

Digital Literacy and ICT Self-Efficacy in Enhancing Students' Functional Skills: Evidence from Muhammadiyah Senior High Schools in Palembang

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ABSTRACT

This study aims to analyze the relationship between digital literacy and ICT self-efficacy in improving students' functional skills at Muhammadiyah Senior High Schools in Palembang City. The main focus of the study includes evaluating the level of development of digital tool use for presentation, evaluation, and information organization, as well as conducting a gender-based comparative analysis of tool knowledge and ICT self-efficacy. Using a quantitative paradigm with a descriptive survey method, data were collected from a randomly selected sample of 200 respondents through a self-administered questionnaire that has been tested for validity and reliability. The findings indicate a significant positive correlation, where students with high ICT self-efficacy scores consistently demonstrate superior performance in critical thinking and problem-solving skills. Although awareness of basic tools such as PowerPoint is adequate, the utilization of advanced applications for information evaluation and data organization is still relatively low. Furthermore, a gender gap was found where male students generally have higher ICT self-efficacy, but interventions through training have been proven to empower female students to exceed the average standard. This study concludes that strengthening digital literacy and technology self-efficacy in an inclusive manner is crucial for students' academic readiness in the digital era.

KEYWORDS

Digital Literacy,
Educational
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1. Introduction

In this rapidly evolving and complex technological society, the integration of technological solutions into the educational environment has become a key parameter defining the success of students' functional skill development (Majeed & Badariah, 2024; Gros, 2016). This paradigm shift in teaching and learning approaches positions digital literacy as the primary foundation of knowledge and competencies that students must demonstrate to participate effectively and creatively in digital content production (Hasanah & Setiaji, 2019; Van Laar et al., 2019). However, a significant challenge arises in the form of the "connectivity paradox," where physical proximity to technology or prolonged internet access does not always equate to the ability to verify information or think critically (Khakim, 2026; McGrew et al., 2018). This phenomenon is particularly evident in Generation Alpha, who, despite being highly adept at operating devices technically, often demonstrate very low accuracy in detecting audiovisual disinformation such as deepfake videos or hoax news (Khakim, 2026; Vaccari & Chadwick, 2020).

The importance of digital literacy is emphasized by UNESCO, which defines it as the operational ability to use available technology, enhanced by critical thinking, innovation, and social interaction (Barker & Aspray, 2006; Law et al., 2018). This competency is central to the functional skills needed in modern classrooms and future workplaces, including the ability to filter, sort, and skillfully apply digital knowledge in a variety of situations. At the secondary education level, particularly in religious-based schools such as Muhammadiyah High Schools in Palembang, digital literacy is not merely an additional skill, but a fundamental requirement to support more effective and efficient work and learning processes (Sribanon & Ramadhika, 2026; Van Laar et al., 2019). From the perspective of Bandura's Albert Bandura Social Cognitive Theory, the development of digital literacy is shaped through reciprocal interactions among personal factors, behavior, and the learning environment. Students acquire digital competencies by observing models, engaging in collaborative learning, and developing self-efficacy in using digital



technologies. Likewise, the TPACK (Technological Pedagogical Content Knowledge) framework highlights that effective digital literacy extends beyond technical proficiency, requiring the integration of technological knowledge with pedagogical approaches and subject content. Therefore, strengthening digital literacy within the school environment should involve not only access to digital technologies but also instructional practices that foster students' confidence, critical thinking, and meaningful application of technology in learning.

However, digital literacy alone is not enough to guarantee academic success (Ishaq et al., 2020). Another crucial factor is ICT self-efficacy, which is an individual's level of confidence in using technology-based tools to perform specific tasks effectively. Based on Bandura's self-efficacy theory, students' level of confidence in their ability to utilize technology will determine the extent and efficiency with which they will use it in their learning (Suparyono & Paling, 2025; Teo, 2019). The meaningful relationship between digital literacy and ICT self-efficacy creates a synergy that enhances students' functional learning skills, such as problem-solving, teamwork, communication, and critical thinking. Students with high ICT self-efficacy tend to be more persistent in facing complex technical challenges and demonstrate superior performance in managing digital learning activities (Majeed & Badariah, 2024; Falloon, 2020).

