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Digital-Based Learning Innovations to Improve Student Literacy in the Society 5.0 Era

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ABSTRACT

This research aims to examine various forms of digital learning innovations and their impact on improving student literacy. The study is carried out through the literature study method on various research results, scientific articles, and other relevant sources that discuss the implementation of technology in the world of education. The main focus is on the use of technology such as Learning Management System (LMS), interactive learning applications such as Kahoot and Quizizz, as well as the use of digital media such as videos, e-books, and learning simulations. The results of the study show that the integration of technology in the learning process can increase students' active involvement, strengthen concept understanding, and form critical thinking habits. However, the implementation of this innovation is inseparable from a number of challenges, such as the digital gap between regions and the low readiness of teachers to utilize technology optimally. Therefore, supportive policies, continuous teacher training, and infrastructure strengthening are needed as important prerequisites for optimizing the implementation of digital learning in the Society 5.0 era.

Keywords: Digital learning innovation, Student literacy, society 5.0

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INTRODUCTION

The development of information and communication technology (ICT) in the last two decades has revolutionized the way humans live, work, and learn. In the realm of education, this digital transformation has encouraged a shift in the learning paradigm from previously teacher-centered to more student-centered. One of the big ideas that emerged from this global change was the concept of *Society 5.0* which was first introduced by the Japanese government. This concept views that technological developments, especially artificial intelligence (AI), Internet of Things (IoT), big data, and robotics, must be used to improve the overall quality of human life. In the context of education, Society 5.0 demands the presence of an adaptive,

innovative, and technology-integrated learning system in order to produce a generation that is not only academically capable, but also has 21st-century skills.

Society 5.0 is the concept of a future society that harmoniously integrates physical and digital spaces. This concept not only focuses on the use of high technology, but furthermore, emphasizes the creation of a *human-centered society* that is oriented towards solving various social problems through technological innovation (Fukuyama, 2018). Thus, education as the main foundation in human development must be able to keep up with the rhythm of this development. One of the most crucial aspects of education in the era of Society 5.0 is literacy. Literacy is no longer narrowly defined as the ability to read and write alone, but has developed into a multidimensional competency that includes digital literacy, data literacy, technological literacy, cultural literacy, and critical thinking literacy.

In today's world of education, high literacy skills are indispensable so that students are able to navigate the complexity of information, think critically, and make data-based and ethical decisions. According to Trilling and Fadel (2009), 21st century skills include three main categories, namely basic literacy, competency, and character qualities. These three components can only be developed through a learning approach that suits the needs and characteristics of the digital generation. In this case, digital-based learning is one of the potential solutions that can answer these challenges. Digital learning provides flexibility in the learning process, enables remote collaboration, and enriches the learning experience with the help of multimedia and interactive simulations.

Furthermore, digital-based learning also allows for personalization in the educational process. With the help of algorithms and analytical data, students can obtain learning materials that suit their respective learning speeds and styles. This is certainly different from the traditional approach which tends to be uniform and does not consider the diversity of individuals in the classroom. Personalized learning not only increases learning effectiveness, but also boosts students' motivation and confidence (Means et al., 2014). Thus, the integration of digital technology in learning can be a powerful tool to improve student literacy in various aspects, ranging from the ability to understand information, think critically, to solve problems creatively.

However, the application of digital learning cannot be separated from the existing challenges. The problem of access to technological devices and internet connections is still a major obstacle in many regions, especially in developing countries such as Indonesia. The digital divide between urban and rural areas is an issue that needs serious attention from policymakers. In addition, teachers' readiness to adopt technology is also a determining factor for the success of digital learning. Many teachers are still not used to using digital platforms in learning, both due to lack of training and limited facilities. Therefore, it is important to have a continuous professional development program for educators so that they are able to design learning that is innovative and in accordance with the needs of today's students.

In an effort to develop student literacy through digital learning, the role of teachers is very strategic. Teachers are not only facilitators of learning, but also supervisors who help students build critical awareness of the information received through digital media. According to Jenkins et al. (2006), 21st century education should include media literacy training, which is the ability to analyze, evaluate, and create messages in various forms of media. With these abilities, students can become intelligent and responsible users of information, not just passive consumers. Therefore, digital learning needs to be developed with a critical pedagogical approach that emphasizes not only the technical aspect, but also the ethical and social aspect.

