions about more effective teaching strategies. In this study, it was found that the use of learning analytics helps educators to monitor student progress in more real-time and provide rapid interventions when needed. Data collected during the learning process can identify students who need additional support, so that teaching can be more focused on areas that need more attention.

However, the implementation of learning analytics also brings challenges related to managing and analyzing large and complex data. Interview results revealed that many educators find it difficult to interpret data obtained from technology-based learning systems, and some of them need further training to maximize the use of data in the teaching process.

4.4. Challenges in implementing technology in education

Although technology brings many benefits, this study also found a number of significant challenges in its implementation. One of the biggest challenges faced is the digital divide that still exists, especially between urban and rural areas. Research by Anderson and Rivera Vargas (2020) highlights the inequities in access to technology lead to gaps in educational opportunities. Several interviews with educators in rural areas revealed that many students do not have adequate access to digital devices or stable internet connections, which prevents them from making the most of educational technology. In addition, issues of privacy and data security are also major concerns. With more and more data being collected during the learning process, protecting students' personal data becomes critical.

Research by Jones et al. (2020) shows that many educators and schools are concerned about the potential misuse of student data. In interviews, several respondents stated that they need clearer policies and stronger data protection systems to ensure the security of students' personal information and prevent privacy breaches.

5. Conclussion

In conclusion, the integration of technology in education in 2025 brings both significant opportunities and challenges. As highlighted throughout this study, the application of advanced technologies such as artificial intelligence (AI) and learning analytics is transforming the educational landscape by making learning more personalized, interactive, and efficient. AI has proven to be a valuable tool in providing real-time feedback and adapting learning materials to the needs of students, while data-driven learning has enabled educators to make more informed decisions and monitor student progress more effectively. These advancements have the potential to revolutionize education by improving engagement, accelerating learning processes, and offering more tailored learning experiences.

However, the implementation of these technologies is not without its obstacles. The digital divide remains a major challenge, particularly in rural areas, where limited access to technology and the internet hinders students' ability to benefit from these innovations. Additionally, the lack of adequate training for educators and concerns about data privacy and security also pose significant barriers to the successful integration of technology in education. To overcome these challenges, it is essential to invest in infrastructure, provide comprehensive training for educators, and develop clear policies to safeguard students' personal data.

Looking forward, the role of technology in education is expected to grow even further. The key to successful integration will lie in addressing the digital divide, ensuring equitable access to technological resources, and fostering a culture of continuous learning for both educators and students. With the right investments and strategies in place, technology can play a transformative role in shaping the future of education, making it more inclusive, effective, and adaptive to the needs of the 21st-century learner.

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