

Empowering Future Educators: Analyzing Digital Literacy Skills in Elementary Teaching Assistants (TAS)

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ABSTRACT

Digital literacy skills are essential for leveraging technological advancements and addressing various challenges in the era of Society 5.0. This study aims to analyze the digital literacy competencies of elementary teaching assistants and their preparedness to support digital learning environments. A quantitative descriptive research method was employed, with a population consisting of 246 fifth-semester students from the Elementary Teacher Education Program at the Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, during the 2024/2025 academic year. A sample of 70 students was selected using a simple random sampling technique. Data collection was conducted through a structured questionnaire assessing digital literacy skills. The data analysis employed descriptive statistical methods to evaluate digital literacy levels across multiple competencies. The findings indicate that 49.2% of respondents demonstrated proficiency in functional skills, creativity, collaboration, communication, information retrieval and selection, critical thinking and evaluation, cultural and social understanding, and e-safety. However, 65.2% of respondents struggled with effectively searching for and selecting information across six digital literacy dimensions. Based on the initial data analysis, it is concluded that the digital literacy skills of students in the Elementary Teacher Education Program are categorized as "insufficient." Further interventions are necessary to ensure that future educators develop the competencies required to adapt to technological advancements and become proficient in digital learning environments.

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1. INTRODUCTION

The rapid advancement of digital technology has significantly transformed the educational landscape, requiring teachers and teaching assistants to possess strong digital literacy skills (Putro et al., 2024). In elementary education, where foundational learning occurs, the role of teaching assistants (TAs) has expanded beyond traditional classroom support to include digital instruction, online resource facilitation, and technology integration (Chootongchai et al., 2021). Research by the International Society for Technology in Education (ISTE) indicates that over 80% of elementary schools in developed nations have integrated digital learning tools into their curriculum, further emphasizing the necessity for digital literacy among educators (Erwin & Mohammed, 2022a). However, despite this integration, gaps in digital proficiency among teaching assistants remain a pressing concern.

Digital literacy encompasses a range of competencies, including the ability to use digital tools effectively, critically evaluate online information, and ensure responsible digital citizenship. The European Commission's Digital Education Action Plan highlights that only 47% of educators in primary education feel confident in utilizing digital tools for student engagement (Tinmaz et al., 2022). This statistic underscores the urgent need to equip teaching assistants with the necessary skills to facilitate digital learning effectively. Given that TAs often serve as intermediaries between students and teachers, their digital competencies can directly influence learning outcomes and classroom efficiency (Hemelt et al., 2021).

Empirical studies have demonstrated a correlation between digital literacy and student performance. According to a report by the Organization for Economic Cooperation and Development, students in classrooms where educators demonstrate high digital competency score 17% higher in literacy and numeracy assessments compared to those in digitally under-equipped environments (Arslantas & Gul, 2022). This finding highlights the critical role of teaching assistants in bridging the digital divide, particularly in underserved communities where access to technology and digital training is limited. Without targeted professional development, TAs may struggle to meet the increasing demands of digital education.

Despite these pressing needs, current teacher training programs often fail to prioritize digital literacy among teaching assistants. A survey conducted by the National Center for Education Statistics (NCES) found that only 39% of teaching assistants in elementary schools receive formal digital skills training (Chootongchai et al., 2021). Furthermore, many training programs focus on teachers rather than on the supporting staff who play a crucial role in daily instruction (Hidayah, 2019; Holilah1 et al., 2024; Supriyanto et al., 2023). This lack of emphasis on digital literacy among TAs results in inconsistent technology implementation and reduced instructional efficacy (Wang et al., 2021).

One of the significant challenges in enhancing digital literacy among teaching assistants is the disparity in access to professional development resources. Research from the World Bank indicates that schools in lower-income regions allocate only 15% of their professional development budget to support staff training, whereas wealthier districts allocate up to 40% (Reddy et al., 2023). This disparity contributes to an uneven distribution of digital competencies, exacerbating educational inequalities. Addressing this issue requires systematic policy interventions and targeted investments in digital skills programs for teaching assistants. The COVID-19 pandemic further exposed the digital preparedness gap in elementary education. A global study by UNESCO revealed that during remote learning periods, 62% of teaching assistants reported difficulties in adapting to online teaching platforms due to inadequate training (Robertson & Yazan, 2022). This disruption affected the quality of student engagement and learning continuity. The pandemic has, therefore, acted as a catalyst for recognizing the importance of digital literacy among all educational personnel, not just lead teachers (Mutiani et al., 2021).

Efforts to improve digital literacy among teaching assistants have begun in several countries, with promising results. In Finland, for example, the introduction of mandatory digital competency training for educational staff led to a 35% improvement in the effective use of digital tools in primary education (Arono et al., 2022a). Similar initiatives in Singapore and Canada have shown positive outcomes,

suggesting that structured training programs can bridge existing skill gaps and empower TAs to contribute more effectively to digital learning environments (Webster & De Boer, 2021).