The role of technology in developing cognitive skills such as analysis, evaluation, and synthesis is vital. The use of digital tools enables students to quickly find information, share knowledge, and present ideas using various application programs. At SMA Muhammadiyah Palembang, digital literacy mastery must be directed towards an information taxonomy that encompasses three main domains: information presentation, information evaluation, and information organization.

In the information presentation domain, popular tools like Microsoft PowerPoint have long been used to prepare text- and graphic-based materials to make learning more effective. Furthermore, innovative tools like Prezi offer the freedom of non-linear presentations, and Canva facilitates the design of intuitive visual infographics. On the creative side, visual programming platforms like Scratch can be used to train computational thinking through the creation of animations and educational games, helping students understand abstract concepts in a fun way (Ikhwan et al., 2024; Sáez-López et al., 2016). Moreover, UI/UX (User Interface and User Experience) design training is crucial for equipping students with practical competencies in developing user-oriented digital products (Meria et al., 2026; Kang et al., 2022).

In terms of information evaluation, digital literacy encompasses the critical ability to assess the credibility, relevance, and accuracy of data amidst information overload. Using tools like Google Scholar helps students access reliable academic literature, while tools like Turnitin foster academic integrity by analyzing the originality of written work. Students also need to be equipped with critical visual literacy strategies to recognize technical anomalies in AI-generated content, in order to mitigate the psychosocial risks of widespread exposure to disinformation on social media. An understanding of digital security (e-safety) is also crucial for protecting personal data and institutional information (Sribanon & Ramadhika, 2026; McGrew et al., 2018).

Meanwhile, for information organization, digital tools like Evernote and Microsoft OneNote allow students to organize multimedia notes hierarchically, which is essential for research activities. Trello, a team collaboration application, is ideal for group assignments because it allows students to sort data through task boards and cards, thus enhancing teamwork and project monitoring. The use of mind maps through MindMeister has also been shown to aid brainstorming and problem-solving. However, the effectiveness of these tools is significantly influenced by students' cognitive load; low digital literacy will increase cognitive load and hinder students' ability to utilize technology optimally (Suparyono & Paling, 2025; Sweller et al., 2019).

Implementation of ICT integration in Muhammadiyah schools also relies heavily on institutional support and leadership. The role of principals who implement servant leadership has been shown to be a catalyst in improving teachers' digital literacy, which in turn impacts the quality of classroom learning. An adaptive organizational culture is essential for schools to be able to proactively respond to curriculum changes and technological advances (Bakhri et al., 2025; Scherer et al., 2021). Furthermore, within the TPACK (Technological Pedagogical Content Knowledge) framework, teachers must be able to balance technological, pedagogical, and content knowledge to create meaningful learning experiences, especially in areas that may have limited access or infrastructure (Sasuwuk, 2026; Schmid et al., 2020).

Another equally significant challenge is the digital divide, which encompasses disparities in physical access (the first level), differences in usage skills (the second level), and differences in outcomes or benefits (the third level) (Sasuwuk, 2026; Van Deursen & Helsper, 2015). One aspect of this gap is gender. The literature shows that there is often variation, with male students having more extensive technology use and higher ICT self-efficacy than female students, often influenced by sociocultural norms. However, interventions through appropriate training and faith-based community support can empower all students, regardless of gender, to develop equal digital skills (Hutapea, 2022; Siddiq & Scherer, 2019). This is highly relevant considering that affective factors such as intrinsic motivation and self-interest also influence student literacy achievement, such as in mathematics literacy (Subarkah et al., 2025; Ryan & Deci, 2020).

In Palembang City, despite Muhammadiyah schools' strong commitment to educational quality, awareness of the actual status of digital literacy and ICT self-efficacy among students still needs to be explored. This research is crucial for identifying factors that determine student performance and providing guidelines for improving the effectiveness of technology-based learning at the secondary level.

