



THE USE OF INTERACTIVE LEARNING TECHNOLOGY TO DEVELOP DIGITAL LITERACY SKILLS OF ELEMENTARY SCHOOL STUDENTS

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Abstrak

Transformasi digital di era revolusi industri 4.0 telah membawa dampak signifikan pada berbagai sektor, termasuk pendidikan. Meskipun teknologi memiliki potensi besar dalam meningkatkan kualitas pembelajaran, implementasi teknologi di sekolah dasar di Indonesia masih belum merata, dengan hanya 35% sekolah dasar yang memanfaatkan teknologi secara optimal. Penelitian ini bertujuan untuk mengeksplorasi efektivitas teknologi pembelajaran interaktif dalam meningkatkan keterampilan literasi digital siswa sekolah dasar. Menggunakan pendekatan studi literatur, penelitian ini mengkaji berbagai teori pendidikan, khususnya konstruktivisme yang dikemukakan oleh Piaget dan Vygotsky, serta penerapan teknologi interaktif seperti augmented reality, video animasi, dan game edukasi dalam konteks pembelajaran dasar. Temuan penelitian menunjukkan bahwa teknologi pembelajaran dapat meningkatkan hasil belajar siswa hingga 25%, meningkatkan motivasi belajar, serta memperkuat keterampilan berpikir kritis dan kolaborasi. Namun, tantangan utama yang dihadapi termasuk rendahnya literasi digital di kalangan guru dan terbatasnya infrastruktur teknologi, terutama di daerah terpencil. Kebijakan pemerintah seperti Merdeka Belajar dan platform Rumah Belajar diharapkan dapat mendukung digitalisasi pendidikan, meskipun masih terdapat hambatan dalam penyediaan perangkat dan pelatihan guru. Penelitian ini menyimpulkan bahwa untuk mewujudkan potensi penuh teknologi dalam pendidikan, diperlukan perbaikan dalam pelatihan guru, pemerataan akses infrastruktur, dan kebijakan yang lebih komprehensif dan inklusif.

Kata kunci : Teknologi, Pembelajaran, Interaktif, Literasi, Digital.

Abstract

Digital transformation in the era of industrial revolution 4.0 has brought significant impacts on various sectors, including education. Although technology has great potential in improving the quality of learning, the implementation of technology in primary schools in Indonesia is still uneven, with only 35% of primary schools optimally utilizing technology. This study aims to explore the effectiveness of interactive learning technology in improving digital literacy skills of primary school students. Using a literature study approach, this research examines various educational theories, particularly constructivism proposed by Piaget and Vygotsky, as well as the application of interactive technologies such as augmented reality, animated videos and educational games in the context of primary learning. The research findings show that learning technologies can improve student learning outcomes by up to 25%, increase learning motivation, and strengthen critical thinking and collaboration skills. However, key challenges include low digital literacy among teachers and limited technology infrastructure, especially in remote areas. Government policies such as Merdeka Belajar and the Rumah Belajar platform

Submitted: 06-12-2024 Approved: 01-01-2025 Published: 20-01-2025



Citation: Yanita, R., Firdaus, R., & Herpratiwi. (2025). The Use of Interactive Learning Technology to Develop Digital Literacy Skills of Elementary School Students. *Educate: Jurnal Teknologi Pendidikan*, 144-154.

are expected to support the digitization of education, although barriers remain in the provision of devices and teacher training. The study concludes that realizing the full potential of technology in education requires improvements in teacher training, equitable access to infrastructure, and more comprehensive and inclusive policies. The abstract should be written in one paragraph and should be 150-250 words. TNR, font size 10, single spacing. Follow the following pattern: General statement about the importance of the topic, gap in literature or discrepancies between theories and practices, purpose of study, method, main findings, and conclusion.

Keywords: Technology, Learning, Interactive, Literacy, Digital

I. Introduction

Digital transformation in the era of Industrial Revolution 4.0 has had significant impacts on various sectors, including education. Primary education, as the first foundation of students' character and skills formation, is essential in preparing the younger generation to face the challenges of the future. However, the reality in Indonesia shows that the integration of learning technology in primary schools is still inconsistent. Based on data from the Ministry of Education, Culture, Research and Technology (MoECT) in 2022, only around 35% of primary schools in Indonesia utilize learning technology optimally, with glaring gaps, especially in remote areas. This challenge is even more critical given that digital literacy is one of the key competencies in the 21st century, where students are not only required to understand technology but also be able to use it creatively and responsibly.

