

RELATIONSHIP BETWEEN DIGITAL LITERACY, LEARNING MOTIVATION, AND LEARNING OUTCOMES: A SYSTEMATIC REVIEW USING THE PRISMA APPROACH

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Abstract

This study aims to systematically examine the relationship between digital literacy, learning motivation, and student learning outcomes through a Systematic Literature Review (SLR) approach based on the PRISMA protocol. The study focuses on the role of digital literacy in improving learning outcomes, the role of learning motivation in improving learning outcomes. As well as the relationship pattern between digital literacy, learning motivation, and learning outcomes. Data searches were conducted through the leading database, Scopus, for the period 2015-2025. Of the dozens of articles searched, only six articles met the inclusion and exclusion criteria and were suitable for further analysis.

The synthesis results show that digital literacy directly and indirectly has a significant influence on student learning outcomes. Digital literacy increases engagement, learning independence and reflective thinking. Meanwhile, learning motivation, especially intrinsic motivation, plays an important mediating role in strengthening the influence of digital literacy on academic achievement. The pattern of relationships between variables was found to be consistent across different contexts and levels of education, with mechanisms of influence through cognitive, affective and behavioral pathways. The study also revealed several research gaps, including the lack of a longitudinal approach, the lack of integration of comprehensive theoretical models, and the limited geographical context of the study. The results of this study can serve as a reference for researchers, educators and policy makers in developing effective learning designs based on literacy and learning motivation.

Keywords: Digital Literacy, Learning Motivation, Learning Outcomes

INTRODUCTION

Digital transformation in education has brought significant changes to how students access, manage, and utilize information. The development of information and communication technology (ICT), accelerated by the COVID-19 pandemic, has driven the massive adoption of online learning systems. Since 2020, more than 1.6 billion students worldwide have been affected by school closures and have shifted to digital-based learning systems (UNESCO, 2021). In Indonesia, this has also prompted an evaluation of the digital competencies of students and educators. The National Digital Literacy Survey conducted by Kominfo and Katadata (2023) noted that the digital literacy index of the Indonesian people is still at a moderate level, namely 3.65 on a scale of 1–5. This figure shows that although access to technological devices is quite high, the mastery of effective digital literacy skills is still relatively low, especially in the context of education.

The phenomenon observed in the field indicates a gap between the availability of technology and students' ability to utilize it optimally for educational purposes. A survey conducted by the

Education Assessment Center (PUSMENDIK) of the Ministry of Education, Culture, Research, and Technology in 2023 revealed that 58% of high school students face difficulties in filtering relevant academic information from the internet. This highlights the importance of digital literacy as a fundamental skill in navigating the overwhelming and unverified flow of information in the digital age. In this context, digital literacy has become an essential competency that encompasses not only technical skills in using devices but also the ability to think critically, evaluate information, and communicate and behave ethically in the digital space (Ng, 2012; Eshet, 2012). Digital literacy has been proven to have a close relationship with the effectiveness of the learning process and the improvement of student learning outcomes.

Research by Getenet et al. (2024) shows that digital literacy has a positive effect on academic self-efficacy, which in turn encourages active student engagement in learning. The higher the level of digital literacy students have, the greater their confidence and independence in completing academic tasks. Thus, digital literacy serves not only as a technical tool but also as a determinant of the quality of the learning process and outcomes. However, mastery of digital technology does not automatically guarantee optimal learning outcomes. Affective factors such as learning motivation remain crucial elements in fostering students' readiness to tackle the challenges of digital learning. Previous research has shown that learning motivation plays an important role in supporting engagement and learning outcomes. Mega, Ronconi, and De Beni (2014) revealed that students with high levels of learning motivation tend to have better emotional regulation skills during the learning process, enabling them to maintain focus and academic engagement in the long term. Similar findings were reported by Wolters and Hussain (2014), who stated that intrinsically motivated students are more disciplined in completing academic tasks and tend to avoid academic procrastination, which positively impacts learning outcomes.

Furthermore, Mahmoodi et al. (2014) emphasize that the effectiveness of motivation in promoting learning outcomes is greatly influenced by the type of motivation possessed by students, whether intrinsic or extrinsic. According to Ryan and Deci (2000), both intrinsic and extrinsic motivation are the main drivers that direct, maintain, and intensify learning activities. A study by Lingga et al. (2024) reinforces this perspective by demonstrating that learning motivation and digital literacy simultaneously contribute significantly to learning outcomes, particularly among digital generation (Gen Z) students at the higher education level. These findings underscore the importance of understanding the role of learning motivation as a key factor in enhancing learning performance.

