

# Digital Literacy in Shaping Academic Performance Among Higher Secondary Students: An Overview

Md Matiur Rahman Biswas

Ph.D. Research Scholar  
Department of Education, Jadavpur University

## Abstract:

In the present scenario Digital literacy has emerged as a significant determinant of academic success in higher secondary education, where learners increasingly depend on digital technologies for research, collaboration, communication, and assessment. This study investigates the relationship between digital literacy and academic performance among higher secondary students. The objectives of the paper are to examine the conceptual dimensions of digital literacy, analyze its impact on students' academic achievement, and identify contextual factors that influence this relationship. A secondary data-based review was conducted using published peer-reviewed journal articles, theoretical models, and policy documents in the field of educational technology and digital competence. The analysis of existing empirical studies shows a positive relationship between digital literacy and academic performance, indicating that students with stronger digital skills demonstrate better critical thinking, improved research quality, higher engagement, and more effective self-regulated learning. However, the extent of this impact is moderated by socioeconomic status, access to digital infrastructure, and teacher preparedness in integrating technology effectively. The study concludes that structured digital literacy integration within higher secondary curricula is essential for improving academic achievement and promoting equitable learning opportunities in digitally mediated educational environments.

**Keywords:** Digital literacy, Academic performance, Higher secondary education, educational technology, Self-regulated learning.

## 1. INTRODUCTION:

The swift development of digital technologies over the previous two eras has suggestively reformed educational systems worldwide. The integration of information and communication technologies (ICT) into classrooms has transformed how knowledge is accessed, constructed, and disseminated. In contemporary education, digital tools are no longer supplementary resources; they are central to teaching, learning, assessment, and communication processes (Selwyn, N., 2021). As societies transition toward knowledge-based economies, digital literacy has emerged as a foundational competency required for academic success, career readiness, and civic participation (Martin, A., 2008 & UNESCO, 2018). Digital literacy extends beyond the mere ability to operate computers or use the internet. Gilster (1997), who first popularized the term, described digital literacy as the ability to understand and use information in multiple formats from a wide range of sources when presented via computers. Over time, scholars have expanded this definition to include cognitive, technical, and socio-emotional dimensions. (Bawden, D., 2008) argued that digital literacy encompasses critical thinking, information evaluation, and ethical participation in digital environments. Eshet, A, Y., (2004) conceptualized digital literacy as a set of survival skills in the digital era, including photo-visual literacy, information literacy, reproduction literacy, and socio-emotional literacy. In the context of higher secondary education, digital literacy assumes particular importance. This stage of education serves as a transitional period between compulsory schooling and

higher education or vocational pathways. Students at this level are expected to engage in independent research, collaborative projects, analytical reasoning, and self-directed learning. The ability to navigate digital platforms effectively directly influences their capacity to meet these academic demands (Ng, W., 2012). Moreover, higher secondary curricula increasingly require students to access digital resources, submit assignments online, participate in virtual learning environments, and utilize digital tools for presentations and research (Hague, C., & Payton, S., 2010). Empirical research indicates a strong association between digital literacy and academic performance. Students who demonstrate higher levels of digital competence tend to achieve better academic outcomes, particularly in tasks involving information search, critical analysis, and problem-solving (Ifenthaler & Schweinbenz, 2013). Van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2015) found that operational and informational internet skills significantly predict educational attainment. Furthermore, digital learning environments that incorporate interactive multimedia and collaborative platforms have been shown to enhance student engagement and comprehension (Zhang et al., 2004). The theoretical underpinnings of digital literacy are grounded in socio-cultural and constructivist perspectives of learning. Vygotsky's (1978) socio-cultural theory posits that cognitive development occurs through interaction with cultural tools and social contexts. In contemporary settings, digital technologies function as powerful mediational tools that shape how students construct knowledge. Constructivist learning theory similarly emphasizes active engagement and learner-centered environments, both of which are facilitated by digital platforms that enable exploration, simulation, and collaboration (Piaget, 1970). Additionally, Zimmerman's (2002) theory of self-regulated learning highlights how digital literacy supports students' capability to set pathways, monitor improvement, and reproduce on learning results. Despite the growing recognition of digital literacy's importance, disparities persist in students' operating to skill and digital ability improvement. The concept of the "digital divide" has evolved from concerns about access to devices and connectivity to inequalities in skills and usage patterns (DiMaggio & Hargittai, 2001). Students from socioeconomically advantaged backgrounds are more likely to possess higher levels of digital competence due to increased exposure and support (Hargittai, E., 2002). Additionally, teacher preparedness and institutional support significantly influence how effectively digital literacy is integrated into classroom practice (Ertmer & Ottenbreit-Leftwich, 2010). Another emerging concern involves the quality of digital engagement. While students may be frequent users of technology, frequency of use does not necessarily equate to critical or academic proficiency. Ng, W., (2012) challenged the assumption that "digital natives" automatically possess advanced digital literacy skills, arguing that structured instruction is necessary to cultivate critical evaluation and responsible digital behavior. Similarly, Hobbs (2011) emphasized that without guided instruction, students may struggle to distinguish credible information from misinformation, thereby affecting academic outcomes. The COVID-19 pandemic more highlighted the crucial role of digital literacy in sustaining educational continuity. Remote and hybrid learning models required students to navigate online learning managing classifications, video conferencing tackles, and digital calculation stands. This global shift revealed significant variations in students' digital preparedness and highlighted the urgent need for systematic digital literacy development at the secondary level (UNESCO, 2018).

