Volume 2 Issue 3 (June,2025)
Jurnal of Pedagogi : Jurnal Pendidikan
ISSN: : 3046-9554 (Online)

Improving Digital Literacy Among Elementary School Students Through Interactive Learning and Online Platforms: Embracing an Era of Flexible and Inclusive Education

Baso Intang Sappaile
Universitas Negeri Makassar, Indonesia[3]

DOI: https://doi.org/10.62872/b3zt5c63

Abstract
The development of digital technology requires the strengthening of digital literacy from elementary school level as part of 21st century competencies. However, students' ability to access, evaluate, and produce digital information is still relatively low. This study aims to evaluate the effectiveness of interactive learning based on online platforms in improving the digital literacy of elementary school students. The study employs a descriptive qualitative approach with a case study design on fifth-grade students at a public elementary school in an urban area. Data were collected through observation, interviews, documentation, and digital literacy assessments before and after the intervention. Over three months, students participated in learning that integrated Google Classroom for task management, Wordwall for interactive evaluation, and Canva for digital content production. The results showed an average increase in students' digital literacy scores from 56 to 84, with significant improvements in information search (35%) and digital content production (42%). Students also began to demonstrate awareness of digital ethics, such as maintaining privacy and recognizing fake news. The main challenges included limitations in devices and internet connectivity, while supporting factors included school principal support, teacher readiness, and parental involvement. The study concluded that interactive learning based on online platforms is effective in improving elementary school students' digital literacy. Implications suggest that this learning model could serve as a strategic alternative to support more flexible, adaptive, and inclusive education in the digital age

Keywords: Digital Literacy, Interactive Learning, Online Platform, Elementary School.

✉ Corresponding author
Email Address : baso.sappaile@unm.ac.id
Received June 07, 2025.Accepted June 20, 2025 Published June 30, 2025

Introduction

The development of digital technology has revolutionized almost every aspect of human life, from the way we communicate and work to the way we obtain information. This is no exception in the field of education, where rapid advances in communication infrastructure, the availability of internet networks, and increasing access to digital devices have fundamentally changed the way learning is conducted (Haleem, 2022). The learning process, which previously took place conventionally in classrooms, has now shifted to a more open, flexible, and interactive virtual space (Mhlanga, 2024). This change is not only technological but also has pedagogical implications that require educators and

DOI: https://doi.org/10.62872/b3zt5c63
learners to develop new approaches, strategies, and skills to embrace the era of digital learning. In the context of education, this transformation necessitates a redefinition of the core competencies that students must possess in the 21st century. It is no longer sufficient for students to merely master reading, writing, and numeracy skills; they are now required to possess digital literacy skills as a foundation for adapting to technology-based learning environments (Vettriselvan, 2025).

Digital literacy does not merely refer to technical skills in operating digital devices, such as computers, tablets, or smartphones. More than that, digital literacy involves complex cognitive abilities, including critical thinking skills in filtering information, evaluating the accuracy and validity of digital sources, and understanding the social and cultural context behind the digital content accessed (Voda, 2022). This literacy also requires the ability to create and disseminate digital content that is in line with communication ethics and intellectual honesty values. Therefore, the development of digital literacy must include affective and ethical dimensions, including an understanding of digital security, privacy, copyright, and responsibility as digital citizens (Marin, 2022). Students with good digital literacy are not only able to use technology effectively but can also be selective and reflective toward the massive flow of information in the digital age.

Considering the complexity of the competencies involved, digital literacy is essentially a multidimensional skill that integrates technical, cognitive, creative, social, and ethical aspects into a single, interconnected whole (Soupramanien, 2024). Within the framework of 21st-century education, digital literacy has become one of the primary indicators of students' readiness to navigate global dynamics, technological disruption, and shifts in learning patterns (Suhardjo, 2023). Digital literacy is an integral part of modern multiliteracy and must be developed systematically within the formal education curriculum. This underscores that digital literacy cannot be viewed merely as an add-on or supplementary skill but as an essential requirement in preparing students to become digitally competent, critical, creative, and responsible individuals in an increasingly digitized society.

At the elementary school level, digital literacy has not yet received proportional attention in the learning process. The curriculum and teaching practices at the elementary level tend to view technology as merely an instructional tool, rather than as a medium for developing comprehensive digital literacy competencies (Kasperski, 2022). Students are generally only introduced to technical aspects, such as how to use hardware (computers or tablets) and run specific applications like Microsoft Word or online quiz apps. These activities often lack guidance aimed at developing critical thinking, analytical, or reflective skills regarding the digital information they access. As a result, students tend to become passive users of technology, without a deep understanding of the validity of information, digital risks, or media ethics. However, elementary school is a golden period in children's cognitive and affective development, during which the foundations of literacy, both conventional and digital, need to be built systematically and continuously (Gultom, 2022). At this stage, children have the capacity to begin to understand basic concepts about information, communication, and social responsibility in using technology. If digital literacy is introduced early and appropriately, students will grow into individuals who are not only technologically proficient but also critical in responding to information and aware of the ethical implications of their digital actions. Thus, failing to instill adequate digital literacy at the elementary school level will create a competency gap that risks persisting into higher levels of education and even into their future social lives.