Several recent studies have highlighted the simultaneous relationship between digital literacy, learning motivation, and learning outcomes. Ata and Alpaslan (2024) found that digital literacy supports epistemological beliefs and reading motivation, which ultimately strengthens the mastery of 21st-century skills. Meanwhile, Zufahmi et al. (2024) demonstrated that the use of augmented reality-based e-learning modules can significantly enhance both learning motivation and digital literacy among students. These findings underscore that technology-based learning developed with appropriate pedagogical approaches can optimize learning outcomes.

Research in Indonesia also shows consistent evidence of the influence of digital literacy on student learning outcomes at various levels of education. Soraya et al. (2023) and Nurramdhani et al. (2023) found that digital literacy contributes significantly to learning outcomes at the secondary school level. Rifai et al. (2024) reported that in vocational schools, digital literacy can improve critical thinking skills. At the elementary school level, Yuliana et al. (2023) showed that teachers' digital literacy and the learning environment play an important role in supporting student learning outcomes. Based on these findings, researchers recommend strengthening digital literacy practices through teacher training and the implementation of innovative learning strategies relevant to the current digital context. Digital literacy and learning motivation are two key factors that complement each other in improving the quality of the learning process and outcomes for students. To achieve sustainable educational transformation in the digital age, synergy is needed between the provision of technological infrastructure, the enhancement of educators' capacities, and the development of

curricula that integrate digital literacy and learning approaches that motivate students comprehensively.

Based on preliminary studies, this research focuses on the role of digital literacy in improving learning outcomes, particularly in facilitating effective access to and utilization of information. The role of learning motivation in improving learning outcomes. As well as the relationship between digital literacy, learning motivation, and learning outcomes, which is important to understand comprehensively in order to design more adaptive and sustainable learning strategies.

LITERATURE REVIEW

Theoretically, the relationship between digital literacy, learning motivation, and learning outcomes can be explained through the Self-Determination Theory (SDT) approach by Deci and Ryan (2000), which states that intrinsic motivation is formed when individuals feel autonomy, competence, and connectedness in their learning process. Good digital literacy provides students with the space to explore, make independent learning decisions, and build self-confidence through digital interactions. In this context, technology is not merely a tool but a learning environment capable of fostering motivation. Additionally, Connectivism Theory (Siemens, 2005) is also relevant in explaining that digital learning is non-linear and relies on networks of information connections.

Digital literacy enables students to build and maintain learning networks and access information critically and selectively, which ultimately supports learning outcomes. Ng et al.'s (2023) research reinforces that the affective and ethical dimensions of digital literacy play an important role in learning engagement. Shen et al. (2024) show that technology-based gamification elements can increase motivation and learning outcomes. Yasa et al. (2024) prove that smart learning inquiry-based learning strategies have a significant impact on improving students' digital literacy and critical thinking.

RESEARCH METHODS

This study applies a Systematic Literature Review (SLR) approach with the aim of finding and summarizing various findings from previous studies related to the relationship between digital literacy, learning motivation, and learning outcomes. The SLR method was chosen because it provides an in-depth and structured literature review. In the data collection stage, this study uses the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. The data collection and analysis processes are carried out following the flow established in the PRISMA method.

Based on Figure 1, it is known that the literature review analysis process consists of four main stages, including:

1. Identification

In this stage, the literature search process uses the Scopus database with the search query ("digital literacy" OR "ICT literacy" OR "technology literacy" OR "media literacy")) AND (TITLE-ABS-KEY ("motivation" OR "learning motivation" OR "academic motivation" OR "self-determination") AND (TITLE-ABS-KEY ("learning outcomes" OR "academic achievement" OR "student performance" OR "learning achievement"))), resulting in 52 articles. These articles were then entered into a reference management platform for further processing.