## **2. REVIEW OF RELATED LITERATURE:**

The term *digital literacy* was initial promoted by Gilster (1997), who labelled it as the capability to appreciate then use data in several presentations retrieved finished processors. Over time, the idea extended to comprise cognitive and socio-emotional scopes (Bawden, 2008). Martin, A., & Grudziecki, J. (2006). conceptualized digital literacy as a combination of digital ability, digital usage, and digital transformation. UNESCO (2018) later emphasized digital literacy as part of broader digital competence frameworks necessary for lifelong learning. Eshet-Alkalai, Y. (2004) proposed a multidimensional framework that includes photo-visual knowledge, imitation literacy, evidence literacy, and socio-emotional literacy. This perspective underscores that digital literacy is not purely technical but also cognitive and social. Ng, W., (2012) further categorized digital literacy into technical, cognitive, and

socio-emotional domains, particularly relevant in secondary education settings. Vygotsky, L.S., (1978) socio-cultural theory posits that learning occurs through interaction with cultural tools and social contexts. Digital technologies act as mediational tools that enhance collaborative learning and knowledge construction. Constructivism suggests learners build knowledge actively through interaction with content and tools (Piaget, 1970). Digital platforms facilitate active engagement, problem-solving, and creativity, reinforcing constructivist principles. Zimmerman, B. J., (2002) highlighted the importance of self-regulation in academic success. Digital literacy fosters independent research skills, goal-setting, and metacognitive awareness. Ifenthaler, D., & Schweinbenz, V. (2013) found that students with higher digital competencies performed better in research-based assignments. Similarly, Van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2015) reported that operational and informational internet skills significantly predicted academic success. Zhang et al., (2006) found that interactive digital learning environments improved student engagement and learning performance. Hobbs (2010) noted that media literacy programs enhanced critical analysis skills, leading to improved academic writing and comprehension. Selwyn, N., (2011) cautioned that technology integration alone does not guarantee improved performance; pedagogical alignment is essential.

Given these developments, understanding the connection among digital literacy and academic performance in higher secondary education is both timely and necessary. While numerous studies have examined digital literacy in general educational contexts, fewer reviews have synthesized its specific impact at the higher secondary level, where academic expectations intensify and preparation for higher education becomes paramount.

This review aims to address this gap by critically examining theoretical perspectives, empirical evidence, and contextual factors influencing digital literacy and its impact on academic performance in higher secondary student's. Specifically, the study seeks to:

1. To clarify the conceptual and theoretical foundations of digital literacy.
2. To examine the empirical evidence linking digital literacy to academic achievement.
3. To identify contextual and institutional factors influencing digital literacy development.
4. To highlight challenges and propose evidence-based strategies for effective integration.

By synthesizing existing evidences, the study investigated a deeper understanding of how digital literacy functions as both a cognitive and socio-cultural competency that shapes academic success in contemporary educational systems.