Given the increasing reliance on technology in classrooms, the integration of digital literacy training into teaching assistant certification programs is imperative. Policymakers and educational institutions must collaborate to develop comprehensive digital skills curricula tailored to the unique needs of teaching assistants (Giangreco, 2021; Qi et al., 2021a). This approach will ensure that TAs are not only equipped to support teachers but can also independently facilitate digital learning activities that enhance student engagement and achievement. Moreover, fostering a culture of continuous digital learning is essential for sustainable improvement. Schools must provide ongoing professional development opportunities, including workshops, micro-credentialing programs, and peer-learning initiatives (Cwik & Singh, 2022; Giangreco, 2021; Jia et al., 2024). A study by the EdTech Research Network found that TAs who engage in continuous digital training exhibit a 28% increase in technology integration effectiveness compared to those with limited training exposure (Jardi et al., 2022).

In conclusion, empowering future educators requires a concerted effort to enhance the digital literacy of elementary teaching assistants. As digital tools become increasingly embedded in education, the role of TAs in supporting technology-driven learning becomes more critical (Jia et al., 2024; Robertson & Yazan, 2022). Addressing the existing training gaps, ensuring equitable access to professional development, and embedding digital literacy in certification programs are key steps toward fostering a technologically proficient support workforce. By prioritizing these efforts, educational institutions can create a more inclusive, effective, and digitally capable learning environment for future generations (Yasir et al., 2024).

Additionally, it is crucial to recognize the psychological and pedagogical implications of digital literacy among teaching assistants. Studies have shown that TAs who feel competent in digital environments exhibit higher job satisfaction and confidence in supporting students. According to the Journal of Educational Technology, 71% of teaching assistants with advanced digital training reported feeling more effective in their roles compared to only 39% of those with limited exposure to digital tools (Qi et al., 2021b). This highlights the importance of structured training in fostering a sense of professional competence. Another important consideration is the ethical dimension of digital literacy. Teaching assistants must be well-versed in data privacy, cybersecurity, and responsible digital citizenship to protect students in an increasingly connected world. A study by the Center for Digital Ethics revealed that 58% of educators lacked comprehensive knowledge of digital safety protocols, emphasizing the need for training programs to incorporate modules on online ethics and security (Erwin & Mohammed, 2022b).

Ultimately, the role of elementary teaching assistants in the digital era cannot be overstated. By ensuring they are well-equipped with essential digital literacy skills, educational institutions can enhance student engagement, foster innovative learning environments, and bridge the technology gap in primary education. Future research should explore longitudinal studies on the impact of digital literacy programs to refine best practices and continuously adapt to the evolving educational landscape.

2. METHODS

The research employed a quantitative descriptive method to objectively describe the digital literacy levels of students based on collected data. This method was chosen because it provides a clear picture of the actual state of students' digital literacy while allowing statistical analysis to identify patterns, trends, and potential areas for improvement (Mohajan, 2020). By using this approach, the study generates data-driven findings that can be used to design more effective interventions to enhance digital literacy among future educators.

The population of this study comprised 246 fifth-semester students enrolled in the Elementary Teacher Education Program at the Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, during the 2024/2025 academic year. These students were selected as the target group due

to their critical stage in teacher training, where digital literacy skills are increasingly essential for their future roles as educators. At this stage of their academic journey, students are expected to be familiar with digital learning tools and pedagogical strategies that integrate technology into elementary education. Their participation in this study provides valuable insights into the effectiveness of existing digital literacy training and the potential gaps that need to be addressed.

To ensure a representative sample, 70 students were selected using a simple random sampling technique. This method was chosen to provide each student in the population an equal opportunity to be included in the study, reducing potential bias and increasing the generalizability of the findings. Simple random sampling is particularly beneficial in educational research as it allows for an unbiased estimation of digital literacy levels among prospective teaching assistants. By selecting participants at random, the study ensures that the findings can be used to make broader inferences about digital competencies among future elementary school educators.

The data collection process was carried out using a structured questionnaire designed to assess multiple aspects of digital literacy skills. The questionnaire was developed based on established digital competence frameworks, ensuring that it covered a comprehensive range of competencies, including functional digital skills, critical thinking in digital environments, online collaboration, and information retrieval. The use of a structured questionnaire allowed for standardized data collection, facilitating the comparison of responses across different participants. Additionally, the questionnaire format ensured that participants could provide responses efficiently, minimizing response biases and maximizing data reliability (Jensen, 2020).

The collected data were analyzed using descriptive statistical methods to evaluate digital literacy levels across various competencies. Descriptive statistics, including measures such as mean, standard deviation, and frequency distributions, were used to summarize and interpret the data. This analytical approach provided a clear overview of students' strengths and weaknesses in digital literacy, highlighting key areas that require further improvement. By employing descriptive statistical analysis, the study was able to present an accurate and detailed depiction of digital competency levels among future elementary teaching assistants, offering valuable insights for curriculum development and teacher training programs.

3. FINDINGS AND DISCUSSION

This study involved 70 students from the Elementary School Teacher Education Program at the Indonesian University of Education. Data was obtained from an online questionnaire distributed via Google Forms. The following are the results from 70 students who responded regarding eight indicators of digital literacy.

a. Functional Skills and Beyond

The first indicator relates to students' ability to use or operate digital devices. The devices commonly used by students include PCs, laptops, mobile phones, tablets, etc. The students' abilities in this indicator can be seen in Figure 1 and Figure 2 below.