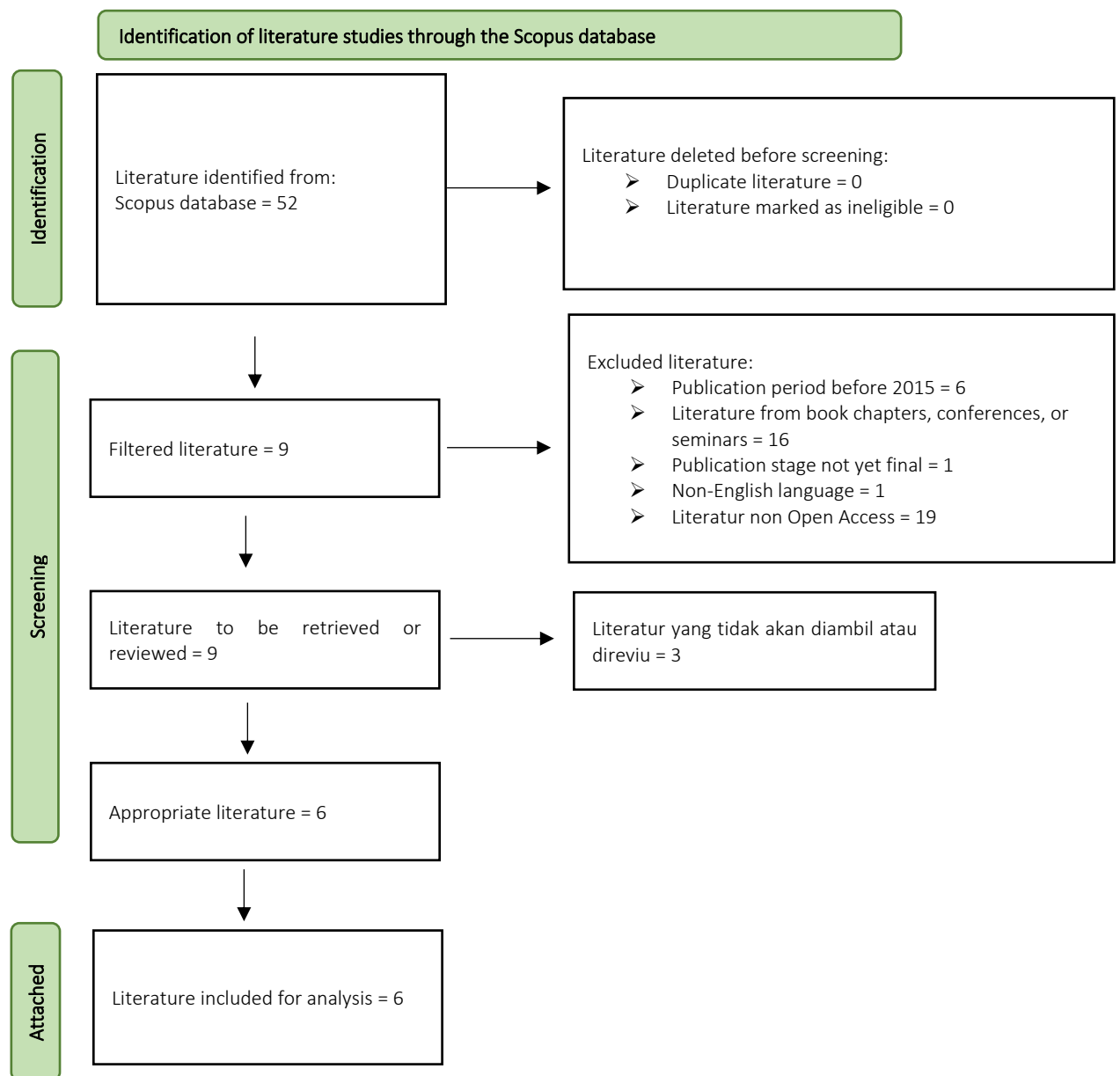


Figure 1. Stages of Article Selection

2. Screening

The screening stage with exclusion criteria includes publications from before 2015, articles sourced from conference papers, book chapters, or conferences, publications that are not yet final, articles in languages other than English, and non-open access literature. At this stage, the number of articles to be reviewed was reduced by 43, leaving 9 articles.

3. Feasibility

The 9 articles were then tested for feasibility by examining their titles and abstracts to determine their relevance to the research topic. Articles that did not discuss the relationship between digital literacy, learning motivation, and learning outcomes were excluded. In this process, 3 articles were deemed irrelevant to the topic, leaving 6 articles that were considered feasible for inclusion.

4. Inclusion

After going through the eligibility stage, the next 6 selected articles that meet the inclusion criteria include publications from 2015 to 2025, articles in English, focusing on the relationship between digital literacy, learning motivation, and learning outcomes, which will then be systematically reviewed.