Previous studies have shown that the level of digital literacy among elementary school students in Indonesia remains low (Bahri, 2022); (Dewi, 2022); (Rejeki, 2022). This condition is reflected in students' limitations in navigating information sources independently, their low ability to evaluate the reliability and validity of digital information, and their weak capacity to produce digital content that is in line with learning objectives. In practice, many students are only able to perform superficial information searches using search engines, without the skills to compare, filter, and critically conclude information. In fact, many students struggle to distinguish between credible information and hoaxes and tend to consume digital content without understanding its ethical or academic implications. This gap

DOI: https://doi.org/10.62872/b3zt5c63
highlights the urgent need to improve digital literacy comprehensively from the elementary education level onwards. One of the main causes of low digital literacy is the suboptimal use of interactive and contextual digital learning media in elementary school environments. Many schools still use digital media in a limited way and only as a substitute for visual aids or one-way delivery of material. Passive learning models, such as the use of presentation slides or learning videos that are not accompanied by reflective and participatory activities, discourage students from exploring information in depth. However, interactive digital media, such as project-based learning platforms, collaborative online quizzes, and creative content applications, have been proven to enhance learning motivation and sharpen higher-order thinking skills.

Interactive learning based on online platforms is a pedagogical approach that is considered effective in fostering students' digital literacy competencies from an early age (Temirkhanova, 2024). Through the integration of technology that is designed in a structured and contextual manner, students are not only recipients of information but also active actors in the learning process (Stefany, 2024). This type of learning encourages students to explore materials independently through information searches, complete project-based tasks, and engage in discussions in collaborative digital spaces. This process provides students with the opportunity to experience learning as a lively and dynamic experience, rather than mere memorization or repetition of information. Additionally, the use of digital platforms such as Google Classroom or Canva enables personalized learning tailored to individual students' learning styles, paces, and interests.

This interactive approach also provides teachers with flexibility in designing learning experiences that are more adaptive and relevant to the demands of the times. Teachers no longer act as the sole source of knowledge but rather as facilitators guiding the learning process to make it more meaningful. With the help of technology, teachers can monitor students' progress in real-time, provide quick feedback, and create activities that integrate various forms of literacy, including visual, digital, and collaborative (Maspul, 2024). This environment strongly supports the achievement of 21st-century learning objectives, which emphasize not only mastery of content but also the development of critical thinking, communication, collaboration, and creativity skills.

The success of digital learning implementation is not solely determined by the availability of technology, but rather depends heavily on the readiness of infrastructure, teacher competence, and a conducive learning environment (Nurhikmah, 2024). Technological infrastructure such as the availability of devices, stable internet connections, and access to learning platforms are essential prerequisites for the optimal implementation of digital learning (Rahman, 2025). Many elementary schools, particularly in rural and remote areas, still face limitations in this regard. This access disparity leads to learning opportunity gaps among students, where most students from low-income backgrounds lack adequate devices or cannot consistently access the internet. This inequality not only impacts learning outcomes but also has the potential to widen the digital divide among student groups. In addition to infrastructure factors, the quality of digital learning is also greatly influenced by teachers' competence in integrating technology into the pedagogical process. Many teachers at the elementary school level do not yet have sufficient digital literacy to effectively design, manage, and evaluate platform-based learning. Varied levels of technology proficiency and a lack of ongoing training mean that teachers tend to use digital media in a limited way, even as a substitute for conventional lecture methods.

In the context of inclusive education, the use of digital platforms opens up enormous opportunities to reach and engage students from diverse social, economic, and geographical backgrounds more equitably. Digital technology can overcome various access barriers that were previously major obstacles in conventional education systems, such as distance, mobility, or certain physical conditions (Garlinska, 2023). For example, students with special needs, such as physical disabilities or communication barriers, can still actively participate in learning activities through the use

DOI: https://doi.org/10.62872/b3zt5c63
of supporting applications, assistive devices, or accessibility features provided by various online learning platforms. Thus, the integration of technology not only supports the achievement of academic goals but also serves as an important instrument in realizing the principles of justice and equality in education. Digital literacy, in this context, does not merely function as an individual competency that students must possess but also as a systemic prerequisite to ensure that every child, without exception, has access to quality learning opportunities.