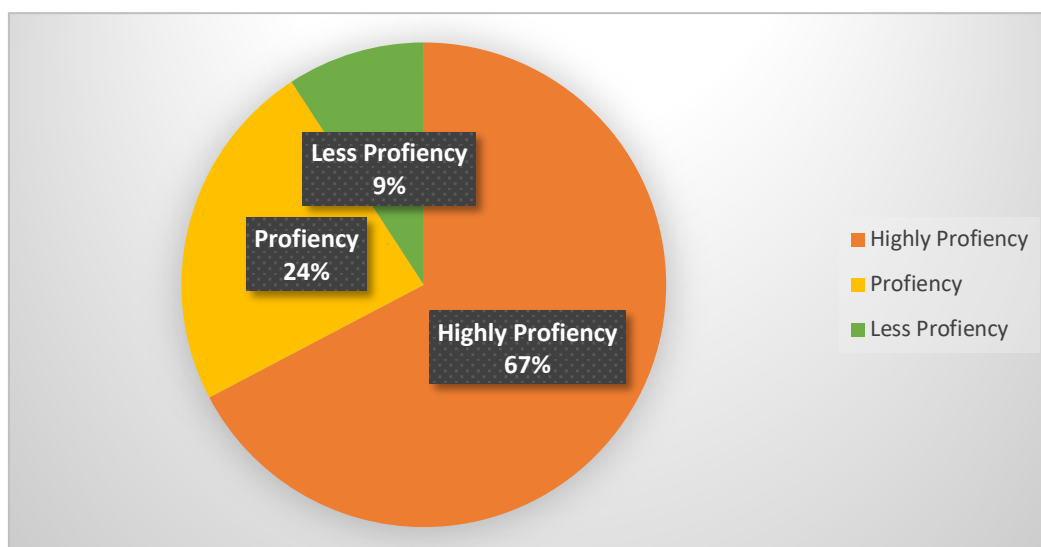


Figure 1. Student proficiency in using digital devices

From the data above, 66% of 70 students in the Elementary School Teacher Education program are highly proficient in using digital devices, and 23% are proficient. However, 9% of students still struggle or are only proficient in using a few devices.

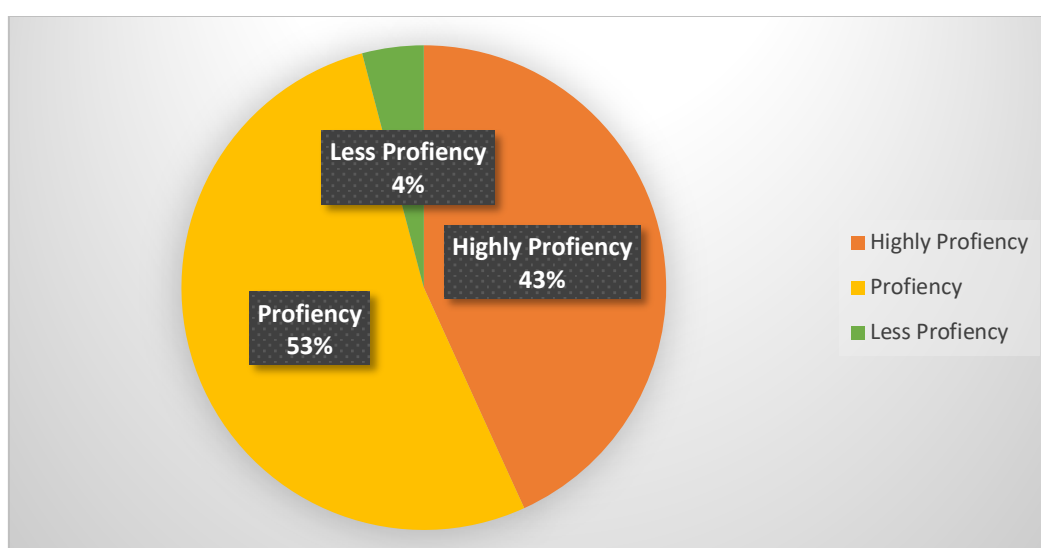


Figure 2. Student proficiency in utilizing the internet

In utilizing the internet, particularly for searching data on search engines, social media, and news portals, 43.2% of students are proficient in its use. However, 52.7% are only proficient in searching for data through social media and news portals but do not use search engines, while 4.1% rely solely on social media for information retrieval.

b. Creativity

The second indicator, Creativity, relates to presenting materials, ideas, and information using digital media. Students' abilities in this indicator are shown in Figures 3 and 4.