The application of the Systematic Literature Review (SLR) method, supplemented by the PRISMA stages, produced data that was then analyzed in greater depth. The analysis process involves classifying the literature into several groups, namely main themes, digital literacy, learning motivation, and learning outcomes. The results of the processing and analysis stages are then systematically organized to provide a comprehensive overview of the relationship between digital literacy, learning motivation, and student learning outcomes.

RESULTS AND DISCUSSION

Based on the results of data processing and analysis, there are various findings regarding the relationship between digital literacy, learning motivation, and learning outcomes. Both from internal and external factors. The results of the literature study analysis are as follows:

Table 1 Results of Literature Study Analysis

No	Author	Year	Main Results	Study Findings
1.	Ana Ibáñez Moreno	2021	There has been a significant increase in: forum participation (from 195 to 460), blogging (from 7 to 34 posts), oral and written assignments, and exam results (higher pass rates and improved average grades); student engagement levels have also increased.	Students showed significant progress in digital literacy and independent learning during full online learning. Higher participation rates were influenced by lockdown conditions that forced them to make greater use of online learning resources. The use of platforms such as AVEX and ALF, as well as blogging projects and oral assignments, contributed to active engagement. This demonstrates that the transition to online learning can be effective when supported by motivational strategies, technological infrastructure, and training for both faculty and students.
2.	Sheikha Ali Al-Buraiki	2022	Four main factors were identified: reading motivation (interest, school activities), literacy practices at home (parental support, home library), reading rituals (pre-reading preparation, reading time), and digital literacy practices (applications, social media, TV). All factors support the formation of habits and the success of students' reading literacy.	Students' reading practices are social in nature, shaped by the support of their families, teachers, and digital environment. Interest in reading is triggered by favorite genres and parental support. Digital technology plays an important role in shaping current reading habits. Researchers suggest integrating digital literacy into teaching strategies and paying attention to students' intrinsic motivation. They also emphasize the importance of

				building a culture of reading at home and at school.
3.	Scippo, Madiat, & Cuomo	2025	The experimental group experienced a significant increase in post-test scores compared to pre-test scores ($p < 0.001$), while the control group did not. Students also showed high enthusiasm for using GeoGebra and 3D printers.	This study shows that integrating technology (GeoGebra & 3D printing) into tessellation-based geometry learning can improve conceptual understanding, spatial skills, and motivation and engagement in learning. These results expand on previous findings that were only conducted at the secondary level and confirm the importance of a manipulative-digital approach in primary education.
4.	Shen, Z., Lai, M., & Wang, F.	2024	• Learning motivation mediates the relationship between gamification and learning outcomes (VAF = 45.83%). • Learning style preferences moderate this relationship: the more compatible the learning style is with gamification elements, the higher the learning outcomes.	• This study expands on Self-Determination Theory (SDT) and Attention Restoration Theory (ART). Gamification elements such as points, badges, and leaderboards increase intrinsic motivation, autonomy, and learning engagement. • These results contribute theoretically to personalized learning design and offer practical implications for the development of adaptive and engaging online learning platforms.
5.	Aba Sha'ar, Waluyo, & Rofiah	2025	Some students' motivation increases because they want to show their best results in public (peer pressure).	This study shows that the use of Padlet in providing digital feedback significantly enriches the learning experience of students. Students experience improvements in technical writing skills and reflective thinking abilities. However, the openness of the platform also creates social pressures such as anxiety and embarrassment. Pedagogical implications include the importance of initial training in platform use, alternatives to more open platforms, and feedback design that builds self-confidence. This study reinforces the urgency of digital literacy as a prerequisite for the effectiveness of technology in learning.

6.	Tasrif et al.	2024	• All mediating variables (immersion, digital literacy, learning motivation) have a significant effect on learning outcomes. • Smartphone-based learning strategies have a positive direct and indirect impact through the three mediators. • Learning motivation has the strongest influence on academic performance ($\beta = 0.605, p < 0.001$). • R^2 for Academic Performance = 0.672 $\rightarrow$ the model has high explanatory power.	This study expands Prosser's theoretical framework in the context of modern digital engineering education, demonstrating that psychological factors and digital literacy play an important role in the effectiveness of smartphone-based learning. The findings indicate that the integration of digital strategies must take into account motivation, immersion, and technological mastery. Android-based mobile learning not only supports access but also enhances learning outcomes through contextually appropriate and technologically sound learning experience design. This study provides important empirical evidence for the development of mobile learning-based technical curricula.
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The results of the literature review summarized in Table 1 show that learning motivation plays a central role in improving student learning outcomes across various levels of education and learning contexts. High motivation, both intrinsic and extrinsic, has been proven to encourage active student engagement in the learning process, increase perseverance, and strengthen their ability to achieve academic goals. On the other hand, digital literacy emerges as an important factor that not only supports access to information and the use of learning technology but also enriches the learning experience through the integration of interactive and collaborative digital media. Furthermore, the results of this study identify complex patterns of relationships and mechanisms between digital literacy, learning motivation, and learning outcomes. Digital literacy acts as an enabler that strengthens the impact of learning motivation on academic achievement, while learning motivation acts as a mediator that bridges the influence of digital literacy on learning outcomes. These findings are consistent across various studies and educational contexts, both at the secondary school and university levels, thereby providing important theoretical and practical implications for the development of learning strategies in the digital age.