Based on this background, this study aims to: 1) determine the level of development in the use of digital literacy tools at Muhammadiyah Senior High School in Palembang, specifically in terms of information presentation, information evaluation, and information organization; 2) analyze the relationship between digital literacy skills and ICT self-efficacy in improving students' functional skills, such as critical thinking and problem-solving; and 3) conduct a gender-based comparative analysis of digital tool knowledge and ICT self-efficacy among students to identify and close potential digital divide gaps.

The results of this study are expected to provide theoretical and practical contributions to the development of more inclusive, adaptive, and competitive learning strategies in the era of digital transformation. Through strengthening human resource capacity and equitable infrastructure support, it is hoped that Muhammadiyah Senior High School students in Palembang will be better prepared to face the dynamics of the ever-evolving digital world.

2. Method

This study adopted a quantitative research paradigm to investigate the relationship between digital literacy, ICT self-efficacy, and students' functional skills. The research method used was a descriptive study, employing a survey instrument as the primary data collection tool. This approach was chosen due to its effectiveness in gathering data from a broad population to identify trends, attitudes, and competency levels of research subjects in the use of educational technology.

The target population of this study consisted of two groups: teachers and students from Muhammadiyah Senior High Schools in Palembang City. Teachers participated because they play a central role in integrating ICT into classroom instruction, while students were included because the study examined their functional skills and ICT self-efficacy. Accordingly, different sampling procedures were applied to each group. For the teacher sample, science teachers who actively integrated ICT into their teaching were selected using simple random sampling from the eligible teacher population to ensure that each teacher had an equal probability of participation. For the student sample, simple random sampling was also employed within the participating schools to obtain a representative distribution of students across grade levels. A total of 200 respondents participated in the study, consisting of 50 teachers and 150 students. The use of separate random sampling procedures for each respondent group minimized sampling bias and improved the representativeness of the data, allowing the findings to reflect the characteristics of both teachers and students in Muhammadiyah Senior High Schools in Palembang City.

Data were collected using a self-administered questionnaire developed by the researcher to suit the needs of the local educational context. This questionnaire was designed to capture two main dimensions of competency: first, instructors' awareness of digital tools, and second, teachers' competency in information taxonomy. Structurally, this instrument divides digital literacy into three main domains: knowledge of information presentation tools, information evaluation, and information organization. To measure subject responses, a five-point Likert scale was used, allowing respondents to express their level of agreement with a series of statements. The scale ratings are as follows: 5 = Strongly Agree; 4 = Agree; 3 = Neutral; 2 = Disagree; 1 = Strongly Disagree.

Before the instrument was widely used, researchers conducted validity and reliability tests to ensure the quality of the resulting data. The validity of the model was assessed by external parties (outsiders) and through pilot testing on a selected sample of respondents to ensure that each question accurately measured what was intended. The rationale for this test was to determine the level of compliance and readiness of instructors in integrating and implementing new technologies to facilitate classroom

learning. The instrument's reliability was verified using Cronbach's Alpha scores, a statistical standard for ensuring the survey is internally consistent and valid for further analysis.

Questionnaires were distributed to respondents in various Muhammadiyah schools across several sub-districts in Palembang City. Following the source methodology, data were categorized by geographic region and gender to allow for in-depth comparative analysis. Respondents were asked to honestly report their proficiency level in using various software such as Microsoft PowerPoint, Canva, Google Scholar, and collaboration tools like Trello and Evernote.

The collected data was analyzed using descriptive statistics. The primary focus of the analysis was to calculate the percentage of digital literacy proficiency levels among instructors and students. The results were then compared across school regions and genders to identify any digital divides or differences in ICT self-efficacy. This analysis also involved hypothesis testing to determine the extent to which digital literacy and ICT self-efficacy collectively contribute to improving functional skills such as critical thinking and problem-solving. The findings from this data analysis will then be used as a basis for policy recommendations for the development of an ICT-based curriculum in Muhammadiyah schools.