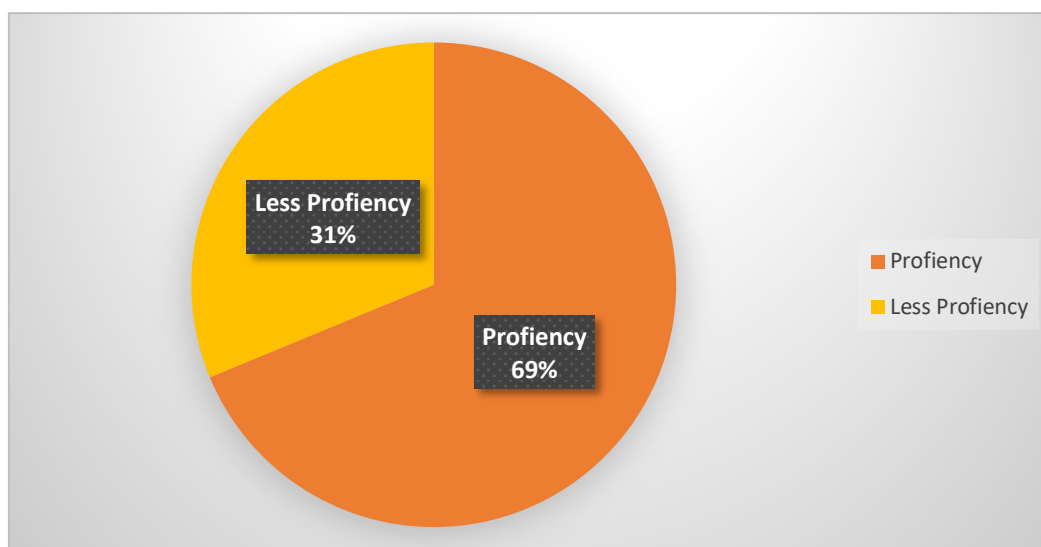


Figure 3. Student proficiency in presenting materials and information

A total of 68.9% of students are proficient in using digital media to present materials and information, including learning materials and social media captions. However, 31,3% of students still lack creativity in presenting materials and information.

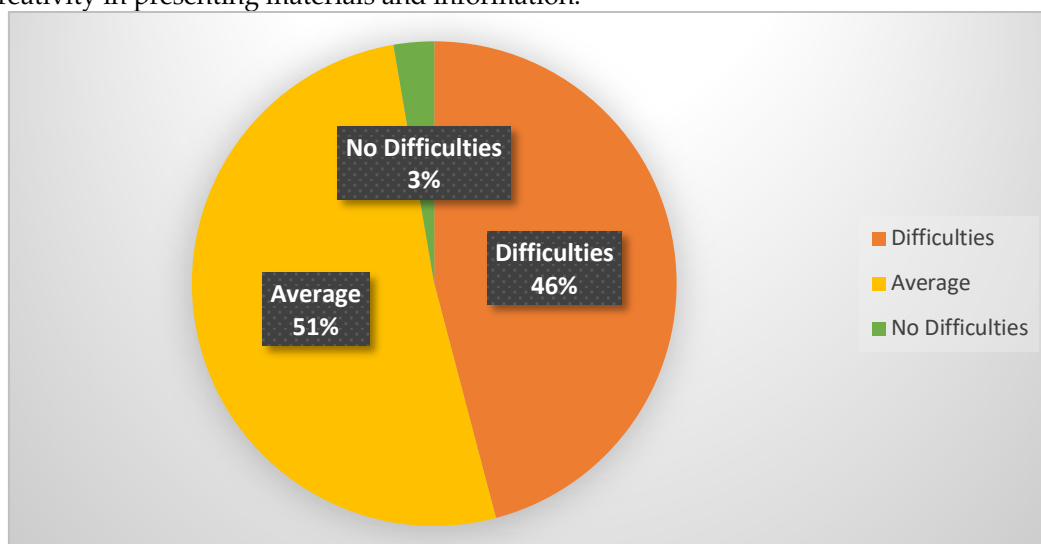


Figure 4. Student ability to plan and explore ideas creatively and imaginatively

In planning and exploring ideas creatively and imaginatively, 45.9% of students experience difficulties, while 2.7% have no difficulties at all.

c. Collaboration

The third indicator, Collaboration, emphasizes students' ability to participate with others in dialogues, discussions, and idea-building. Students' abilities in this indicator are shown in Figure 5.