The Role of Digital Literacy in Improving Learning Outcomes

Digital literacy is key to supporting learning success, especially in this era of digital transformation in education. CALL (Computer-Assisted Language Learning) literacy developed at UNED helps students build skills such as problem solving, communication, and online collaboration that support independent learning. Study results indicate that students with high digital literacy are better able to navigate learning platforms, complete assignments, and interact through digital forums and projects such as blogs, all of which contribute to better learning outcomes. Meanwhile, in the context of elementary schools, the implementation of GeoGebra and 3D printers has proven that students' ability to understand geometric concepts improves significantly when they can actively and exploratively use digital tools. Digital literacy, in this case, is not merely technical proficiency but also involves the creative and reflective use of digital tools to solve learning problems.

Digital literacy supports learners in accessing, evaluating, and utilizing technology for effective learning. In Tasrif et al.'s (2024) study, digital literacy acts as a mediator that enables students to use technology optimally to improve learning outcomes. Students with good digital literacy are better able to utilize smartphone-based learning applications to access educational resources, collaborate, and develop new skills. At the higher education level, digital literacy also supports the implementation of technology-based feedback. Aba Sha'ar et al. (2025) showed that Padlet as a feedback medium increases student engagement, learning independence, and reflective skills. However, limitations in digital literacy can be a barrier, such as technical difficulties that hinder interaction and impact learning outcomes.

Digital literacy is an important factor that moderates the relationship between learning motivation and learning outcomes. Shen et al. (2024) found that students' digital literacy influences the extent to which they can utilize gamification elements in online learning. Students with high digital literacy levels are able to optimize the use of learning technology, thereby improving learning outcomes. Meanwhile, Al-Buraiki (2022) noted that the use of digital technologies such as mobile applications and the internet has sparked reading interest among high school students in Oman. Access to technology enables students to access various types of texts and information, expand their knowledge, and enhance their critical thinking skills. This underscores that digital literacy is not merely a technical skill but also a cognitive competency that supports learning outcomes.

The Role of Learning Motivation in Improving Learning Outcomes

Learning motivation is an important internal factor that plays a significant role in improving student learning outcomes. In a study by Ibáñez Moreno (2021), student motivation in learning increased significantly during the pandemic when learning shifted to fully online. This was evident from increased participation in tasks such as blogging and continuous assessment activities. When students feel actively engaged and are given space to express themselves through contextual and relevant digital activities, learning motivation increases, directly impacting higher final grades. Similarly, in the context of primary education, Scippo et al. (2025) demonstrated that the use of digital tools such as GeoGebra and 3D printers in geometry learning increased student engagement and motivation, which significantly influenced post-intervention test results. In other words, when motivation increases through engaging and meaningful approaches, students are more inclined to learn actively, which in turn improves their learning outcomes.

Learning motivation plays a crucial role as an internal driver influencing students' engagement in the learning process and achievement of learning outcomes. Tasrif et al. (2024) demonstrate that learning motivation has an impact on students' learning outcomes, both directly and through the mediation of digital literacy. Students with high motivation are better able to maintain concentration in technology-based learning, which in turn enhances conceptual understanding and problem-solving skills. This aligns with Prosser's theory emphasizing the relevance of education to industry needs, where learning motivation is key to producing graduates adaptable to workplace challenges. In another context, learning motivation has also been shown to enhance students' independence in correcting errors through technological feedback, as revealed by Aba Sha'ar et al. (2025), who found that Padlet-based feedback motivates learners to write better and pay attention to language details.