Efforts to strengthen digital literacy through interactive learning approaches and the use of online platforms are highly relevant and strategic, especially at the primary education level, which serves as the foundation for character development and 21st-century skills. At this stage, students are in a period of rapid cognitive development and are highly responsive to learning approaches that involve hands-on, exploratory, and collaborative experiences. Therefore, pedagogical interventions designed contextually in accordance with the characteristics, needs, and learning environment of students can have a significant impact on improving digital literacy as a whole. This approach aims not only to introduce technology as a learning tool, but more than that, to shape critical thinking, the ability to filter information, produce meaningful digital content, and understand ethics and responsibility in the use of digital space. By equipping students from an early age through interactive, reflective, and technology-based learning models, the education system will be able to produce a generation of learners who are not only technically proficient in technology but also capable of utilizing it wisely, responsibly, and constructively in both social and academic contexts.

This study was conducted in response to the limited empirical research specifically highlighting the integration of digital technology in the learning process at the elementary school level and its impact on improving students' digital literacy. Until now, most implementations of digital technology in education have tended to focus on the middle and upper levels, assuming that students at these levels already have adequate cognitive and technological readiness. However, such an approach overlooks the importance of introducing digital literacy from an early age, which is pedagogically more effective in building learning habits, critical thinking skills, and ethical awareness in using technology. By starting earlier, students will become accustomed to navigating the digital environment consciously and responsibly, and will develop the skills to access, evaluate, and produce digital information sustainably. Therefore, this study aims to fill the existing literature gap by providing empirical evidence on the effectiveness of interactive learning based on online platforms in improving elementary school students' digital literacy, while strengthening the argument that elementary education is a strategic phase in forming the foundation for long-term digital skills.

Using a case study design, this research explores in depth how the application of interactive learning based on online platforms can influence the development of digital literacy in fifth-grade students. This research also analyzes the supporting and inhibiting factors during the implementation process. This study not only aims to improve students' technical skills but also seeks to identify the extent to which platform-based learning can shape students' understanding of digital ethics, awareness of personal data security, and online collaboration skills. The findings from this study are expected to contribute theoretically and practically to the development of curricula, learning strategies, and educational policies that are more responsive to the challenges of the times. Additionally, the results of this study are also expected to serve as a reference for teachers, school principals, and other stakeholders in designing inclusive technology-based learning approaches.

Methodology

This study uses a descriptive qualitative approach with the aim of gaining an in-depth understanding of the implementation of interactive learning based on online platforms in an effort to improve the digital literacy of elementary school students. This approach was chosen because it is suitable for exploring phenomena contextually and holistically, especially those related to student

DOI: https://doi.org/10.62872/b3zt5c63
learning experiences in a dynamic digital environment. The research location was determined purposively, namely at one public elementary school in an urban area that has integrated digital technology into the learning process. The research subjects consisted of fifth-grade students, homeroom teachers, and the school principal, all of whom were selected using purposive sampling based on their active involvement in the use of digital media in learning.

Data collection was conducted using three main techniques, namely non-participatory observation of interactive learning processes both online and offline, semi-structured interviews with key informants to obtain exploratory data on perceptions and practices of digital literacy, and documentation studies of teaching materials, students' digital assignments, and activity logs of learning platform usage such as Google Classroom. The data obtained were analyzed qualitatively through three main stages: data reduction, data presentation, and conclusion drawing or verification. The entire process was analyzed inductively with the aim of identifying patterns, meanings, and dynamics that occurred during the learning process. To ensure data validity, the researcher applied source and method triangulation techniques and conducted data credibility checks through member checking and peer debriefing. Through this method, the study is expected to produce significant empirical contributions to the development of an inclusive and adaptive digital learning model tailored to the needs of elementary school students in the modern education era

Result and Discussion

RESULTS

1. Initial Conditions of Students' Digital Literacy

Based on initial observations conducted during the first two weeks and diagnostic assessment instruments distributed to fifth-grade students, it was found that students' digital literacy levels were still low. Of the 50 students who were the subjects of the study, only 20 students, or about 40%, demonstrated basic skills in independently accessing digital information. These students are generally accustomed to using devices such as smartphones or computers at home, primarily for entertainment purposes like watching videos or playing games, but not in an educational context. Digital literacy encompasses three main aspects: technical, cognitive, and socio-emotional (Erdat, 2023). In this context, students only demonstrated mastery of the technical aspect in using devices for entertainment, but had not yet developed the cognitive and socio-emotional skills that support the productive use of technology for learning.

