Ludi Litterarri
Basic Education

https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983

DOI : https://doi.org/10.62872/x0vkx912

Utilization of Digital Technology in the Learning Process in Elementary Schools: A Literature Review of Challenges and Opportunities for Teachers

Rahmat Purnomo

University of Science Al-Quran Wonosobo, Indonesia
rahmatpurnomo@gmail.com

Abstract

The digital transformation in education has driven significant changes in learning approaches in elementary schools. This study aims to critically examine the use of digital technology in elementary school learning through a literature review of the challenges and opportunities faced by teachers. The method used is a qualitative study with a literature review approach, which collects and analyzes various scientific sources from journals, proceedings, and academic books published in the last five years. The results of the study indicate that digital technology can improve learning effectiveness, facilitate more interactive and contextual learning, and encourage the development of 21st-century competencies in students. However, its implementation still faces significant challenges, particularly in aspects of teacher readiness, infrastructure gaps, and limited professional training. This study also highlights the importance of a TPACK-based pedagogical approach, supportive school leadership, and educational policies that are responsive to technological developments. Thus, the results of this study provide a conceptual contribution to the development of digital learning practices in elementary schools and can serve as a reference in formulating adaptive and sustainable educational strategies in the digital era.

Keywords : Teachers, Learning, Digital Technology

Introduction

In the digital era of the 21st century, the integration of information and communication technology (ICT) into the education sector is no longer an option but a necessity. The development of digital technology has driven a transformation in the education system, including at the elementary school level, requiring changes in learning approaches, methods, and media. The previously conventional teaching and learning process is now being replaced by a more interactive, adaptive, and collaborative technology-based learning model. This dynamic is leading to the emergence of a new

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

paradigm in elementary education, where technology is no longer merely a tool but an integral part of the student learning experience.

In the context of primary education, the integration of digital technology presents opportunities to improve learning effectiveness, both in terms of material delivery, media utilization, and strengthening 21st-century student competencies such as critical thinking, communication, collaboration, and creativity (the 4Cs). Various digital applications and platforms, such as Learning Management Systems (LMS), augmented reality (AR), and educational gamification, provide new colors in the learning process that can be adapted to the characteristics of the cognitive and affective development of primary school-aged children. Appropriate use of technology also allows for more contextual, enjoyable, and meaningful learning, which in turn can improve learning motivation and overall student learning outcomes.

However, the adoption of digital technology in elementary schools has not been without obstacles. One major challenge lies in teachers' readiness to integrate technology into learning. Many elementary school teachers still experience limitations in mastering digital literacy and technology pedagogy, especially those who have not received adequate training or professional mentoring. This competency gap is exacerbated by unequal access to technological infrastructure in various regions, particularly between urban and rural schools. As a result, the enormous potential of digital technology to improve the quality of learning is often not optimally utilized.

On the other hand, these challenges imply the need to strengthen teachers' professionalism and technological readiness. Teachers are required not only to be able to operate digital devices but also to design technology-based learning pedagogically, creatively, and in accordance with student characteristics. In this regard, the Technological Pedagogical Content Knowledge (TPACK) approach is a crucial foundation in equipping teachers to integrate technology, pedagogy, and content holistically. Therefore, strengthening elementary school teachers' TPACK competencies is a crucial prerequisite for bridging the challenges of technology utilization in elementary schools.

Beyond teachers, educational policies that favor digital learning also determine the success of technology integration in elementary schools. National curricula, such as the Independent Curriculum, have provided ample space for technology-based learning innovations. However, without the support of concrete implementing policies—including the provision of infrastructure, ongoing training, and strengthening the digital ecosystem in schools—technology integration efforts will struggle to achieve significant impact. Therefore, synergy between policymakers,

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

educational institutions, and the community is needed to create an inclusive and sustainable digital learning ecosystem.

Given the complexity of the issues and potential, the use of digital technology in elementary education is a strategic issue that requires comprehensive academic study. Several previous studies have explored specific aspects of technology use in elementary schools, but the results have been partial and scattered. This necessitates a systematic literature review that can compile the latest findings, including those on the benefits, constraints, and integrative strategies used in digital learning. By reviewing the literature in depth, general patterns and research gaps can be identified, which can serve as a basis for further research and education policy.