The constructivist approach in education provides a strong foundation for understanding the role of technology in learning. Piaget's theory emphasizes that effective learning occurs when students actively construct their knowledge through direct experience, while Vygotsky through the concept of the zone of proximal development (ZPD) suggests that support, both from teachers and tools such as technology, can accelerate students' cognitive development. Interactive learning technologies such as augmented reality applications, animated videos, and educational games allow students to learn through independent exploration while gaining a fun and meaningful learning experience. In addition, these technologies can also be a bridge to convey abstract concepts in a more concrete way and easily understood by elementary school students, who are at the concrete operational stage according to Piaget.

The benefits of technology in learning have been widely proven through research. Susanti et al. (2021) found that the technology-based learning media improved primary school students' learning outcomes by 25% compared to conventional methods. Putri and Anwar (2020) reported that interactive learning applications can increase students' learning motivation by 30% while strengthening their ability to work together and think critically. Another study by Setiawan (2022) confirmed that technology not only helps students understand the material faster but also facilitates the development

of problem-solving skills. However, on the other hand, these studies also underline the existing constraints, such as the low digital literacy of teachers and the limited technological infrastructure in most primary schools, especially in remote areas.

The Indonesian government has initiated various programs to support the digitalization of education, including through the Merdeka Belajar policy. One of the strategic efforts is to provide digital platforms such as Rumah Belajar designed to increase students' access to quality learning resources for free. In addition, the government also allocates a budget for the procurement of technological devices and digital literacy training for teachers. However, the implementation of this policy still faces various obstacles. Data from the Central Statistics Agency (BPS) in 2022 showed that 42% of primary schools in Indonesia do not have adequate internet access, and around 60% of teachers reported not having received sufficient training to use technology in the learning process. These barriers reflect the need for a more comprehensive and targeted approach to supporting the transformation of technology-based education at the primary level.

Based on these issues, this study formulates the main question: how can the utilization of interactive learning technology improve the digital literacy skills of primary school students? This study aims to explore the effectiveness of using interactive learning technology in supporting the achievement of learning objectives, especially in the development of students' digital literacy. It also aims to identify the challenges faced in implementing technology in primary schools and provide practical recommendations for schools, teachers, and policymakers. With an approach that integrates theory, empirical evidence, and policy analysis, this research is expected to make a significant contribution to supporting the improvement of the quality of basic education in Indonesia, as well as a reference for a more inclusive and sustainable digital transformation strategy.

II. Research Method

This research uses a literature study approach to explore the effectiveness of interactive learning technology in improving the digital literacy of primary school students. This literature study aims to review relevant previous studies, as well as education and technology theories that can support the implementation of technology in learning at the primary level. This approach will consider various sources that examine learning technology, digital literacy, and the implementation of technology-based education policies in Indonesia.

Steps in the Literature Study:

1. Selection of literature sources

The literature sources used in this study include journal articles, books, research reports, as well as education policy documents published by government

agencies, such as the Indonesian Ministry of Education, Culture, Research and Technology. The main focus is on literature that addresses digital transformation in education, the application of technology in basic learning, and the development of digital literacy among students.

2. Theories Reviewed

- a. Constructivism in Education: Using Piaget's and Vygotsky's theories to understand how technology can support active learning and students' cognitive development through hands-on experience and technological support.
- b. Technology-based Learning Theory: Analyse interactive technologies such as augmented reality, animated videos, and educational game applications in basic learning.
- c. Digital Literacy: Explores various definitions and frameworks of digital literacy that are relevant in the context of primary education and how technology can enhance students' digital literacy skills.

3. Analysis of Previous Research

The literature reviewed will include studies conducted on the use of technology in primary education, including experiments and surveys that assess the impact of interactive learning technologies on learning outcomes and student motivation. Some notable studies that will be analyzed include those of Susanti et al. (2021), Putri and Anwar (2020), and Setiawan (2022), which show the benefits and challenges of using technology in learning.

4. Government Policies and Programmes

This research will also discuss various Indonesian government policies and programs, such as Merdeka Belajar and the Rumah Belajar digital platform, as well as other initiatives to support the digitization of education. An evaluation of the successes and obstacles in the implementation of these policies will be discussed in depth.

5. Identification of Challenges and Recommendations

Based on the literature analysis, this research will identify the challenges faced in implementing learning technology in primary schools, such as infrastructure constraints, teachers' digital literacy, and disparities in access to technology in different regions. In addition, this research will also provide recommendations to improve the effectiveness of using interactive learning technology, both in terms of policy and practice in the field.

III. Findings & Discussion

Digital transformation in education, especially at the primary school level, brings many opportunities and challenges. Previous research has shown the significant

impact of using learning technologies in supporting students' digital literacy development. Technology, especially interactive ones, plays an important role in creating engaging and effective learning experiences. This literature review will review key findings from relevant sources on the role of technology in primary education.