Most other students still have difficulty operating basic learning applications such as Google Classroom and search engines for educational purposes. In addition to low technical skills in accessing information, there are also significant weaknesses in students' critical thinking skills related to evaluating digital information. As many as 70% of students cannot distinguish between credible information and manipulative or irrelevant information. This is reflected in the results of the initial assignment, where students tend to directly copy information from the first website they encounter without filtering or verifying its accuracy. This situation aligns with Jamil's (2024) perspective on critical thinking, which emphasizes the importance of evaluating arguments, assessing the reliability of sources, and making decisions based on evidence. The weaknesses in students' critical thinking indicate that learning has not developed the metacognitive skills necessary to deal with the complexity of digital information. The lack of experience with digital-based tasks and the lack of explicit guidance from teachers regarding ethics and information search techniques are the main factors contributing to this weakness. In this case, students need scaffolding from teachers or the environment to develop advanced digital skills (Tammets, 2022). Without targeted intervention, the development of digital literacy will remain superficial.

DOI: https://doi.org/10.62872/b3zt5c63

In terms of digital content production, students' abilities are still limited. When given the task of creating a simple digital presentation or poster, the majority of students are only able to use the basic features of applications such as Microsoft PowerPoint or Canva. Only a small number of students are able to utilize interactive visual elements, organize information in a structured manner, or use design elements that support educational messages in their media. Creative digital content production reflects the participatory dimension of the Digital Literacy Framework (Martinez, 2022), which emphasizes that learners must not only be able to understand information but also create new content creatively and responsibly. The low level of this ability indicates that digital creative competence has not yet developed among elementary school students.

Lack of experience, limited access to devices, and the unavailability of technical training are the main obstacles limiting students' digital creativity in the early stages (Sikalima, 2023). In general, these initial conditions illustrate that digital literacy has not yet become a systematically integrated competency in elementary school learning. Activities related to the use of information technology are more incidental in nature and have not been directed toward supporting the optimal achievement of learning objectives. This indicates that interventions in the form of interactive learning based on online platforms are urgently needed, not only to enhance technical skills but also to instill critical, ethical, and creative understanding in the use of digital technology from an early age.

2. The Process of Implementing Interactive Learning and Online Platforms

The implementation of interactive learning based on an online platform was carried out over a period of three months, covering six weekly thematic learning cycles. In its implementation, teachers designed learning activities that combined digital technology in a structured and integrated manner with the curriculum material. The platforms used include Google Classroom as a learning management and task distribution tool, Wordwall for interactive evaluation activities based on quizzes and games, and Canva as a medium for producing creative content such as posters, infographics, and visual presentations (Reftyawati, 2025). Teachers are first provided with basic technical training to ensure their readiness to facilitate digital-based learning consistently. This learning model adopts a combination of online and guided offline learning approaches. Online learning is conducted through the uploading of materials, interactive videos, and discussion forums on Google Classroom, while offline sessions are held on a limited and scheduled basis in the classroom, aiming to strengthen direct interaction and clarify students' understanding. Each week, students are given one to two digital projects designed to encourage independent information-seeking processes, group collaboration through online collaborative features, and the development of visual communication skills through digital products.

Observations made by researchers during the intervention period showed a significant increase in student engagement, especially after entering the second cycle of learning. In the early stages, some students still showed confusion in navigating the platform, but by the fourth week, the majority of students had demonstrated the ability to access, read instructions, and upload assignments independently. The level of participation in online discussion forums also increased, marked by the emergence of reflective questions and responses that indicated further information processing by students. This indicates that interactive learning has succeeded in forming a more active and participatory mindset compared to conventional models. Teachers reported that the use of digital platforms enriched the variety of methods for delivering material, allowing for more flexible differentiation of learning according to the needs of each student. Students with high abilities could explore further through external sources, while students who needed additional guidance could obtain personalized support materials. Additionally, open digital projects provide students with space for expression to develop creativity, which was previously limited in traditional face-to-face learning (Selfa, 2022). Overall, this implementation process demonstrates that technology integration not only expands access to learning but also strengthens the pedagogical dimensions of learning itself.

DOI: https://doi.org/10.62872/b3zt5c63

3. Improvement in Student Digital Literacy

After the interactive online platform-based learning program was systematically implemented, a significant improvement in student digital literacy was observed across almost all measured indicators. Before the intervention, most students had only passive experience with technology, limited to the use of entertainment applications without functional understanding in the context of learning. However, after three months, the final assessment results showed that the average digital literacy score of students increased from 56 to 84. This change indicates that a learning approach designed with a comprehensive consideration of the digital context can form new habits in interacting with technology in a more meaningful way.

One of the most notable achievements is the improvement in digital information search skills. Students who previously tended to search randomly are now able to use more appropriate keywords, select relevant sources, and tailor information to the needs of the task at hand. This process not only trains technical skills but also involves critical and selective thinking. This aligns with the theory of digital literacy proposed by Tinmaz (2022), who states that digital literacy is not merely the ability to use digital devices but also encompasses critical thinking, information evaluation, and the ability to understand the context of information use. When asked to compare two information sources, most students are already able to identify which is informative and which is speculative or less credible. This progress indicates that digital literacy is not only developing in terms of the ability to use tools but also in terms of deeper thinking, as emphasized by Dilekçi (2023), who stresses the importance of "thinking skills" in digital literacy as part of 21st-century competencies.