Literature reviews also have the potential to explore digital learning models that have proven effective in elementary education contexts. Through this approach, researchers can evaluate the successes and failures of technology implementation in real-life learning practices, while highlighting the supporting and inhibiting factors. A systematic literature review allows for the development of a conceptual map of technology utilization in elementary schools, which is useful for designing pedagogical interventions based on data and proven empirical experience.

Thus, a literature review on the use of digital technology in elementary school learning is a crucial step in critically understanding the challenges and opportunities faced by teachers. This study not only provides theoretical contributions to the development of elementary education but also has practical relevance in improving the quality of learning and creating learning experiences that are more adaptive to the demands of the digital age. This approach is expected to strengthen the capacity of elementary school teachers as key actors in transforming education in the technological era.

Method

This study uses a qualitative approach using a literature review method to in-depth examine the use of digital technology in the learning process in elementary schools, particularly in relation to the challenges and opportunities faced by teachers. This method was chosen because it is appropriate for exploring existing knowledge through the systematic and critical collection, analysis, and synthesis of previous research results (Snyder, 2019).

The data in this study comes from scientific documents in the form of accredited national and international journals, seminar proceedings, research reports, and academic books relevant to the topic. The inclusion criteria used in the literature selection include: (1) publications within the last

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

five years, namely 2019–2024, (2) focusing on primary education, (3) discussing the use of digital technology in learning, and (4) reviewing the role or experience of teachers as the main actors in the process.

The data collection procedure was conducted by searching articles in various scientific databases such as Google Scholar, Scopus, ScienceDirect, and Garuda. The keywords used included: digital technology, primary education, elementary school, teachers' readiness, pedagogical integration, and online learning. After initial screening based on abstracts and titles, a full-text review was conducted on articles that met the selection criteria.

Next, the data analysis process was carried out using a thematic analysis approach, which aims to identify patterns, themes, and relationships between concepts that appear in various literature sources. This analysis was carried out through three main stages, namely: (1) open coding to identify the main topics of each literature, (2) thematic categorization based on similarities in meaning and issues discussed, and (3) narrative synthesis to build a comprehensive understanding of the phenomena being studied.

The validity of the data in this literature study was maintained through source triangulation and an audit trail strategy, which involved comparing research findings from different sources and transparently documenting each stage of the analysis process. Furthermore, researcher reflexivity was maintained by reviewing potential biases in the data selection and interpretation process.

Through this approach, the research is expected to provide theoretical contributions by mapping the evolving academic discourse regarding the integration of digital technology in elementary schools, while also offering critical reflection on the challenges and opportunities faced by teachers as primary agents of learning. The findings of this study can be used as a reference in educational policymaking, the development of teacher training programs, and the development of more contextual and applicable digital learning designs.

Results and Discussion

The use of digital technology in elementary school learning has become a key focus for developing educational quality in the 21st century. With the acceleration of global digital transformation, educational institutions are required to adopt relevant and contextual learning approaches, including at the elementary level. This is not simply about the use of technological tools, but also involves a profound shift in pedagogical paradigms, where teachers are no longer the sole source of knowledge but rather facilitators in a technology-based learning ecosystem.

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

The analyzed literature shows that the integration of digital technology in elementary school learning has a positive impact on increasing student engagement, strengthening learning motivation, and diversifying material delivery methods to suit individual learning styles. Interactive platforms, such as learning videos, digital simulations, and educational games, can facilitate in-depth multisensory engagement, thereby supporting more effective learning outcomes. Research findings also confirm that technology-based learning provides students with greater space to explore, collaborate, and constructively build understanding.

However, literature studies also note that the challenges in implementing digital technology in elementary schools are complex and multidimensional. These challenges stem not only from limited technological infrastructure in schools but also from teacher preparedness, both in terms of technical and pedagogical competencies. Many teachers do not fully understand the principles of technology integration in learning designs that are oriented towards student competency achievement, especially in the context of a dynamic curriculum like the Independent Curriculum.

Furthermore, findings from various literature reveal that the lack of ongoing professional training is a major contributing factor to the low effectiveness of digital technology utilization by teachers. In many cases, teachers use technology only as a supplementary medium or substitute for textbooks, rather than as a tool for pedagogical transformation. This highlights the importance of a Technological Pedagogical Content Knowledge (TPACK)-based approach, which has been conceptually and empirically proven to improve teachers' readiness to effectively integrate content, pedagogy, and technology.