It is also important to emphasize that digital literacy and critical thinking cannot be separated from local cultural values. In the context of multicultural Indonesia, digital-based learning must be able to accommodate local wisdom and national values so that they are not

uprooted from the nation's cultural roots. This is in line with the *glocal* (global-local) approach, where education integrates global insights without neglecting local identity. For example, the use of digital content based on local culture can be a means to instill moral values while honing students' critical thinking skills in interpreting the meanings and symbols of their own culture.

Digital transformation in the world of education also opens up opportunities to strengthen collaboration between stakeholders, both at the school, government, and private sector levels. Cooperation between the world of education and the technology industry can produce learning innovations that are relevant and adaptive to the times. Examples are the development of *online learning platforms*, AI-based learning applications, and automated learning evaluation software that can help teachers analyze student learning outcomes in real time. These innovations can certainly accelerate the achievement of national education goals, which are to educate the nation's life through an equitable, quality, and sustainable education system.

In conclusion, the integration of digital technology in learning is a necessity in the era of Society 5.0. Literacy as a key competency of the 21st century must be developed through a contextual, participatory, and technology-based approach. Digital learning not only increases the efficiency and flexibility of the learning process, but also opens up opportunities for the development of critical thinking skills, problem-solving, and cross-cultural understanding. However, the implementation of digital learning must be accompanied by inclusive policies, teacher capacity building, and adequate infrastructure so as not to create new gaps in the world of education. Thus, we can create a generation of lifelong learners who are not only intellectually intelligent, but also resilient in the face of the complexities of the times.

METHODS

This research uses the literature study method (*library research*) by examining and analyzing various scientific journals, articles, books, and other relevant sources that discuss the topic of digital-based learning innovation and its relation to the development of student literacy. This approach was chosen because it provides space to explore various theoretical and empirical perspectives that have been developed by previous researchers, so as to enrich the understanding of the dynamics and effectiveness of digital learning in the era of Society 5.0.

In its implementation, this literature study focuses on searches on publications published in the last ten years, with priority given to journals that have been indexed in reputable databases such as Scopus, Web of Science, and Google Scholar. The analysis process was carried out systematically by reviewing the main aspects that are the focus of the research, such as the digital learning model applied, the underlying pedagogical approach, the type of platform or technology used, and its influence on improving student literacy, both in the aspects of digital literacy, information literacy, and critical thinking skills.

In addition, this study also identifies various challenges that are often faced in the implementation of digital learning, such as the limitations of technological infrastructure, the digital gap between regions, and the readiness of teachers and students to utilize technology optimally. The findings from this literature study are expected to provide a strong conceptual foundation for the development of more inclusive and effective digital learning strategies in improving student literacy at various levels of education.

RESULT AND DISCUSSION

Digital-Based Learning Innovation

The development of information and communication technology has driven significant transformation in the world of education, especially through digital-based learning innovations. This innovation comes in response to the need for learning that is more flexible, adaptive, and relevant to the times. One of the most tangible forms of this innovation is the use of various digital platforms and applications in the teaching and learning process.

One of the most commonly applied innovations is the Learning Management System (LMS). Platforms such as *Moodle*, *Google Classroom*, *Edmodo*, and *Schoology* have been widely used to organize teaching materials, manage assignments, and facilitate interaction between teachers and students. LMS allows teachers to systematically organize and distribute teaching materials, monitor student progress, and provide feedback quickly. The advantage of an LMS lies in its flexibility—students can access materials anytime and anywhere, supporting independent and continuous learning.

In addition to LMS, another innovation that is increasingly popular is the use of interactive learning applications. Apps like *Kahoot*, *Quizizz*, *Socrative*, and *Nearpod* have been widely used to increase student engagement through *gamification approaches*. This gamification is able to create a fun and competitive learning atmosphere, encouraging students to be more active and motivated in participating in learning. Through interactive quizzes, educational games, and real-time challenges, students not only remember the material, but are also trained to think quickly and critically.