Learning motivation serves as the primary driving force in achieving optimal learning outcomes. Shen et al.'s (2024) study shows that intrinsic motivation, triggered through gamification approaches, has a significant mediating relationship between the application of gamification and language learning outcomes. When students feel they have autonomy, competence, and social relationships in the learning process, they show higher engagement and better academic achievement. In line with this, Al-Buraiki (2022) emphasizes that student motivation is influenced by personal interests, teacher support through reading activities at school, and family involvement at home. The formation of reading habits driven by intrinsic motivation has been shown to foster deeper engagement and higher academic outcomes. Both studies align with Self-Determination

Theory (SDT), which states that a learning environment that supports students' psychological needs fosters intrinsic motivation, ultimately enhancing learning outcomes.

Patterns of Relationships and Mechanisms between Digital Literacy, Learning Motivation, and Learning Outcomes

The synergistic relationship between digital literacy, learning motivation, and learning outcomes. Within the framework of online learning, digital literacy not only enhances access to materials but also serves as a means to stimulate motivation through interactive and collaborative learning approaches. Ibáñez Moreno (2021) emphasizes that increased motivation through participation in digital projects (such as blogging and continuous assessment tasks) encourages students to use learning platforms more actively, ultimately leading to better academic performance. Similar findings were reported by Scippo et al. (2025), where digital integration in tessellation activities encouraged students to think visually, creatively, and critically, thereby strengthening engagement and learning outcomes in geometry.

Mechanistically, digital literacy acts as a stimulus that enables students to search for various learning resources, while learning motivation acts as an internal driver to utilize that literacy. When these two factors work together, learning outcomes improve significantly. This occurs not only in higher education but also at the elementary level, indicating that this pattern of relationship is cross-contextual and cross-educational level.

Tasrif et al. (2024) found that digital literacy and learning motivation jointly mediate the relationship between learning strategies and academic outcomes among students. Digital literacy enables students to utilize learning technologies, while learning motivation encourages students to remain engaged and strive for optimal performance. This mechanism is reinforced by focused immersion, where learners focused on digital tasks are better able to internalize feedback and improve their weaknesses. Meanwhile, Aba Sha'ar et al. (2025) emphasized that technology-based learning experiences not only improve technical skills but also foster learners' self-confidence and self-awareness of their own mistakes. Both studies show that the integration of digital literacy and learning motivation in the context of technology-based learning supports the achievement of better learning outcomes at various levels of education.

The complex relationship between digital literacy, learning motivation, and learning outcomes, as suggested by Shen et al. (2024), proposes a moderated mediation model in which learning motivation mediates the influence of game-based learning on learning outcomes, while digital literacy acts as a moderator that strengthens this effect on learners with specific learning style preferences. On the other hand, Al-Buraiki (2022) demonstrates that digital literacy practices at home, including access to digital devices, interact with motivational factors (reading interest, family support) to form reading habits that support learning outcomes. Thus, the mechanism formed is digital literacy as a facilitator that strengthens the impact of intrinsic motivation on learning outcomes, through increased access to information and active student engagement in the learning process.

CONCLUSION

This systematic review shows that digital literacy and learning motivation are two crucial factors that interact with each other in influencing student learning outcomes at various levels of education. Empirical findings show that digital literacy, both directly and through increased learning motivation, can encourage student engagement in the learning process, improve critical thinking skills, and strengthen independence and self-reflection in learning.

Learning motivation, particularly intrinsic motivation, has been proven to be a significant mediator in linking digital literacy with learning outcomes. Meanwhile, the use of adaptive technology and active learning approaches such as inquiry, game-based learning, and digital

feedback can simultaneously improve digital literacy and motivation, which ultimately has a positive impact on learning outcomes.

The synthesis results also revealed a conceptual relationship between the three main variables, namely: digital literacy strengthens learning motivation, and both together influence learning outcomes. This influence operates through affective pathways (interest, self-efficacy), cognitive pathways (content mastery and conceptual understanding), and behavioral pathways (engagement and collaboration). However, this study also identified research gaps, particularly regarding geographical context limitations, the lack of a longitudinal approach, and the minimal integration of comprehensive theoretical models.

Thus, this study not only reinforces the position of digital literacy and learning motivation as important determinants of learning outcomes but also provides new directions for the development of more contextual, personalized, and sustainable learning designs. Further studies with mixed-method approaches, cross-cultural perspectives, and exploration of moderator variables such as self-regulation and social support are highly recommended to enrich theoretical and practical understanding in the future.

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