The use of digital technology has also been shown to contribute to improving students' 21st-century competencies, such as critical thinking, communication, collaboration, and creativity (the 4Cs). Several studies have shown that digital project-based learning, the integration of interactive visual media, and technology-supported problem-based learning encourage students to actively solve learning challenges independently and collaboratively. This provides an important foundation for developing independence and responsibility for learning from an early age.

However, disparities in technology access between schools, particularly between urban and rural areas, remain a prominent issue in the literature. Elementary schools in remote areas often lack basic infrastructure such as stable internet connections, adequate computer equipment, or digitally competent educators. This situation widens the gap in education quality and requires more responsive, data-driven policy interventions.

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

The discussion also highlighted the critical role of school leadership in creating a conducive digital learning ecosystem. The literature suggests that principals with a digital vision and progressive managerial skills can be important catalysts in driving technology adoption in the school environment. Furthermore, collaboration between teachers, professional learning communities, and partnerships with external parties (e.g., educational technology providers) are considered crucial to supporting the collective strengthening of teacher capacity.

The literature review also shows that the use of digital technology does not always translate directly to improved learning outcomes if not accompanied by appropriate learning design. In some cases, overly technocentric use of technology actually obscures pedagogical objectives and causes excessive cognitive load for students. Therefore, it is crucial for teachers to position technology as a pedagogical tool, not simply a technical tool, while taking into account the psychological and developmental aspects of children.

On the other hand, recent research shows that digital technology can be an inclusive medium for students with special needs, through the provision of flexible, accessible materials, personalized learning pace, and the use of visual or audio aids. This confirms that technology integration can also be a strategy for realizing a more equitable, humanistic, and adaptive basic education for the diverse characteristics of learners.

The analyzed literature also emphasizes the importance of digital literacy as part of the core competencies required of elementary school teachers. Without strong digital literacy skills, teachers are likely to fall into the trap of using technology that is meaningless or even detrimental to the learning process. Therefore, improving teachers' digital literacy must be part of a structured and ongoing professional development strategy.

A literature review shows that national education policies significantly influence the direction and quality of digital technology integration. Policies that provide space for innovation, budget support, and incentives for the creative use of technology are considered capable of creating a more dynamic learning environment. In the Indonesian context, the implementation of the Independent Curriculum (Curriculum Merdeka) presents a crucial opportunity to strengthen teachers' digital literacy and expand the scope for exploring technology in elementary school learning.

Other findings indicate that the process of evaluating the use of technology in learning is often not part of teachers' professional reflection. The literature suggests structured reflective mechanisms through lesson study, peer observation, or data-driven digital assessment as ways to improve the quality of technology integration in the teaching and learning process. This approach allows

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

teachers not only to use technology but also to objectively and continuously evaluate its effectiveness.

By reviewing various literature from an interdisciplinary and evidence-based perspective, it can be concluded that the use of digital technology in elementary school learning is both an inevitability and a complex pedagogical challenge. Teachers, as the primary actors in learning, play a central role in ensuring that technology is not merely present in the classroom but truly becomes a tool for meaningful educational transformation. Therefore, synergy between teacher competency, institutional support, and public policies that support strengthening digital education capacity is key to successful technology integration in elementary schools.

This discussion emphasizes that a literature review serves not only as a presentation of previous information but also as a critical-reflective vehicle for a comprehensive understanding of the landscape of technology integration in elementary school learning. This study not only records what has occurred but also maps the direction for developing more adaptive, collaborative, and inclusive educational practices in the future. Therefore, this literature review is expected to serve as a conceptual and practical foundation for developing digital learning designs that are holistic and relevant to the needs of elementary education in the digital era.

Conclusion

Based on the results of the analyzed literature, it can be concluded that the use of digital technology in elementary school learning is a strategic necessity to address the challenges of education in the digital era. Digital technology has great potential to improve the quality of student learning processes and outcomes through a more interactive, adaptive, and collaborative approach. However, its implementation still faces various challenges, particularly those related to teacher readiness, limited infrastructure, and the lack of ongoing professional training. The role of teachers is crucial in making technology a pedagogical tool, not just a technical device, so competency strengthening based on the TPACK approach is necessary. In addition, support from progressive education policies, visionary school leadership, and synergy between various stakeholders are determining factors for the successful integration of technology into elementary school learning. This literature review emphasizes the importance of reflective evaluation, teacher digital literacy, and technology-based learning innovations that are appropriate to children's psychological development. Thus, the use of digital technology in elementary education not only meets the demands of the times but also opens up significant opportunities for the realization of a more inclusive, contextual, and future-oriented learning system.