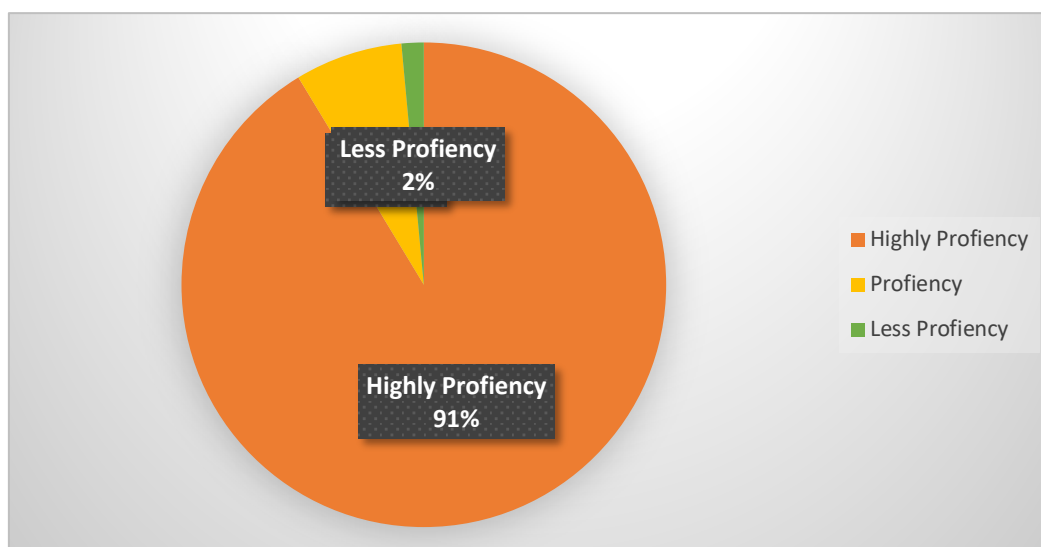


Figure 5. Student ability to understand others' ideas in digital spaces

In this indicator, 86.5% of students are proficient in understanding others' ideas, 6.8% are less proficient, and 1.4% are not proficient at all.

d. Communication

The fourth indicator, Communication, is related to the ability to communicate effectively in digital spaces, including sharing thoughts, ideas, and understanding. Students' abilities in this indicator are shown in Figure 6.

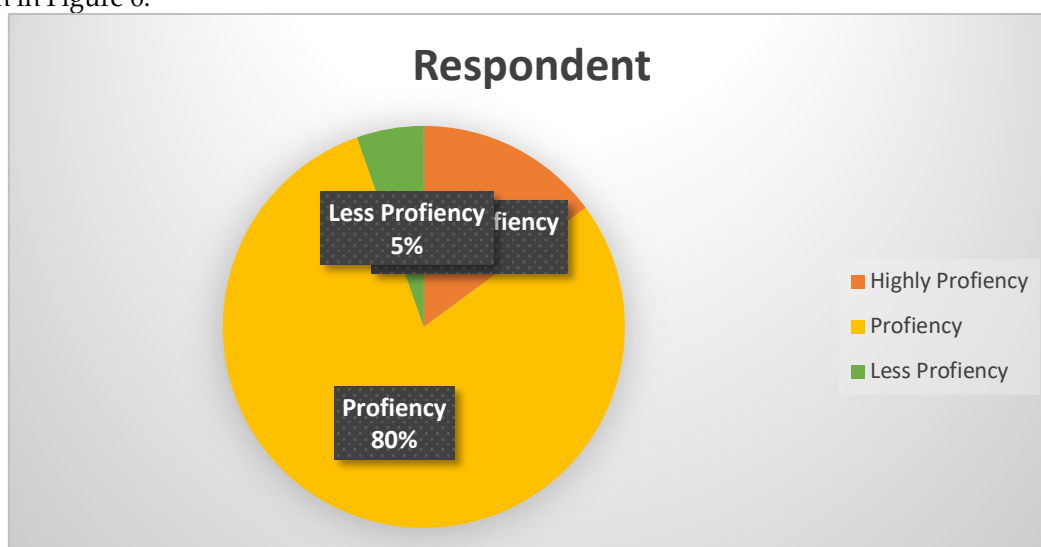


Figure 6. Communication skills through digital technology

In this indicator, 14.9% of students are highly proficient in communication, 79.7% are proficient, and 5.4% are less proficient.

e. The Ability to Find and Select Information

The fifth indicator focuses on the ability to search for and select information. In this indicator, 13.5% of students can effectively select diverse information, while 40.2% find it challenging to search for and filter information. Students' abilities in this indicator are shown in Figure 7.