### **3. COMPONENTS OF DIGITAL LITERACY:**

Digital literacy is broadly recognized as a multidimensional concept that mixes practical, cognitive, social, and ethical competencies. Scholars and international organizations have proposed various frameworks to conceptualize its components, reflecting the evolving nature of digital environments (Bawden, D., 2008; Martin & Grudziecki, 2006; UNESCO, 2018). Rather than viewing digital literacy as a single skill, contemporary research emphasizes its composite structure, particularly in the context of higher secondary education where students must demonstrate advanced academic and analytical capabilities (Ng, W., 2012). The following subsections examine the core components of digital literacy and their relevance to academic performance.

#### **3.1 Technical and Operational Skills:**

Technical or operational skills form the foundational layer of digital literacy. These skills involve the capability to function digital devices, direct operational systems, use software applications, and manage digital files effectively (Hargittai, E., 2001). At the higher secondary level, students are expected to demonstrate proficiency in word processing, presentation software, spreadsheets, learning management systems, and internet navigation.

Van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2015) Distinguished between operational skills (basic use of hardware and software) and formal skills (understanding website structures and navigation). Students who lack these basic competencies may struggle to complete assignments, access resources, or participate in digital learning platforms. However, technical skills alone are insufficient for academic success. Gilster (1997) emphasized that digital literacy must extend beyond “button knowledge” to include critical engagement with digital content.

In higher secondary education, operational competence supports efficient task completion, timely submission of assignments, and participation in virtual classrooms. Without foundational technical skills, students may experience cognitive overload when attempting to manage academic tasks in digital environments (Ng, W., 2012).

### **3.2 Information Literacy:**

Information literateness is an essential factor of digital literacy and theatres a straight part in academic performance. The Suggestion of College & Investigate Public library (ACRL, 2015) definite evidence literacy as the skill to classify material requirements, detect applicable causes, assess reliability, and use information morally and successfully. In digital contexts, information literacy includes searching online databases, assessing website credibility, identifying bias, and synthesizing information from multiple digital sources (Bawden, D., 2008). Higher secondary students increasingly rely on online sources for research projects, essays, and exam preparation. Therefore, the ability to critically evaluate digital information significantly affects the quality of their academic work. Eshet, A, Y., (2004) described this dimension as “information literacy” and emphasized the importance of critical thinking in distinguishing reliable sources from misinformation. (Hobbs, R., 2011) argued that students require explicit instruction to develop skills in analyzing authorship, purpose, accuracy, and currency of digital content. Research suggests that students with strong information literacy skills demonstrate improved research quality, stronger argumentation, and higher academic achievement (Ifenthaler & Schweinbenz, 2013). In contrast, students who lack these skills may rely on unreliable sources, resulting in weaker academic outcomes.

### **3.3 Media Literacy:**

Media literacy mentions to the ability to contact, examine, appraise, create, and respond to letters in many forms of media (Buckingham, D., 2003). In digital environments, students encounter diverse multimedia content including videos, social media posts, blogs, podcasts, and news platforms. Media literacy equips students with the capacity to interpret visual and audiovisual messages critically. (Buckingham, D., 2003) emphasized that media texts are constructed representations influenced by economic, political, and ideological factors. Understanding these influences enables students to critically assess digital media rather than passively consuming content. In higher secondary education, media literacy contributes to improved comprehension, critical analysis, and communication skills. Mihailidis and Thevenin (2013) linked media literacy to civic engagement and critical inquiry, suggesting that students who understand media dynamics are better equipped to participate in academic discussions and societal debates.

Furthermore, the proliferation of misinformation and digital manipulation highlights the need for media literacy education. Without these competencies, students may struggle to differentiate between credible academic resources and misleading online content (Hobbs, R., 2011).

### **3.4 Communication and Collaboration Skills:**

Digital literacy comprises the ability to communicate efficiently and collaborate using digital stages. This component encompasses email communication, participation in online discussions, video conferencing, collaborative document editing, and social media engagement for academic purposes (Ribble, M., 2015). Martin, A., and Grudziecki, J., (2006) emphasized that digital literacy involves participation in digital communities. In higher secondary education, collaborative learning activities often require students to work together using cloud-based tools and virtual platforms. Effective digital communication enhances

group coordination, peer feedback, and collective problem-solving. Zhang et al. (2006) found that interactive and collaborative digital learning environments significantly improve engagement and learning outcomes. Similarly, constructivist perspectives suggest that collaborative digital tools support knowledge co-construction and deeper understanding (Vygotsky, 1978). Communication skills in digital environments also involve understanding appropriate tone, clarity, and etiquette. Students must adapt their communication styles depending on academic contexts, demonstrating professionalism and respect in virtual interactions.