3. Results and Discussion

Analysis of research findings from Muhammadiyah Senior High Schools in Palembang City reveals a complex picture of technology integration in secondary education. Overall, the study indicates that digital skills among Islamic high school students remain relatively low, largely due to limited access to advanced digital technology. However, there are significant variations in digital literacy and ICT self-efficacy levels among the schools studied: Muhammadiyah Senior High Schools 1, 2, 3, 4, 5, 6, 8, and 9 Palembang, and Aisyiyah Senior High School 1 Palembang.

3.1. Digital Literacy Level and ICT Tools Knowledge

Table 1. Digital Literacy Level and ICT Tools Knowledge of Teachers and Students

No	School Name	Percentage (%)
1	SMA Muhammadiyah 1 Palembang	35,00
2	SMA Muhammadiyah 2 Palembang	34,51
3	SMA Muhammadiyah 3 Palembang	26,00
4	SMA Muhammadiyah 4 Palembang	25,04
5	SMA Muhammadiyah 5 Palembang	21,05
6	SMA Muhammadiyah 6 Palembang	20,14
7	SMA Muhammadiyah 8 Palembang	22,01
8	SMA Muhammadiyah 9 Palembang	22,46
9	SMA 'Aisyiyah 1 Palembang	24,65

Based on data collected on instructors' and students' knowledge of digital tools for presentation, evaluation, and information organization, a significant competency gap was identified. Students at SMA Muhammadiyah 1 and SMA 2 Palembang demonstrated a better understanding of the use of presentation tools. Collectively, the results indicate that teachers have a good understanding of basic tools such as personal computer operation and Microsoft PowerPoint, but they are still unfamiliar with advanced ICT applications for assessment and information sorting.

In the Information Presentation domain, the use of PowerPoint remains the gold standard due to its ability to prepare text-based and graphical materials, making learning easier to understand. At SMA Muhammadiyah 3 and SMA 4 Palembang, the integration of tools such as Prezi has been introduced to provide the freedom of non-linear presentations, which have been shown to enhance audience attention through their spatial features. Meanwhile, at schools like SMA 'Aisyiyah 01 Palembang, the use of Canva to design infographics and visual posters is prominent, which, according to the literature, is very helpful in organizing information and enhancing visual learning. The ability to use these tools is not simply a technical task but a crucial step in improving students' digital communication skills, which are highly sought after in the modern job market (Van Audenhove et al., 2024; Mayer, 2022).

In terms of Information Evaluation, the findings indicate persistent weaknesses. Most students and teachers at schools such as SMA Muhammadiyah 8 and SMA 9 Palembang have not fully utilized information credibility assessment tools despite their important role in facilitating access to credible scholarly information and supporting evidence-based learning. Likewise, plagiarism detection systems

are underutilized, reducing opportunities to promote academic integrity and scientific writing skills. From the perspective of Cognitive Load Theory, this limited utilization may reflect not only insufficient technical competence but also instructional and contextual constraints (Sweller et al., 2019). When research-based learning activities are infrequently integrated into the curriculum, students have limited authentic opportunities to develop information evaluation skills using academic search and plagiarism detection technologies. Furthermore, teachers' limited digital competence may constrain their ability to model effective information evaluation strategies and digital safety practices, thereby increasing students' extraneous cognitive load when interacting with unfamiliar digital technologies (Falloon, 2020). As a result, students may devote greater cognitive resources to understanding how to operate digital tools than to critically evaluating the credibility and relevance of information sources (Kalyuga & Singh, 2016). These findings suggest that strengthening information evaluation competencies requires not only improved access to digital technologies but also curriculum integration, teacher professional development, and scaffolded learning experiences that progressively reduce extraneous cognitive load while enhancing students' digital literacy and critical thinking skills (Van Audenhove et al., 2024).

For Information Organization, digital tools like Evernote and Microsoft OneNote have begun to be adopted at SMA Muhammadiyah 5 and SMA 6 Palembang to replace traditional notebooks. These tools allow students to manage multimedia data hierarchically, simplifying research and independent study. Furthermore, Trello has been used in group assignments to sort data through task boards, directly improving teamwork and monitoring project progress. The use of MindMeister has also been found to aid students in brainstorming and problem-solving through the creation of mind maps that visualize complex information structures.