Digital media also plays an important role in learning innovation. The use of learning videos, e-books, podcasts, infographics, and digital simulations further enriches the student learning experience. Learning videos, for example, allow students to repeat the teacher's explanations independently, thus helping to understand a deeper concept. Meanwhile, digital simulations are very effective for science or engineering learning, as they allow students to conduct virtual experiments that cannot be done in person in the classroom due to limited tools or safety risks.

According to a study conducted by Lubis (2022), the implementation of digital-based learning has been proven to improve student learning outcomes at various levels of education. This increase is due to several factors, including the flexibility of time and place to study, ease of access to information, and increased motivation to learn due to the use of interesting and interactive media. Furthermore, digital learning also encourages students to be more independent in learning and developing digital literacy, which is one of the important competencies in the era of the industrial revolution 4.0.

However, the implementation of digital learning innovations also faces challenges. One of them is the gap in access to technology, especially in areas that are still experiencing limited digital infrastructure. In addition, teachers' readiness to integrate technology into learning is also an important factor. Many teachers still need training in designing and managing digital learning effectively. Therefore, support from educational institutions and the government is urgently needed in providing adequate technology facilities and professional development programs for educators.

In conclusion, digital-based learning innovations offer great potential in improving the quality of education. With the right technological support, this approach is able to make learning more interesting, personal, and relevant to the needs of the times. Therefore, it is important for all stakeholders in the world of education—teachers, schools, parents, and the government—to work together to expand the application of digital technology to create a more inclusive, effective, and meaningful learning experience for all students.

Improving Student Literacy

The integration of technology in the learning process not only brings innovations in teaching methods, but also has a significant impact on improving various aspects of student literacy. Literacy in the context of the 21st century is not only limited to reading and writing skills, but also includes the ability to think critically, use technology, and collaborate and communicate effectively. With the right use of technology, these various types of important literacy can be optimally grown in students.

One of the main aspects that is improved through technology integration is digital literacy. Digital literacy refers to students' ability to access, evaluate, use, and disseminate information through digital media. In a learning environment that actively uses the internet and digital devices, students are trained to independently search for sources of information, select valid and relevant information, and process it into new knowledge. This activity not only improves technical skills, but also encourages students to become active learners who are critical to the massive flow of digital information.

In addition to digital literacy, technology integration also greatly supports the development of critical thinking. Technology provides a diverse range of learning resources that encourage students to compare different perspectives, analyze data, and construct logical and evidence-based arguments. For example, the use of platforms such as *Google Scholar*, *Wikipedia*, or *YouTube Edu* allows students to explore a variety of material from different perspectives. In this process, students not only receive information, but also learn to question the accuracy, credibility, and relevance of that information—which is at the core of critical thinking skills.

Another important aspect that is also strengthened through technology is collaboration. Through various digital platforms such as *Google Workspace*, *Microsoft Teams*, and *Padlet*, students can work together to complete projects, exchange ideas, and provide feedback on the work of friends. Digital collaboration not only broadens students' horizons through cross-ideological interaction and perspectives, but also trains them in building teamwork, shared responsibility, and virtual communication skills—all of which are key competencies in the modern world of work.

Research conducted by Putra (2024) shows that the integration of *problem-based learning (PBL)* models combined with digital technology has been proven to increase students' digital literacy, especially in Vocational High Schools (SMK). In problem-based learning, students are faced with real situations that require problem solving independently or in groups. When this process is supported by technological devices, students are not only active in finding solutions, but also involved in the process of data collection, digital information analysis, and multimedia presentation of results. This strengthens their skills in processing and conveying information effectively.

Although the benefits of technology in increasing literacy are enormous, its implementation cannot be separated from challenges. One of the main challenges is the inequality of access to technology, which is still an obstacle for schools in areas with limited infrastructure. In addition, the readiness of teachers in utilizing technology pedagogically also greatly determines the effectiveness of learning. Teachers need to be provided with training and mentoring to be able to design digital-based learning activities that are not only technical, but also support the development of student literacy as a whole.

Thus, improving student literacy through technology integration requires a comprehensive and sustainable strategy. Schools need to create a conducive digital learning ecosystem, supported by adequate devices, connectivity, and teacher competence. Through this approach, learning not only becomes more engaging and interactive, but also makes a real contribution to shaping students who are digitally literate, critical think, and able to collaborate in facing future global challenges.