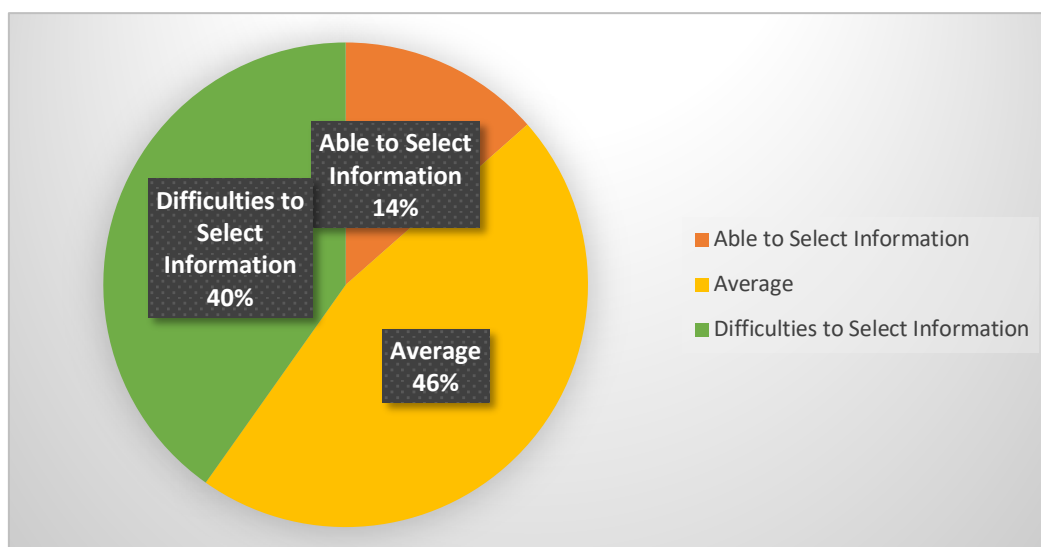


Figure 7. Student ability to search for and select information

f. Critical Thinking and Evaluation & Cultural and Social Understanding

The sixth and seventh indicators emphasize how individuals contribute, analyze, and sharpen critical thinking when encountering information in social and cultural contexts. In this indicator, 13.5% of students struggle with analyzing information, and 14.9% struggle with critically evaluating questionable information. Students' abilities in these indicators are shown in Figures 8 and 9 below.

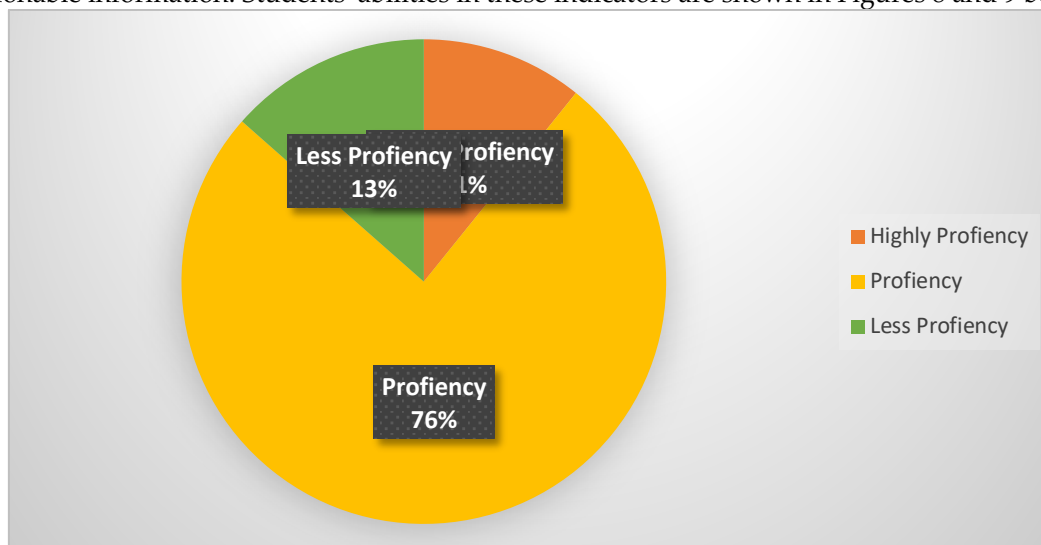


Figure 8. Student ability to analyze information

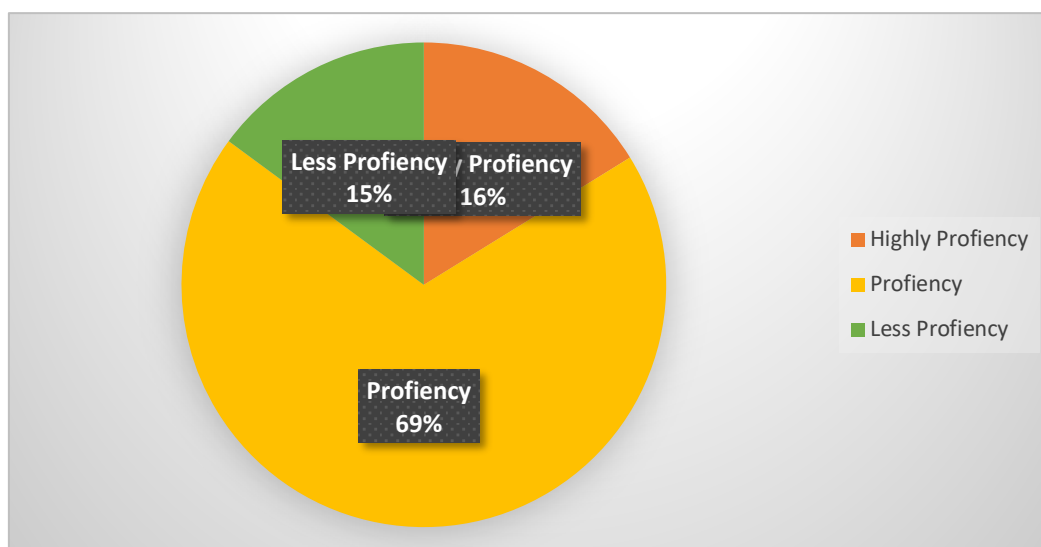


Figure 9. Student ability to think critically

g. E-safety

The eighth indicator, E-safety, ensures security when users explore, create, and collaborate using digital technology. In this indicator, 18.9% of students are highly capable of understanding digital security, 74.3% are capable, and 6.8% do not understand digital security at all. Students' abilities in this indicator are shown in Figure 10.