1. The Concept of Constructivism in Learning

The theory of constructivism proposed by Piaget and Vygotsky provides an important basis for the application of learning technology. Piaget stated that effective learning occurs when students actively construct their knowledge through direct experience. Vygotsky suggests that learning can be accelerated with support from the social environment and tools, such as technology. In this context, technologies such as augmented reality (AR) applications and educational games allow students to learn more interactively and exploratorily, thus supporting constructivism's principles.

2. Use of Interactive Learning Technology

Research shows that interactive technologies, such as animated videos, AR apps, and educational games, can enhance the understanding of abstract concepts in a way that is more easily understood by primary school students. This is highly relevant to the stage of cognitive development of students who are at the concrete operational stage according to Piaget. These technologies also support the development of students' digital literacy skills, which is an important competency in the 21st century.

3. Benefits of Technology Use in Learning

Several studies show that using learning technology can improve student learning outcomes. For example, Susanti et al. (2021) found that the use of interactive media-based learning technology improved student learning outcomes by 25% compared to conventional methods. In addition, Putri and Anwar (2020) reported that technology can increase students' learning motivation and strengthen their ability to think critically and work together.

4. Challenges of Technology Implementation in Elementary Schools

However, although technology has great potential, its implementation still faces many obstacles. One of the main challenges is the low digital literacy among teachers, which often becomes an obstacle in optimizing the use of technology in learning. In addition, limited infrastructure, especially in remote areas, is also a major obstacle to the effective implementation of learning technology. Data from the Central Statistics Agency (BPS) 2022 shows that around 42% of primary schools in Indonesia do not have adequate internet access.

5. Government Policies in Support of Education Digitalization

The Indonesian government has launched various initiatives to support education digitization, including the Merdeka Belajar policy and the provision of digital platforms such as Rumah Belajar. However, while these policies aim to improve access to education technology, there are still many challenges that need to be overcome, particularly in terms of teacher training and the provision of equitable infrastructure across Indonesia.

Summary of research findings related to learning technology in primary schools:

Susanti et al. (2021) The use of technology-based learning media increases student learning outcomes by 25% compared to conventional methods. Interactive media-based learning technology experiments can increase the effectiveness of student learning in elementary schools.

Putri & Anwar (2020) Interactive learning applications increase student learning motivation by 30%. Survey and observation Interactive technology strengthens critical thinking skills, and collaboration, and increases student learning motivation.

Setiawan (2022) Technology helps students understand the material faster and develop problem-solving skills. Case study The use of technology in learning accelerates students' understanding of the material and develops their problem-solving skills.

BPS (2022) 42% of primary schools in Indonesia do not have adequate internet access, and 60% of teachers have not received technology training. Government Statistics Limited infrastructure and low digital literacy of teachers hinder the implementation of technology in education in Indonesia.

MoECristek (2022) Education digitization initiatives through the Rumah Belajar platform and Merdeka Belajar policy. Policy report Merdeka Belajar policy and Rumah Belajar platform aim to improve access to quality learning, but implementation challenges remain.

Hadiyanto & Rahmawati (2021) The use of e-learning applications improves students' digital skills in urban and rural areas. Experiment with control group E-learning-based technology is effective in improving students' digital skills in urban areas but still faces difficulties in rural areas.

Ramadhani (2020) The use of AR in learning helps students understand math concepts more clearly and interestingly. Augmented reality (AR) experiments can be used to improve students' understanding of abstract concepts in subjects such as math.

Mulyadi & Ningsih (2021) Educational games can improve collaboration and communication skills among elementary school students. Survey and classroom observation Educational games improve students' social skills, including cooperating and communicating with their peers.

Suwandi & Ardiansyah (2022) Learning technology increases students' engagement in class discussions and aids a deeper understanding of course topics. Case study Technology increased students' participation in class discussions, deepening their understanding of the learning topics taught.

Agustina & Wahyudi (2020) The use of digital media accelerates the improvement of reading and writing skills of grade 4 and 5 students. Experiments Digital learning media accelerate the development of students' literacy skills, especially in reading and writing.

Sutrisno et al. (2021) The use of technology can improve students' understanding of science with more interactive learning methods. Experiment The use of technology in science learning has a positive impact on understanding science concepts, with a more interactive and fun approach.

Daryanto (2022) The use of technology-based learning videos improves students' ability to complete practical tasks. Experiments Learning videos accompanied by practicum instructions are effective in improving students' practical skills in experiment-based subjects.

Nursalim & Wijaya (2020) Students' digital literacy increases after learning using technology-based learning applications. Survey and observation The use of technology-based learning applications improves students' digital literacy and their ability to utilize technology for educational purposes.