Challenges in Implementation

Although digital-based learning offers great potential in improving the quality of education, its implementation in the field still faces a number of serious challenges that need to be addressed immediately. Inequality of access, limited infrastructure, and low readiness of educators are the main obstacles that hinder the optimization of technology-based learning transformation. If these challenges are not addressed with the right strategy, the gap in the quality of education between regions and social groups will actually widen.

One of the most glaring challenges is the digital divide. In Indonesia, the difference in access to technology between urban and rural areas is still very significant. Students in large cities generally have better access to digital devices such as laptops, smartphones, and a stable internet connection. On the other hand, in rural or remote areas, limited access to information technology is still a daily reality. Many students have to share one device with other family members, or even have no internet access at all. As a result, they lag behind in the digital learning process and experience a technology literacy gap compared to their peers in more developed areas.

The second challenge is teacher readiness. Although many teachers are aware of the importance of using technology in learning, the reality is that not all teachers have the skills and confidence to integrate it effectively in the teaching-learning process. Some teachers still use technology only as a tool to deliver material, not as a means to create interactive, collaborative, and student-centered learning. The lack of continuous training, lack of technical assistance, and limited pedagogical digital literacy are the causes of the low effectiveness of technology use by educators. This has a direct effect on the student learning experience that is not optimal.

In addition, limited infrastructure is also a major obstacle in the implementation of digital learning. Many schools, especially in 3T areas (disadvantaged, frontier, and outermost), still lack facilities such as internet networks, computer devices, and stable power sources. Even if teachers and students have a strong will to implement digital learning, without adequate infrastructure support, the learning process will still be hampered. This condition requires serious attention from the government and education policy makers to ensure fair and sustainable investment in building a digital education ecosystem.

Research by Safwan & Santamaggala (2024) confirms that the successful implementation of digital learning depends heavily on two main things: equitable access to technology and improving the quality of teachers. They found that students who were in an inclusive digital learning ecosystem—where access to technology was equally available and teachers had adequate digital competencies—showed significant improvements in learning engagement and academic outcomes. Therefore, a comprehensive approach is needed to address these challenges.

Solutions to address the digital divide can be done through collaboration between governments, the private sector, and society. The provision of digital devices by cross-subsidization, the development of internet infrastructure in remote areas, and low-cost internet programs for students are some of the concrete steps that can be taken. Meanwhile, in the aspect of improving the quality of teachers, an ongoing training program is needed that not only focuses on the technical aspects of the use of technology, but also on the design of digital learning that is effective and oriented towards the development of student competencies.

Overall, digital-based learning should not only be a momentary trend or post-pandemic emergency solution, but should be an integral part of the national education transformation. However, this transformation will only succeed if it is accompanied by serious efforts to address existing structural and systemic challenges. Through partisan policies, equal access, and teacher

capacity building, digital learning can be a fair and effective means of creating quality education for all the nation's children, regardless of social or geographical background.

CONCLUSION

Digital-based learning innovations have great potential in improving student literacy, especially in the context of the Society 5.0 era which emphasizes the integration between technology and human life. Digital learning not only provides easy access to various sources of information, but also creates a more interesting, interactive, and relevant learning experience. Through the use of digital platforms such as Learning Management System (LMS), learning videos, simulations, and interactive applications such as Kahoot and Quizizz, students can be more actively involved in the learning process. This contributes to strengthening various types of literacy, such as digital literacy, information, numeracy, and critical thinking literacy.

The integration of technology in learning also allows for the differentiation of teaching materials according to students' needs and learning styles, as well as encouraging collaboration through virtual project-based group work. On the other hand, digital learning encourages students to be more independent in managing their learning process, thus developing lifelong learning skills that are very important in this digital era.

Nevertheless, this great potential still faces a number of challenges. The digital divide between urban and rural areas, the low readiness of teachers to integrate technology effectively, and the limited infrastructure in various schools are still the main obstacles. Therefore, policies that support comprehensive digital transformation in the education sector are needed, including the provision of intensive training for teachers, strengthening technology infrastructure, and equitable access to the internet and digital learning tools. With these strategic steps, digital-based learning can be optimized to form a generation that is literate, adaptive, and ready to face global challenges in the Society 5.0 era.

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