### **3.5 Digital Citizenship and Ethical Literacy:**

Digital citizenship refers to responsible, ethical, and safe behavior in digital environments (Ribble, M., & Bailey, G., D., 2011). It includes understanding issues such as privacy, cybersecurity, intellectual property rights, plagiarism, and online safety. Higher secondary students frequently engage with social media, online forums, and academic platforms. Without awareness of digital ethics, they may inadvertently violate academic integrity policies or compromise personal security. Ribble, M., (2015) recognized nine essentials of digital nationality, with digital protocol, digital law, and digital security. Ethical literacy is closely tied to academic integrity. Proper citation practices, avoidance of plagiarism, and respect for intellectual property are essential components of digital academic work (ACRL, 2015). Teaching students how to reference digital sources correctly strengthens both ethical awareness and scholarly rigor.

Additionally, socio-emotional literacy—another dimension identified by Eshet, A, Y., (2004)—involves recognizing online risks, managing digital identity, and engaging respectfully in digital communities. These competencies contribute to a positive learning environment and support academic collaboration.

### **3.6 Cognitive and Critical Thinking Skills**

Digital literacy includes higher-order cognitive developments such as examination, assessment, combination, and creation. According to Bloom's revised taxonomy (Anderson & Krathwohl, 2001), digital tools can facilitate advanced thinking when used appropriately. Ng, W., (2012) argued that cognitive digital literacy includes the ability to interpret digital texts, integrate multimedia information, and solve problems using technological resources. Students must not only retrieve information but also analyze patterns, compare perspectives, and generate original ideas. Zimmerman, B, J., (2002) linked digital literacy with self-regulated learning, emphasizing goal-setting, strategic planning, and reflective thinking. Students who use digital tools to monitor progress and evaluate performance demonstrate greater academic autonomy.

### **3.7 Creativity and Digital Content Creation:**

Modern frameworks emphasize that digital literacy includes not only consumption but also production of digital content (UNESCO, 2018). Students are increasingly required to create multimedia presentations, videos, blogs, and digital portfolios. Content creation fosters creativity, innovation, and applied learning. It enables students to demonstrate understanding through diverse formats beyond traditional written exams. According to Hobbs, R., (2011), producing digital media enhances comprehension and engagement by requiring students to synthesize knowledge actively. In higher secondary education, digital content creation supports project-based learning and interdisciplinary exploration. It encourages students to transform knowledge into tangible outputs, reinforcing deeper cognitive processing.

### **3.8 Problem-Solving and Adaptability:**

Digital environments are dynamic and constantly evolving. Therefore, digital literacy includes the ability to troubleshoot technical issues, adapt to new platforms, and learn emerging technologies independently (Van Deursen & van Dijk, 2015). Problem-solving skills are particularly relevant in higher secondary education, where students encounter diverse digital tools across subjects. Adaptive learners are better positioned to overcome technical challenges and maintain academic productivity. Martin, A., (2008)

described digital literacy as developmental, meaning individuals progress from basic competence to transformative and innovative use. This adaptability supports lifelong learning and academic resilience. The components of digital literacy extend far beyond technical proficiency. They encompass information literacy, media literacy, communication, ethical awareness, cognitive skills, creativity, and adaptability. Together, these dimensions contribute to academic performance by enhancing research quality, critical thinking, collaboration, and responsible participation in digital learning environments. Understanding digital literacy as a multidimensional construct allows educators to design comprehensive interventions that address not only operational skills but also higher-order thinking and ethical engagement. In higher secondary education, where academic demands intensify, strengthening each of these components is essential for improving student achievement and preparing learners for higher education and the digital workforce.