Yuliana et al. (2021) The use of mobile device-based learning technology is effective in improving students' writing skills. Learning experiments based on mobile device applications can improve students' writing skills, by increasing the involvement and effectiveness of the learning process.

Subekti & Yudhistira (2020) Learning technology can be used to introduce math concepts visually. Observation and document analysis The use of visual learning technology helps students understand more complicated mathematical concepts in a way that is easier to understand.

Hartono (2022) Technology-based learning improves students' problem-solving and critical thinking skills. Case study Game-based and interactive learning technology can strengthen students' problem-solving and critical thinking skills, which are important for the future.

Digital transformation in education, especially at the primary school level, has provided many opportunities and challenges. The use of interactive learning technology becomes very relevant in supporting the development of students' digital literacy skills. Various studies have shown that interactive technologies such as Augmented Reality (AR) applications, animated videos, and educational games can enrich students' learning experience and provide a deeper understanding of abstract concepts.

1. The Concept of Constructivism in Learning

The constructivism theory proposed by Piaget and Vygotsky provides an important basis for the application of technology in learning. Piaget emphasized that students learn actively through direct experience and self-discovery, while Vygotsky emphasized the importance of social support and tools, including technology, in accelerating learning. In this context, interactive technologies such as AR applications and educational games strongly support the principles of constructivism. Technology provides students with the opportunity to interact with learning materials directly and exploratively, which accelerates the learning process and improves their understanding of abstract concepts.

For example, AR applications used in mathematics lessons allow students to see and interact with mathematical concepts in three-dimensional visual form. This helps students to more easily understand concepts that are difficult to explain conventionally. This approach is very relevant to the cognitive development stage of students who are at the concrete operational stage according to Piaget, where they find it easier to understand material through direct experience.

2. Use of Interactive Learning Technology

Research shows that interactive learning technology can improve students' understanding of more abstract concepts. This is relevant to the findings of several studies, such as those conducted by Ramadhani (2020) who found that the use of AR in mathematics learning makes students understand mathematical concepts in a more interesting way. In addition, the use of technology such as animated videos and educational games makes students not only actively involved in learning, but also develop digital literacy skills that are important in the 21st century.

The application of this technology also facilitates the achievement of higher competencies, such as the ability to think critically, work together, and develop problem-solving skills. Educational games, as found by Mulyadi & Ningsih (2021), can help students develop collaboration and communication skills among themselves. This technology not only teaches academic content but also prepares students to face the challenges of an increasingly complex digital world.

3. Benefits of Using Technology in Learning

Research shows that the use of learning technology can improve student learning outcomes. Research by Susanti et al. (2021) shows that technology-based learning media improves student learning outcomes by up to 25% compared to conventional methods. The use of technology provides opportunities for students to learn more independently and interactively, which in turn improves their understanding of the subject matter.

In addition, Putri & Anwar (2020) reported that interactive learning applications increase students' learning motivation by 30%, as well as strengthen their ability to

think critically and collaborate. This shows that in addition to improving learning outcomes, technology also contributes to the development of students' non-cognitive skills, which are very important in preparing them for future challenges.

4. Challenges of Technology Implementation in Elementary Schools

Although technology has great potential in improving the quality of education, its implementation still faces many challenges. One of the main challenges is the low digital literacy among teachers. Research by BPS (2022) shows that around 60% of teachers in Indonesia have not received adequate training in using technology in learning. This hinders their ability to optimize the use of technology in the classroom.

In addition, infrastructure problems are also a major obstacle. Data from BPS (2022) shows that 42% of elementary schools in Indonesia do not have adequate internet access. This challenge is more pronounced in remote areas, where access to technology and digital resources is still limited. This creates a large gap between schools in urban and rural areas in terms of access to educational technology.

5. Government Policy in Supporting Digitalization of Education

The Indonesian government has launched various initiatives to support the digitalization of education, including the Merdeka Belajar policy and the provision of digital platforms such as Rumah Belajar. Although this policy aims to increase access to quality education, major challenges remain in terms of providing equitable infrastructure and teacher training.

The Ministry of Education, Culture, Research and Technology (2022) noted that although the Rumah Belajar platform has provided free access to quality learning, the implementation of this policy still faces many obstacles, especially in terms of providing adequate technological devices and digital literacy training for teachers.

IV. Conclusion

Based on the results of this study, it can be concluded that interactive learning technology has great potential to improve the quality of learning in primary schools. Appropriate use of technology can accelerate students' understanding of abstract concepts, improve their digital literacy skills, and motivate them to learn more actively and creatively. However, to realize this potential, there needs to be greater attention to teacher training, provision of adequate infrastructure, and equitable access to technology across Indonesia. Thus, policies that support the digitization of education must continue to be strengthened to create a more inclusive and sustainable education.

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