3.2. The Interplay between Digital Literacy and ICT Self-Efficacy

Table 2. Interplay of digital literacy skills and ICT self-efficacy in enhancing functional skills

Gender	Percentage								
	SMA Muh. 1	SMA Muh. 2	SMA Muh. 3	SMA Muh. 4	SMA Muh. 5	SMA Muh. 6	SMA Muh. 8	SMA Muh. 9	SMA 'Aisyiyah 1
Male	24,04	23,17	23,71	21,55	23,45	24,16	21,06	20,03	13,82
Female	13,06	14,66	13,43	13,89	14,13	14,46	12,37	12,57	25,02
Total	37,10	37,83	37,14	35,44	37,58	38,62	33,43	32,6	38,84

Research confirms a strong relationship between digital literacy and ICT self-efficacy in improving students' functional skills. ICT self-efficacy, defined as an individual's level of confidence in performing tasks using technology, has been shown to be a key predictor of academic success. Students with high ICT self-efficacy scores consistently perform best in critical thinking and problem-solving skills.

The findings indicate that ICT self-efficacy significantly influences students' engagement with digital technologies, thereby contributing to the development of functional competencies. Students who demonstrate higher confidence in using digital learning technologies are more likely to persist when encountering complex technological tasks and to apply digital tools effectively in learning activities. This finding is consistent with Bandura's self-efficacy theory, which posits that individuals with stronger efficacy beliefs exhibit greater persistence and resilience when facing challenges. Furthermore, the interaction between digital literacy and ICT self-efficacy enables students to translate technological knowledge into authentic learning practices, thereby strengthening higher-order competencies such as analysis, synthesis, collaboration, and communication, which are widely recognized as essential twenty-first-century skills (Prior et al., 2016; van Laar et al., 2020).

3.3. Comparative Analysis Based on Gender

Table 3. Current level of digital literacy tools, teacher's knowledge about presentation of information, evaluation, organization of information

Gender	Percentage								
	SMA Muh. 1	SMA Muh. 2	SMA Muh. 3	SMA Muh. 4	SMA Muh. 5	SMA Muh. 6	SMA Muh. 8	SMA Muh. 9	SMA 'Aisyiyah 1
Male	22,41	25,73	25,65	23,23	25,40	26,19	23,63	22,34	15,24
Female	15,16	16,61	15,32	15,66	16,35	16,41	14,30	14,51	27,31
Total	37,57	42,34	40,97	38,89	41,75	42,60	37,93	36,85	42,55

One of the most striking findings of this study is the gender gap in digital literacy and ICT self-efficacy. Overall, male students in Muhammadiyah schools in Palembang reported greater levels of

technology use and higher self-efficacy than female students. This reflects the ongoing digital parity within the student population, where social norms sometimes impact women's access to and confidence in interacting with technology.

However, specific data provide interesting findings and offer hope for institutions such as SMA 'Aisyiyah 01 Palembang, a predominantly female school. The finding that female teachers performed 27.31% better than male teachers in digital literacy courses demonstrates that, given appropriate training and institutional support, women can surpass the average performance standard. Furthermore, in terms of ICT self-efficacy, female teachers in the school achieved a score of 25.02%, significantly higher than that reported for their male counterparts in other regions. These findings suggest that lower ICT self-efficacy among women should not be interpreted as an inherent limitation but rather as a reflection of unequal educational opportunities, sociocultural expectations, and differential access to professional development (Siddiq & Scherer, 2019; van Deursen & van Dijk, 2019). In the context of SMA 'Aisyiyah 01 Palembang, the predominantly female educational environment may have reduced the influence of gender stereotypes traditionally associated with technology use. Such an environment provides greater opportunities for female teachers to assume leadership roles, participate in technology-related professional development, and observe successful female colleagues integrating digital technologies into classroom practice. Consistent with Bandura's social cognitive theory, these vicarious experiences and supportive organizational conditions can strengthen self-efficacy and encourage collaborative professional learning (Tondeur et al., 2021). Consequently, the findings indicate that institutional culture can serve as an enabling sociocultural context that promotes women's digital competence and reinforces the view that gender disparities in digital literacy are shaped primarily by educational opportunities and contextual factors rather than gender itself (Ertosun & Adiguzel, 2018).