#### **4.IMPACT ON ACADEMIC PERFORMANCE:**

Digital literacy plays a significant role in shaping academic performance in higher secondary education by enhancing students' cognitive, metacognitive, and collaborative learning capacities. As academic tasks increasingly require digital research, online collaboration, and multimedia engagement, students' ability to navigate digital environments effectively becomes directly linked to their academic outcomes (Ng, W., 2012). Empirical research consistently demonstrates a positive relationship between digital competence and student achievement across various subject areas. One of the most direct impacts of digital literacy is on research quality and information processing. Students with strong information literacy skills are better able to identify credible sources, evaluate evidence, and synthesize diverse perspectives into coherent academic arguments (Association of College & Research Libraries [ACRL], 2015). Eshet, A. Y., (2004) emphasized that critical digital thinking enables learners to filter irrelevant or misleading information, thereby improving the depth and accuracy of academic assignments. Ifenthaler and Schweinbenz (2013) found that students with higher digital competencies performed significantly better on inquiry-based tasks that required online research and problem-solving. Digital literacy also enhances student engagement and motivation. Interactive digital platforms, multimedia resources, and collaborative tools foster active learning environments that increase participation and comprehension (Zhang et al., 2006). Engaged students are more likely to invest effort in academic tasks, which contributes to improved performance outcomes. Constructivist learning environments supported by digital technologies encourage exploration, discussion, and knowledge co-construction, aligning with socio-cultural learning principles (Vygotsky, 1978). Furthermore, digital literacy strengthens self-regulated learning, a key predictor of academic success. Students who can use digital tools to plan tasks, monitor progress, and evaluate their understanding demonstrate higher levels of autonomy and responsibility (Zimmerman, B. J., 2002). Access to online resources, digital planners, and educational applications enables learners to manage time effectively and seek clarification independently, particularly in higher secondary settings where academic expectations intensify. Operational and formal internet skills also influence performance. Van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2015) reported that students with advanced digital skills achieved better academic results because they could efficiently locate and utilize online educational materials. However, scholars caution that mere exposure to technology does not automatically lead to improved achievement; meaningful pedagogical integration is essential (Selwyn, N., 2011).

Overall, digital literacy enhances academic performance by promoting critical inquiry, engagement, collaboration, and independent learning. When effectively integrated into curriculum and instruction, digital competence becomes a powerful enabler of academic excellence in higher secondary education

#### **5. INFLUENCING FACTORS:**

The development of digital literacy in higher secondary education is shaped by multiple interrelated factors, including socioeconomic status (SES), gender, access to technology, and teacher competence. Socioeconomic disparities significantly influence students' opportunities to acquire digital skills. Students

from advanced SES families generally have better access to personal devices, high-speed internet, and supportive learning environments, which enhance their exposure to digital tools and skill development (DiMaggio & Hargittai, 2001). This unequal access contributes to what scholars describe as the “second-level digital divide,” referring to differences in digital skills rather than mere access (Hargittai, E., 2001). Gender differences may also affect digital literacy outcomes. While overall access gaps have narrowed, variations persist in confidence levels, usage patterns, and types of digital engagement (Van Deursen & van Dijk, 2015). Additionally, teacher preparedness plays a vital role in promoting students’ digital capabilities. Educators who possess strong technological pedagogical information are more likely to participate digital tools successfully into instruction, thereby enhancing students’ academic use of technology (Ertmer & Ottenbreit-Leftwich, 2010). Institutional support, infrastructure quality, and curriculum design further mediate how digital literacy skills are cultivated in higher secondary settings (Selwyn, N., 2011).

### **6. CHALLENGES IN HIGHER SECONDARY EDUCATION:**

Despite the recognized importance of digital literacy, several challenges hinder its effective development in higher secondary education. One major obstacle is unequal access to technological infrastructure, including reliable internet connectivity and updated digital devices. Schools in under-resourced communities often struggle to provide adequate technological support, reinforcing educational inequalities (Selwyn, N., 2011). Additionally, the persistence of the digital divide extends beyond access to encompass disparities in digital skills and meaningful usage (Hargittai, E., 2002).

Another challenge is insufficient teacher training. Many educators lack confidence or pedagogical knowledge to integrate digital tools effectively into classroom instruction (Ertmer & Ottenbreit-Leftwich, 2010). Without proper guidance, technology may be used superficially rather than to enhance higher-order thinking skills. Curriculum constraints further limit systematic digital literacy instruction, as digital competencies are often treated as supplementary rather than embedded across subjects (Hague, C., & Payton, S., 2010). Moreover, issues such as digital distraction, cyber safety concerns, and academic dishonesty complicate technology integration in secondary classrooms (Ribble, M., 2015).