Students' ability to create digital content has also seen significant development. In the early cycles, the products produced tended to be simple and repetitive. However, as the frequency and complexity of tasks increased, students showed greater creativity in designing posters, infographics, and presentations. They began to consider color selection, typography, and information sequencing to make their work more communicative. In some cases, students even took the initiative to explore tutorials on YouTube independently to improve the quality of their work. This development is in line with the concept of digital content creation described by Bravo (2021), where digital content creation involves the integration of technical skills and creative expression that is critical to the context of communication. This shows that when given the right space and tools, students are able to demonstrate their potential for creative and independent thinking in a digital environment. Additionally, this intervention also impacts ethical awareness in using technology. In class discussions and weekly reflections, students began to express their understanding of the importance of maintaining privacy, avoiding plagiarism, and behaving politely when interacting in digital spaces. This development supports Wulandari's (2021) view of digital citizenship, which is the ability of individuals to use technology responsibly, ethically, and productively in a social context. They are also able to identify negative or misleading content and explain why such information is not appropriate to share. This marks a shift from merely being "tech-savvy" to being "digitally literate," a state where technology is not only used but also understood within its social and moral context.

4. Challenges and Supporting Factors

During the implementation of interactive learning based on online platforms, a number of structural and technical obstacles were identified that directly affected the effectiveness of the program. One of the main obstacles was the limited technological devices available to students. Not all students had access to personal devices or laptops at home. Most of them had to take turns using their parents' or siblings' devices, which resulted in delays in completing assignments and irregular participation in digital activities. This condition shows that there is still a digital divide among elementary school students, even in urban areas. According to Van (2022), the digital divide not only includes access to hardware but also differences in the quality of use, technological literacy, and environmental support.

DOI: https://doi.org/10.62872/b3zt5c63
In the context of education, this gap has the potential to widen learning disparities and reinforce socio-economic inequalities. This aligns with Iskandar's (2023) perspective, who emphasizes that access to technology does not automatically lead to equitable learning outcomes, as social, cultural, and economic factors also determine students' ability to utilize technology optimally. Therefore, these constraints pose a serious challenge to efforts to create inclusive and equitable education in the digital age. In addition to device limitations, unstable internet connections also pose a significant barrier, especially for students living in areas with inadequate network infrastructure. In some cases, students cannot access Google Classroom or submit assignments on time due to signal disruptions or limited internet quotas. Teachers also face challenges when attempting to conduct synchronous learning via video conferencing due to poor network quality. These technical barriers result in disparities in learning experiences among students and require systemic solutions, both through school policies and government support.

The varying levels of digital literacy among teachers also affect the smooth implementation of online learning. While some teachers show high enthusiasm for learning and trying new technologies, there are still teachers who feel overwhelmed by the use of digital platforms due to limited technical skills and lack of experience. Some teachers still use conventional methods to deliver material, even though digital learning devices and applications are available. This indicates that digital transformation in education requires not only technology but also a paradigm shift and enhanced human resource capacity within the school environment (Akour, 2022).

However, a number of supporting factors also succeeded in strengthening the implementation of this program. The support of school principals has been a crucial element, particularly in terms of providing facilities, scheduling, and academic policy flexibility. Proactive principals who encourage teachers to participate in technology training and provide space for pedagogical experimentation are key to the success of digital integration (Zhao, 2024). Additionally, parental involvement in supporting children during the online learning process has positively contributed to students' regularity and motivation in learning. Parents' role in helping children understand assignments, manage study time, and overcome technical challenges is a tangible form of collaboration between home and school in creating a conducive digital learning environment. The synergy between internal school support and external family participation is the essential foundation for the successful implementation of inclusive and sustainable digital education.

DISCUSSION

The results of the study indicate that the integration of interactive learning through the use of digital platforms has a significant impact on improving the digital literacy of elementary school students. This transformation is not only evident in the improvement of technical skills in using technology but also includes students' ability to access and evaluate digital information more carefully. Learning that actively incorporates technology encourages students to be more open to diverse sources of information and hones their ability to discern credible and relevant information. This finding aligns with Erdat's (2023) view that digital literacy is a set of multidimensional competencies that encompass cognitive, affective, and social aspects. In this context, mastery of technology is not limited to the ability to operate digital devices, but also involves how students understand and evaluate information, as well as how they act responsibly in the digital space. Therefore, interactive learning based on online platforms plays an important role in shaping students into critical, reflective, and ethical technology users.