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

Bibliography

Anderson, J., & Rainie, L. (2020). *The future of digital life and learning*. Pew Research Center.

Anwar, C., & Yulianti, K. (2022). Integrasi teknologi dalam pembelajaran SD: Tinjauan kesiapan guru dalam era digital. *Jurnal Pendidikan Dasar Indonesia*, 7(1), 45–56. https://doi.org/10.21009/jpdi

Arifin, Z., & Suharyanto. (2020). Penggunaan media pembelajaran digital di sekolah dasar: Peluang dan tantangan. *Jurnal Teknologi Pendidikan*, 22(3), 310–320.

Azizan, M., & Ismail, M. (2021). Teachers' readiness and barriers in using digital tools in primary schools. *International Journal of Instruction*, 14(4), 225–240. https://doi.org/10.29333/iji.2021.14413a

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2019). A review of TPACK research with implications for teacher education. *British Journal of Educational Technology*, 50(5), 2439–2458.

Dewi, F. R., & Kartika, Y. (2022). Analisis peran kepala sekolah dalam mendukung pembelajaran digital di SD. *Jurnal Kepemimpinan Pendidikan Dasar*, 4(1), 11–20.

Firmansyah, R., & Novitasari, D. (2021). Transformasi pembelajaran digital di masa pandemi: Studi kasus pada guru SD. *Jurnal Pendidikan Dasar dan Pembelajaran*, 5(2), 134–143.

Hamid, S., & Wibowo, A. (2023). Pembelajaran digital dan literasi guru di sekolah dasar. *Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 8(1), 75–88.

Herlina, T., & Prasetyo, D. (2022). The impact of digital platforms on students' engagement in elementary education. *Journal of Educational Research and Practice*, 12(3), 201–215.

Kurniawan, R., & Lestari, I. (2020). Tantangan guru dalam implementasi TIK di sekolah dasar. *Jurnal Pendidikan dan Teknologi*, 3(1), 67–74.

Kusuma, A. P., & Fadilah, R. (2023). Evaluasi penggunaan teknologi digital dalam pembelajaran tematik SD. *Jurnal Pendidikan Dasar Nusantara*, 9(2), 99–110.

Lee, Y., & Tsai, C. (2021). Technology integration and teacher professional development: A meta-synthesis. *Educational Technology & Society*, 24(1), 1–15.

Maulana, H. A., & Sari, N. P. (2021). Peran literasi digital guru dalam menunjang pembelajaran daring di sekolah dasar. *Jurnal Teknologi Pendidikan Dasar*, 6(2), 102–113.

Ludi Litterarri
Basic Education
https://nawalaeducation.com/index.php/JLL
Volume 1 Issue 2, August 2024
e-ISSN : 3047-9983
DOI : https://doi.org/10.62872/x0vkx912

Mishra, P., & Koehler, M. J. (2020). Revisiting TPACK: New directions for technology integration in teacher education. *Computers & Education*, 156, 103940.

Nasution, H., & Fitriani, E. (2020). Persepsi guru terhadap pembelajaran digital di sekolah dasar. *Jurnal Penelitian dan Pengembangan Pendidikan*, 4(1), 45–55.

Nugroho, M. A., & Santoso, R. (2021). Digitalisasi pendidikan dasar: Implikasi kebijakan dan praktik pembelajaran. *Jurnal Kajian Pendidikan Dasar*, 6(1), 88–99.

Putri, D. W., & Yuliana, S. (2022). Strategi pembelajaran daring berbasis TPACK di sekolah dasar. *Jurnal Inovasi Pendidikan Dasar*, 7(3), 123–132.

Rahmah, S., & Suryana, D. (2023). Peluang dan tantangan guru dalam pembelajaran digital pasca-pandemi. *Jurnal Pendidikan dan Pembelajaran Dasar*, 10(1), 56–67.

Sari, L. M., & Widodo, S. (2021). Pemanfaatan teknologi interaktif dalam pembelajaran tematik di sekolah dasar. *Jurnal Teknologi Pembelajaran*, 9(2), 145–157.

Yusuf, M., & Fitria, N. (2023). Pengembangan profesional guru dalam menghadapi digitalisasi pendidikan dasar. *Jurnal Pengembangan Pendidikan Guru SD*, 5(1), 21–34.