### **7. STRATEGIES FOR IMPROVEMENT:**

Addressing these challenges requires a comprehensive and systemic approach. Integrating digital literacy across the curriculum, rather than confining it to isolated ICT classes, ensures consistent skill development (International Society for Technology in Education [ISTE], 2016). Professional development programs should equip teachers with both technical and pedagogical competencies to promote meaningful technology integration (Ertmer & Ottenbreit-Leftwich, 2010). Equitable access policies, including school-provided devices and community internet initiatives, are essential to reduce disparities (UNESCO, 2018). Project-based learning and collaborative digital activities can enhance critical thinking and engagement while fostering responsible digital citizenship (Hobbs, R., 2010). Finally, clear guidelines on digital ethics, academic integrity, and online safety should be incorporated into school policies to create a secure and productive digital learning environment (Ribble, M., & Bailey, G., D., 2011).

### **8. DISCUSSION:**

The reviewed literature consistently demonstrates that digital literacy is positively associated with academic performance in higher secondary education. However, this relationship is complex and mediated by contextual, pedagogical, and individual factors. While students with higher levels of digital competence tend to perform better in research-based, analytical, and collaborative tasks, the benefits of technology are not automatic. Meaningful integration into instructional design is essential to translate digital skills into measurable academic gains (Selwyn, N., 2011). A key insight from the literature is that digital literacy extends beyond operational proficiency. Cognitive and critical evaluation skills significantly influence how effectively students utilize digital resources for academic purposes (Eshet, A, Y., 2004; Ng, W., 2012).

Students who can assess credibility, synthesize information, and apply digital tools strategically are more likely to produce high-quality academic work. Moreover, digital literacy supports self-regulated learning, enabling students to manage time, set goals, and monitor progress—competencies strongly linked to academic success (Zimmerman, B. J., 2002). At the same time, disparities in access, teacher preparedness, and institutional support may limit the positive impact of digital literacy initiatives (Ertmer & Ottenbreit-Leftwich, 2010). The persistence of skill-based digital divides highlights the need for structured and equitable interventions (Hargittai, E., 2002). The findings also indicate that digital literacy's impact on academic achievement is contingent upon contextual variables. Access disparities and variations in instructional quality can either amplify or constrain its benefits (DiMaggio & Hargittai, 2001; Selwyn, N., 2011). Importantly, simply increasing technological access does not automatically translate into improved outcomes; purposeful pedagogical integration is essential (Ertmer & Ottenbreit-Leftwich, 2010).

Overall, the discussion suggests that digital literacy functions as both a cognitive skill set and a socio-cultural practice. When systematically embedded within curriculum and supported by effective pedagogy, digital literacy becomes a powerful catalyst for enhancing academic achievement in higher secondary education.

## 9. CONCLUSION:

Digital literacy has emerged as a critical determinant of academic performance in higher secondary education, reflecting the broader transformation of learning in the digital age. As educational systems increasingly rely on digital platforms for instruction, assessment, and collaboration, students' ability to navigate, evaluate, and create digital content has become integral to academic success. The literature consistently demonstrates that digital literacy enhances research quality, critical thinking, engagement, and self-regulated learning—core competencies required at the higher secondary level. Students who possess strong informational and cognitive digital skills are better equipped to analyze sources, construct arguments, and participate effectively in collaborative academic. However, the relationship between digital literacy and academic performance is influenced by contextual variables such as socioeconomic status, access to infrastructure, and teacher preparedness. Merely providing access to technology is insufficient; meaningful pedagogical integration and structured instruction are essential to transform digital tools into instruments of deeper learning. To maximize academic outcomes, schools must adopt comprehensive strategies that embed digital literacy across curricula, support continuous teacher professional development, and ensure equitable access to technological resources. By fostering technical, cognitive, and ethical competencies, higher secondary institutions can empower students not only to excel academically but also to thrive in an increasingly digital and knowledge-driven society.

## REFERENCES:

1. Amin, H., Malik, M. A., & Amin, S. (2025). *Digital edge: Does digital literacy enhance academic performance in online education?* *Academy of Education and Social Sciences Review*, 5(2), 196–206. <https://doi.org/10.5281/zenodo.15583825>
2. Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition*. Addison Wesley Longman, Inc.
3. Association of College & Research Libraries. (2015). *Framework for information literacy for higher education*. American Library Association. <http://www.ala.org/acrl/standards/ilframework>
4. Bawden, D. (2008). Origins and concepts of digital literacy. In C. Lankshear & M. Knobel (Eds.), *Digital literacies: Concepts, policies and practices* (pp. 17–32). Peter Lang.
5. Board, A. C. R. L. (2016). Framework for information literacy for higher education.
6. Bruckhaus, A. A., Bennett, A., et al. (2024). *Evaluation of students' digital literacy through an immersive university-high school collaboration*. *Frontiers in Education*, 9.