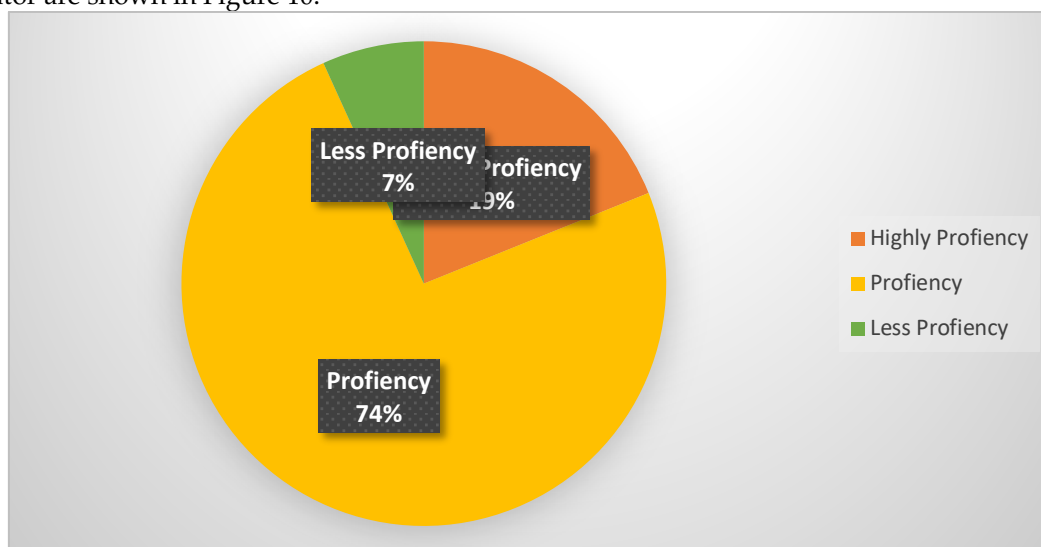


Figure 10. Student ability to understand digital security when exploring digital spaces

Based on the initial data analysis, it is concluded that the digital literacy skills of students in the Elementary School Teacher Education Program are categorized as "less proficient." Further action is required to ensure that students can become professional educators who are adaptive to technological advancements. The ability to use or operate digital devices (Indicator 1) is a crucial aspect of modern education. The **access indicator**, which refers to students' ability to access information related to finding and operating media and technology proficiently, is essential for disseminating appropriate and useful information to others (Nanjundaswamy et al., 2021; Ronzhina et al., 2021). For example, in distance learning, proficiency in using digital devices effectively is required. Moreover, utilizing digital devices is closely related to digital-based learning media (Jahnke et al., 2014). Additionally, in online learning, digital literacy facilitates participation in the learning process, making interaction and communication

more effective. The ability to use camera and microphone features on devices enables students to engage and connect virtually (Liu et al., 2020). Therefore, this skill is essential for future educators.

One of the most significant aspects is how digital devices facilitate communication between students and lecturers, as well as collaboration among students in group projects. Digital devices such as PCs, laptops, mobile phones, and tablets enable more effective and efficient communication between students and lecturers (Wibawa et al., 2018). In higher education, online learning is conducted through various communication media, such as email and LMS platforms like Google Classroom, Moodle, or Blackboard, which allow lecturers to deliver announcements, assign tasks, and receive feedback from students (Becker, 2018; Sánchez-Cruzado et al., 2021). With digital literacy skills, students can access, analyze, and utilize information effectively. However, the accuracy of the information obtained must be verified. Contextual knowledge is required to determine whether the information aligns with the relevant field of study. To achieve a high level of digital literacy, pedagogy plays a crucial role. Innovative and structured pedagogical approaches provide a strong foundation for students to develop their digital skills (Leaning, 2019; Ramadhan et al., 2019; Tang & Chaw, 2016).

The findings of this study highlight the existing gaps in digital literacy competencies among elementary teaching assistants. Despite the growing integration of technology in educational settings, a significant portion of the respondents demonstrated insufficient digital literacy skills, particularly in information retrieval and selection. This aligns with previous studies indicating that digital literacy challenges often stem from limited exposure to systematic training and a lack of critical evaluation skills when interacting with digital content (Ihsan et al., 2024).

A key aspect of digital literacy is the ability to critically assess and validate information. The data indicate that 65.2% of respondents struggled with this competency, suggesting a pressing need for targeted interventions in digital information literacy. This is particularly crucial given the increasing prevalence of misinformation and the necessity for educators to model proper information evaluation practices for their students. Without sufficient proficiency in this area, teaching assistants may inadvertently contribute to the spread of unreliable content, ultimately impacting the quality of education delivered.

The study also reveals that 49.2% of respondents exhibited proficiency in functional digital skills, including basic tool usage, creativity, collaboration, and communication. While this percentage indicates that nearly half of the sample possesses foundational digital competencies, the results suggest a need for further enhancement in applied digital skills. Effective digital instruction requires more than just functional proficiency; it necessitates the ability to integrate technology meaningfully into pedagogical practices, which many teaching assistants may not yet be fully prepared to do (Sari dkk., 2024).