Significant improvements in students' ability to search for and evaluate digital information reflect important developments in information literacy. Students are beginning to demonstrate skills in using keywords effectively, identifying the credibility of sources, and distinguishing between facts and opinions. These skills indicate that digital literacy is not limited to technical abilities but also encompasses complex thinking processes in critically understanding and processing information. This is highly relevant in the context of the massive and rapid dissemination of information in the digital age, which is often accompanied by the risks of misinformation and hoaxes (Wuyckens, 2022). Therefore,

DOI: https://doi.org/10.62872/b3zt5c63
learning interventions explicitly designed to foster critical awareness of information become highly strategic. This approach not only protects students from the negative impacts of misleading information but also cultivates a digitally resilient younger generation.

The development of digital content production skills has also shown remarkable improvement. Through the implementation of project-based tasks, students are given the space to express their ideas and thoughts in various forms, such as visual presentations, digital posters, and multimedia narratives. These activities not only improve technical skills but also encourage students to think creatively and communicatively in conveying messages through digital media. This process directly supports the creation of a more interactive and meaningful learning environment. These skills are part of creative digital literacy, which, according to Junaedi (2023), is crucial for equipping students to navigate the future work and communication ecosystem that increasingly relies on technology. The fact that students can explore various applications independently and demonstrate courage in innovating indicates that digital learning has opened opportunities for more autonomous and participatory learning models. Thus, technology-based learning not only instills technical skills but also fosters self-confidence, initiative, and independence in the learning process. The effectiveness of digital learning strategies heavily depends on the readiness of technological infrastructure and the competencies of educators as the key factors in implementation (Alieto, 2024). In this study, several significant challenges were identified, such as limited access to technological devices, uneven internet connectivity across regions, and varying levels of digital literacy among teachers. These challenges reflect a significant gap between innovative policies at the macro level and the actual conditions faced in elementary schools.

The findings also indicate that external factors such as principal support and active parental involvement play an important role in supporting the success of digital learning (Lee, 2024). Progressive and innovation-friendly school leadership creates a school climate that supports teacher creativity and encourages the implementation of technology-based learning strategies. On the other hand, active parental involvement, especially in the context of home-based learning, contributes to ensuring student engagement and discipline during the learning process. This synergy between school principals, teachers, and parents reflects an ecosystemic approach to education, where the learning process does not occur in an isolated space but is influenced by interactions between various systems—school, family, and social environment. The success of digital learning, therefore, does not depend solely on technical and pedagogical aspects but also on cross-role collaboration that supports the creation of a holistic and sustainable learning environment.

The integration of online platforms also contributes to the creation of a more flexible and inclusive education system (Hadiana, 2024). The learning process, which can be accessed anytime and anywhere, allows for differentiated learning according to the needs and learning speeds of each student. This strategy opens up great opportunities for students with physical, geographical, or socioeconomic limitations to continue to access quality education. Thus, this digital learning model supports the Sustainable Development Goals (SDG) point 4 related to inclusive and quality education for all. Digital transformation in basic education must continue to consider the balance between online and offline activities. Although technology offers flexibility and efficiency, direct interaction and physical activities remain important for shaping students' character, social empathy, and motor skills. Therefore, a blended learning approach that combines the strengths of face-to-face and digital learning should be the primary model in post-digitalization education planning.

The implications of these findings suggest that digital literacy programs at the elementary school level should be designed in a structured, comprehensive, and contextual manner. It is not enough to simply provide devices and internet connections; it is also important to develop a curriculum that explicitly includes digital competencies, equip teachers with technopedagogical training, and create a learning environment that supports creativity and critical reflection. This research provides empirical evidence that digital platform-based interventions can be relied upon to enhance students' digital literacy

DOI: https://doi.org/10.62872/b3zt5c63
from an early age, provided they are implemented with the appropriate pedagogical approach and robust systemic support.

Conclusion

This study shows that the integration of interactive learning based on online platforms significantly contributes to improving the digital literacy of elementary school students. The improvement is not only seen in the technical aspects of technology use, but also in the ability to think critically in searching for, evaluating, and producing digital information responsibly. The systematic use of digital media such as Google Classroom, Wordwall, and Canva has encouraged active engagement, creativity, and collaboration among students in the learning process. Analysis results indicate that learning strategies designed using constructivist and experiential approaches can develop digital competencies relevant to 21st-century needs. However, the effectiveness of implementation is greatly influenced by supporting factors such as infrastructure readiness, teacher competence, principal support, and parental involvement. Constraints such as limited devices and internet connections need to be addressed through a more inclusive policy approach that favors equitable access to educational technology. The implications of this study emphasize the importance of developing a digital literacy curriculum from the elementary education level onwards, which not only focuses on the use of digital tools but also fosters ethical and reflective awareness in interacting in digital spaces. Therefore, efforts to transform education through technology must be grounded in a strong pedagogical approach and sustained systemic support. As such, interactive digital learning models have the potential to serve as a transformative strategy in fostering flexible, adaptive, and inclusive education in the digital age.