3.4. The Impact of Digital Tools on Functional Skills

The integration of digital technologies in learning at SMA Muhammadiyah 1–9 Palembang has the potential to strengthen students' functional competencies in several domains. First, digital information evaluation tools encourage students to critically assess and synthesize information from credible sources, thereby fostering critical thinking (McGrew et al., 2018; Jones-Jang et al., 2021). Second, collaborative and knowledge-organization technologies support problem-solving by enabling students to break complex tasks into manageable components and coordinate project activities effectively (van Laar et al., 2020; Chen et al., 2018). Third, digital collaboration platforms facilitate communication, teamwork, and shared responsibility in group learning, enhancing students' interpersonal competencies (Chen et al., 2018). Finally, digital presentation and visual design technologies promote creativity and communication by enabling students to organize and present ideas in engaging and meaningful ways, competencies that are increasingly important in higher education and professional contexts (Falloon, 2020; UNESCO, 2023).

3.5. Discussion and Educational Implications

These findings have serious implications for curriculum development within Muhammadiyah. A key issue identified is that digital literacy is often viewed solely as the ability to use hardware, while advanced information evaluation and organization skills remain neglected. The gap between schools in urban centers (such as SMA Muhammadiyah 1) and schools that may have more limited access to resources (such as SMA Muhammadiyah 8 or 9) highlights an infrastructure disparity that must be addressed immediately.

Failure to develop ICT self-efficacy early on can hinder students' future career prospects, particularly for female students who may feel less confident pursuing careers in technology. Therefore, it is crucial for Muhammadiyah schools to not only provide physical devices but also to build an inclusive and supportive digital culture.

3.6. Recommendations for Future Development

Based on the above findings, several strategic recommendations are proposed for Muhammadiyah Senior High Schools in Palembang City, including: 1) Integration of Comprehensive Training Programs: Schools should implement digital literacy training programs that focus not only on ICT basics but also on advanced tools for presentation, evaluation, and information organization; 2) Adoption of Gender-Sensitive Strategies: Given the disparity in self-efficacy, schools (especially SMA 'Aisyiyah 01) should create strategies that encourage female students to engage more confidently with technology through dedicated digital competitions or clubs; 3) Investment in Infrastructure and Resources: Continuous investment is needed to improve access to digital resources to ensure equal opportunities for all students

to develop functional skills; 4) Continuous Teacher Training: Providing training for teachers is crucial to enable them to implement ICT appropriately in the classroom, thereby facilitating the adoption of technology integration in the teaching process as a whole.

In summary, this study confirms that digital literacy and ICT self-efficacy are key elements that can improve functional skills such as critical thinking, problem-solving, and communication in secondary schools. By closing the digital and gender gap, Muhammadiyah schools in Palembang will be better prepared to equip their students to face the challenges of the ever-evolving digital world.

4. Conclusion

This study concludes that digital literacy and ICT self-efficacy are fundamental, interrelated elements in improving students' functional skills at Muhammadiyah Senior High School in Palembang. Key findings indicate that while awareness of basic tools such as computer operation and PowerPoint is quite good, utilization of advanced applications for information evaluation and data organization remains very limited among instructors and students. A significant positive correlation was found, with students with high levels of ICT self-efficacy consistently demonstrating superior performance in critical thinking and complex problem-solving skills.

However, the challenge of a gender gap in digital competency remains significant, with male students generally having higher confidence in using technology than female students. Nevertheless, the study's findings offer hope that interventions through appropriate training can empower female students to surpass the average standard of self-efficacy. Therefore, schools such as Muhammadiyah Senior High Schools 1 to 9 and 'Aisiyah Senior High School 01 are strongly recommended to integrate a comprehensive ICT curriculum and provide equitable digital infrastructure. By strengthening digital literacy and building technological confidence in an inclusive manner, students will be better prepared to face the dynamics of the ever-evolving and competitive digital world.

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