7. Buckingham, D. (2003). Media Education. Literacy. *Learning and Contemporary Culture*.
8. DiMaggio, P., & Hargittai, E. (2001). From the 'digital divide' to 'digital inequality': Studying Internet use as penetration increases. *Princeton: Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University*, 4(1), 4-2.
9. Ertmer, P. A., & Ottenbreit-Leftwich, A. (2010). Teacher technology change. *Journal of Research on Technology in Education*, 42(3), 255–284.
10. Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia*, 13(1), 93-106.
11. Getenet, S., Cantle, R., Redmond, P., & Albion, P. (2024). Students' digital technology attitude, literacy and self-efficacy and their effect on online learning engagement. *International Journal of Educational Technology in Higher Education*, 21(1), 3..
12. Gilster, P., & Glistler, P. (1997). *Digital literacy* (p. 1). New York: Wiley Computer Pub.
13. Hague, C., & Payton, S. (2010). *Digital literacy across the curriculum* (Vol. 4, No. 1, pp. 1-63). Bristol: Futurelab.
14. Hargittai, E. (2001). Second-level digital divide: Mapping differences in people's online skills. *arXiv preprint cs/0109068*.
15. Hobbs, R. (2011). *Digital and media literacy: Connecting culture and classroom*. Corwin Press.
16. Ifenthaler, D., & Schweinbenz, V. (2013). The acceptance of Tablet-PCs in classroom instruction: The teachers' perspectives. *Computers in human behavior*, 29(3), 525-534.
17. Laanpere, M. (2019). Recommendations on assessment tools for monitoring digital literacy within UNESCO's digital literacy global framework. *Information Paper*, 56, 23
18. Martin, A. (2008). Digital Literacy and the. *Digital," Digital literacies: Concepts, policies and practices*, 30, 151.
19. Martin, A., & Grudziecki, J. (2006). DigEuLit: Concepts and Tools for Digital Literacy Development. *Innovation in Teaching and Learning in Information and Computer Sciences*, 5(4), 249–267. <https://doi.org/10.11120/ital.2006.05040249>
20. Moses, S. (2023). *Impact of digital literacy skills on students' engagement and academic performance in senior secondary schools in Chikun Local Government, Kaduna State, Nigeria. Zaria Journal of Educational Studies*, 24(1), 76–82.
21. Ng, W. (2012). Can we teach digital natives digital literacy?. *Computers & education*, 59(3), 1065-1078.
22. Ribble, M., & Bailey, G. D. (2011). *Digital citizenship in schools*. Washington, DC: International Society for technology in Education.
23. Riegel, C. (2018). *The development of the teacher preparation technology inventory (TPTI): An instrument designed to measure how often teacher candidates model and apply the 2017 international society for technology in education (ISTE) standards for educators in teacher preparation programs* (Order No. 10785453). Available from ProQuest Dissertations & Theses Global. (2033157091). Retrieved from
24. Selwyn, N. (2021). *Education and technology: Key issues and debates*. Bloomsbury Publishing.
25. Selwyn, N., & Stirling, E. (2011). Social media and Education.
26. van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2015). Toward a Multifaceted Model of Internet Access for Understanding Digital Divides: An Empirical Investigation. *The Information Society*, 31(5), 379–391. <https://doi.org/10.1080/01972243.2015.1069770>.
27. Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard university press.
28. Yuan, X., Rehman, S., Altalbe, A., Rehman, E., & Shahiman, M. A. (2024). Digital literacy as a catalyst for academic confidence: exploring the interplay between academic self-efficacy and academic procrastination among medical students. *BMC Medical Education*, 24(1), 1317.

29. Zakir, S., Hoque, M. E., Susanto, P., Nisaa, V., Alam, M. K., Khatimah, H., & Mulyani, E. (2025, June). Digital literacy and academic performance: the mediating roles of digital informal learning, self-efficacy, and students' digital competence. In *Frontiers in Education* (Vol. 10, p. 1590274). Frontiers Media SA.
30. Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker Jr, J. F. (2004). Can e-learning replace classroom learning. *Communications of the ACM*, 47(5), 75-79.
31. Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, 41(2), 64-70.