References

Akour, M., & Alenezi, M. (2022). Higher education future in the era of digital transformation. Education Sciences, 12(11), 784. https://doi.org/10.3390/educsci12110784

Alieto, E., Abequibel-Encarnacion, B., Estigoy, E., Balasa, K., Eijansantos, A., & Torres-Toukoumidis, A. (2024). Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. Heliyon, 10(2).

Bahri, A., Jamaluddin, A. B., & Saparuddin, S. (2022). Students' and Teachers' Digital Literacy Skill: A Comparative Study between Schools, Classes, and Genders in Urban and Rural Areas. International Journal of Science of Research, 11(2). http://eprints.unm.ac.id/id/eprint/22634

Bravo, M. C. M., Chalezquer, C. S., & Serrano-Puche, J. (2021). Meta-framework of digital literacy: A comparative analysis of 21st-century skills frameworks. Revista Latina de Comunicacion Social, (79), 76-109. https://www.doi.org/10.4185/RLCS-2021-1508

Dewi, C. (2022). Digital literacy analysis of elementary school students through implementation of e-learning based learning management system. Journal of Education Technology, 6(2), 199-206. https://doi.org/10.23887/jet.v6i2.44160

Dilekçi, A., & Karatay, H. (2023). The effects of the 21st century skills curriculum on the development of students' creative thinking skills. Thinking skills and creativity, 47, 101229. https://doi.org/10.1016/j.tsc.2022.101229

Erdat, Y., Ceren, R. E. S., Ozdemir, L., Uslu-Sahan, F., & Bilgin, A. (2023). Influence of technical, cognitive and socio-emotional factors on digital literacy in nursing students

DOI: https://doi.org/10.62872/b3zt5c63

assessed using structural equation modeling. Nurse Education Today, 130, 105937. https://doi.org/10.1016/j.nedt.2023.105937

Garlinska, M., Osial, M., Proniewska, K., & Pregowska, A. (2023). The influence of emerging technologies on distance education. Electronics, 12(7), 1550. https://doi.org/10.3390/electronics12071550

Gultom, S., Ampera, D., Endriani, D., Jahidin, I., & Tanjung, S. (2022). Traditional games in cultural literacy to build the character of elementary school students during the COVID-19 pandemic. NeuroQuantology, 20(5), 704-712. https://doi.org/10.14704/nq.2022.20.5.NQ22226

Hadiana, D., Wardhani, R. D. K., Muhsinin, U., Mursyidi, M., & Mubarok, H. (2024). The Effect of Online Learning Platforms, Inclusive Education Practices, and Teacher Professional Development on Student Achievement. The Journal of Academic Science, 1(3), 139-145. https://doi.org/10.59613/mx4gk540

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. Sustainable operations and computers, 3, 275-285. https://doi.org/10.1016/j.susoc.2022.05.004

Iskandar, A., Winata, W., Kurdi, M. S., Sitompul, P. H. S., Kurdi, M. S., Nurhayati, S., ... & Haluti, F. (2023). Peran teknologi dalam dunia pendidikan. Yayasan Cendekiawan Inovasi Digital Indonesia.

Jamil, M., Bokhari, T. B., & Zia, Q. (2024). Qualitative content analysis for critical thinking and skill development: A case of chemistry curriculum. Journal of Asian Development Studies, 13(1), 147-155. https://doi.org/10.62345/jads.2024.13.1.12

Junaedi, A. T., Renaldo, N., Yovita, I., Veronica, K., & Sudarno, S. (2023). Digital culture as a moderating factor in increasing digital literacy. Reflection: Education and Pedagogical Insights, 1(3), 116-127. http://firstcierapublisher.com/index.php/reflection/article/view/49

Kasperski, R., Blau, I., & Ben-Yehudah, G. (2022). Teaching digital literacy: are teachers' perspectives consistent with actual pedagogy?. Technology, Pedagogy and Education, 31(5), 615-635. https://doi.org/10.1080/1475939X.2022.2091015

Lee, T. T. L. (2024). Leadership for inclusive online learning in public primary schools during COVID-19: A multiple case study in Hong Kong. Educational Management Administration & Leadership, 52(6), 1434-1454. https://doi.org/10.1177/17411432221135310

Marín, V. I., & Castaneda, L. (2022). Developing digital literacy for teaching and learning. In Handbook of open, distance and digital education (pp. 1-20). Singapore: Springer Nature Singapore. https://link.springer.com/rwe/10.1007/978-981-19-0351-9_64-1

Martínez-Bravo, M. C., Sádaba Chalezquer, C., & Serrano-Puche, J. (2022). Dimensions of digital literacy in the 21st century competency frameworks. Sustainability, 14(3), 1867. https://doi.org/10.3390/su14031867

Maspul, K. A. (2024). Enhancing reading instruction with reciprocal teaching: A focus on technology integration. GLOBAL: Education Language and Humanity Journal, 1(2), 66-74.