Another significant finding is the disparity in digital literacy skills across different competency areas. While some respondents demonstrated strong capabilities in certain aspects, their weaknesses in others suggest an unbalanced digital skill set. This inconsistency could be attributed to the varied nature of digital exposure in teacher education programs, as well as the limited emphasis placed on digital pedagogy in current curricula. Addressing this issue requires a more structured approach to digital literacy training, ensuring that teaching assistants develop well-rounded competencies that align with modern educational demands (Cahya dkk., 2024).

Furthermore, the study underscores the importance of continuous professional development in digital literacy. Given that digital technologies evolve rapidly, initial training alone is insufficient to equip future educators with long-term competencies (Amelia et al., 2021; Arono et al., 2022b; Zan et al., 2021). Institutions must prioritize ongoing training programs, workshops, and hands-on learning experiences that allow teaching assistants to refine their digital skills over time. Collaborative learning environments, where TAs can engage with peers and educators to share best practices, can also serve as effective strategies for bridging digital literacy gaps (Bosanquet et al., 2021).

The role of institutional support in fostering digital literacy is also crucial. Universities and teacher training institutions must integrate digital literacy courses into their core curricula to ensure that

teaching assistants acquire the necessary skills before entering the classroom (Robertson & Yazan, 2022; Wang et al., 2021). This includes not only technical proficiency but also pedagogical strategies that enable the effective use of digital tools in instructional settings. By embedding digital literacy into formal education, future educators can be better prepared for the evolving landscape of digital learning (Farias-Gaytan et al., 2022; Koltay, 2011; Ng, 2012).

Moreover, exposure to real-world teaching experiences that incorporate digital tools can significantly enhance digital literacy among teaching assistants. Internship programs, micro-teaching sessions, and digital-based lesson planning can serve as practical avenues for students to apply their digital competencies in authentic educational contexts (Mittal et al., 2024; Ronzhina et al., 2021). This hands-on approach fosters confidence and adaptability in utilizing technology for teaching and learning purposes. Another key implication of this study is the necessity of fostering a growth mindset among future educators regarding digital literacy (Becker, 2018; Polizzi, 2020; Ramadhan et al., 2019). Given the rapid advancements in educational technology, a fixed mindset toward digital skills may hinder professional growth and adaptability. Encouraging a culture of lifelong learning and technological curiosity can empower teaching assistants to proactively engage with new digital tools and innovations in education (Bosanquet et al., 2021; Jardí et al., 2022; Qi et al., 2021b).

In addition to formal training, peer mentoring and collaborative learning can serve as effective mechanisms for improving digital literacy skills. Establishing communities of practice among teaching assistants, where they can share digital resources, teaching strategies, and troubleshooting experiences, can create a supportive learning environment. Such initiatives can enhance digital competence through collective knowledge-building and peer support. Finally, policymakers and educational stakeholders must recognize the significance of digital literacy in shaping future educators. Investments in digital infrastructure, teacher training programs, and access to up-to-date educational technologies are necessary to bridge the digital literacy gap. By aligning institutional policies with digital competency frameworks, educational systems can ensure that teaching assistants are equipped with the skills required to thrive in the digital age. In conclusion, the findings of this study emphasize the need for structured, continuous, and comprehensive digital literacy training for elementary teaching assistants. The identified weaknesses in digital information retrieval, critical thinking, and applied digital pedagogy highlight key areas for improvement. By implementing targeted digital literacy programs and fostering a culture of lifelong learning, educational institutions can ensure that future educators are well-prepared to navigate and facilitate technology-driven learning environments (Santosa dkk., 2024).

4. CONCLUSION

The findings of this study highlight significant gaps in digital literacy skills among elementary teaching assistants. Based on the initial data analysis, it is concluded that the digital literacy skills of students in the Elementary School Teacher Education Program are categorized as "less proficient." Further action is required to ensure that students can become professional educators who are adaptive to technological advancements. The ability to use or operate digital devices is a crucial aspect of modern education. The access indicator, which refers to students' ability to access information related to finding and operating media and technology proficiently, is essential for disseminating appropriate and useful information to others. While nearly half of the respondents demonstrated proficiency in fundamental digital skills, a considerable percentage struggled with effectively searching for, selecting, and critically assessing digital content. This indicates an urgent need for structured digital literacy training programs that equip future educators with the necessary competencies to navigate technology-driven learning environments. Without adequate digital proficiency, teaching assistants may face challenges in integrating technology into their instructional practices, potentially limiting the effectiveness of digital education in elementary schools. To address these challenges, educational institutions must prioritize continuous and systematic digital literacy development. This can be achieved through targeted training programs, hands-on digital workshops, and collaborative learning initiatives that enhance teaching

assistants' abilities to utilize digital tools effectively. Additionally, integrating digital pedagogy into teacher education curricula can ensure that future educators develop well-rounded competencies necessary for 21st-century education. By fostering a culture of lifelong learning and technological adaptability, institutions can empower future educators to become proficient digital facilitators, ultimately improving the quality of digital learning experiences for elementary school students.

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