Mhlanga, D. (2024). Digital transformation of education, the limitations and prospects of introducing the fourth industrial revolution asynchronous online learning in emerging

DOI: https://doi.org/10.62872/b3zt5c63
markets. Discover education, 3(1), 32. https://link.springer.com/article/10.1007/s44217-024-00115-9

Nurhikmah, H., Ramli, A. M., Bena, B. A., Arwadi, F., Syawaluddin, A., & Nur, I. D. M. (2024). Teachers' readiness in online learning: Digital literacy-self-efficacy, pedagogical competence, attitude, infrastructure, and management support. Electronic Journal of e-Learning, 22(8), 93-105. https://doi.org/10.34190/ejel.22.8.3358

Rahman, M. K., Ismail, N. A., Hossain, M. A., & Hossen, M. S. (2025). Students' mindset to adopt AI chatbots for effectiveness of online learning in higher education. Future Business Journal, 11(1), 30. https://link.springer.com/article/10.1186/s43093-025-00459-0

Reftyawati, D. (2025). Optimizing Book and Poster Design with Canva: Student Perspectives. The Journal of Language and Literature Insights, 2(1), 1-8.

Rejeki, H. I., Sutarto, J., & Mindyarto, B. N. (2022). The effectiveness of online problem-based learning in improving critical thinking skills and digital literacy of elementary school students. Journal of Primary Education, 11(2), 152-164.

Selfa-Sastre, M., Pifarré, M., Cujba, A., Cutillas, L., & Falguera, E. (2022). The role of digital technologies to promote collaborative creativity in language education. Frontiers in Psychology, 13, 828981.

Sikalima, J. V. (2023). Digital skills challenges and opportunities for digitally under-resourced primary schools in Zambia: an exploratory study. https://hdl.handle.net/2077/75631

Soupramanien, L. D. B. (2024). Through Digital Literacy. Revitalizing Student Skills for Workforce Preparation, 161.

Stefany, S., Cong, L. M., Helmi, J., & Roedavan, R. (2024, October). Integrating Learning and Serious Game Design: The Development and Application of the Learning and Game Integration (LGI) Framework Using the'Blackout'Serious Game. In European Conference on Games Based Learning (pp. 971-980). Academic Conferences International Limited.

Suhardjo, S., Renaldo, N., Sevendy, T., Yladbla, D., Udab, R. N., & Ukanahseil, N. (2023). Accounting skills, digital literacy, and human literacy on work readiness of prospective accountants in digital technology disruption era. Reflection: Education and Pedagogical Insights, 1(3), 106-115. http://firstcierapublisher.com/index.php/reflection/article/view/48

Tammets, K., Khulbe, M., Sillat, L. H., & Ley, T. (2022). A digital learning ecosystem to scaffold teachers' learning. IEEE Transactions on Learning technologies, 15(5), 620-633. https://doi.org/10.1109/TLT.2022.3198739

Temirkhanova, M., Abildinova, G., & Karaca, C. (2024, October). Enhancing digital literacy skills among teachers for effective integration of computer science and design education: a case study at Astana International School, Kazakhstan. In Frontiers in Education (Vol. 9, p. 1408512). Frontiers Media SA. https://doi.org/10.3389/feduc.2024.1408512

Tinmaz, H., Lee, Y. T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. Smart Learning Environments, 9(1), 21. https://link.springer.com/article/10.1186/s40561-022-00204-y

DOI: https://doi.org/10.62872/b3zt5c63

Vettriselvan, R. (2025). Empowering Digital Education: The Future of Value-Based Learning in the Digital Era. In Empowering Value Co-Creation in the Digital Era (pp. 199-228). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-1742-7.ch009

Vodă, A. I., Cautisanu, C., Grădinaru, C., Tănăsescu, C., & de Moraes, G. H. S. M. (2022). Exploring digital literacy skills in social sciences and humanities students. Sustainability, 14(5), 2483. https://doi.org/10.3390/su14052483

Wulandari, E., Winarno, W., & Triyanto, T. (2021). Digital citizenship education: Shaping digital ethics in society 5.0. Universal Journal of Educational Research, 9(5), 948-956.

Wuyckens, G., Landry, N., & Fastrez, P. (2022). Untangling media literacy, information literacy, and digital literacy: A systematic meta-review of core concepts in media education. Journal of Media Literacy Education, 14(1), 168-182. https://digitalcommons.uri.edu/jmle/vol14/iss1/12/

Zhao, Y., Zhao, M., & Shi, F. (2024). Integrating moral education and educational information technology: A strategic approach to enhance rural teacher training in universities. Journal of the Knowledge Economy, 15(3), 15053-15093. https://link.springer.com/article/10.1007/s13132-023-01693-z

..