Digital Literacy Practices of Pre-service English Teachers: An Analytical Study

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Abstract

The study explores digital literacy of pre-service English teachers in Yogyakarta, Indonesia, given the growing need for technology integration in English teaching and learning. Quantitative descriptive research was used, data were obtained by a questionnaire answered by 105 students who attended the English Language Education Department at a private university. The instrument, which was also reviewed by expert judgment and pilot tested for reliability using Cronbach's Alpha ($\alpha = 0.956$), assessed different components of digital literacy that comprised: information literacy, media literacy, digital scholarship, creativity, communication, collaboration, and digital citizenship. The results indicate the participants were relatively computer-literate (mean score of 3.41 across all items). The largest unit was information literacy, where students demonstrated a high level of competence regarding search and retrieval, evaluation, and organization; to a lesser extent, they mastered topics such as digital identity or advanced creativity. The research is of interest across the globe and to both educators and pre-service English teachers who are not only technologically literate, but also aware of intellectual property protection and ethical information behaviour in digital environments. These results highlight the importance of ongoing professional and curriculum development to fill in gaps in DSL (digital skills literacy), so that future teachers are fully prepared to effectively use technology in the 21st-century classroom. Integrating digital literacy in the higher education process with reference to the pre-service English language teachers.

1. Introduction

The fact that society is increasingly more digital raises digital competences as a foundational skill for current education, especially in moments like these, when teaching-learning strategies and techniques change at the same rate as technology advances. Today, teacher expertise with digital tools is not enough. Rather, they should cultivate digital literacy as a 'way of thinking' that enables them to develop a critical eye to examine digital resources, integrate technology into the course design process on their own persuasive merits and design applicable pedagogically sound and ethically developed kinds of digital content (Wang & He, 2022). This growing relevance is evident from recent studies. In the systematic review of Sogalrey et al., (2024) on digital literacy, literature output saw continuous annual increase with more research conducted to know what it means to be a digitally literate person, how it is measured, and integrated throughout educational contexts. Similarly, a Scopus-driven review by George Reyes and Avello-Martínez (2021) suggests it is crucial to investigate the employment of digital competence frameworks in diverse educational situations.

In the context of teacher education, technology literacy – or, more commonly known as digital literacy -- is especially important. For preservice teachers, developing strong digital competencies is necessary not only to support their academic learning but also to help them provide effective technology-

based instruction. Previous studies consistently note that digital literacy is multifaceted, encompassing technical competence, critical thinking, creativity, cooperation, and reflection. This complexity underscores the need to consider digital literacy in a multimodal way in assessment and professional development activities (Nur et al., 2023).

Yet, despite the growing literature on digital literacy, key gaps remain, particularly in terms of understanding how contextual factors influence pre-service English teachers' digital literacy in under-investigated contexts. There are a few empirical studies that could be useful for the research context in Indonesia. Nur, Sahril and La Sunra (2023) discovered that pre-service English teachers in Makassar mostly utilise information literacy, while the use of digital skills would have a positive impact on their teaching performance, specifically in supporting creative instructional content. A comparative investigation by Yuvita et al. (2023) found that the level of digital literacy among pre-service English teachers in Indonesia and Thailand was a concern, as many participants were positioned within an intermediate range across the four domains. Information literacy tended to be weaker. Likewise, Ambarwati et al. (2025) found a general "moderate" level of digital competence among pre-service English language teachers in Indonesia across data literacy, collaboration, content creation, safety, and problem-solving. Outside Southeast Asia, a qualitative study from Hong Kong showed that although pre-service language teachers have a positive attitude toward educational technology, this may not lead to effective classroom use, especially when infrastructure and institutional support are lacking (Lu et al., 2025).

In sum, these insights underscore the need for further empirical work in diverse cultural and institutional environments to draw comprehensive conclusions, especially as it relates to under-resourced regions and populations. Therefore, Yogyakarta, Indonesia, offers a relevant site for the study of pre-service English teachers' digital literacy. On the one hand, Yogyakarta is home to robust educational traditions, which may have implications for pre-service teachers' digital literacy levels. On the other hand, Yogyakarta, like the rest of Indonesia and Southeast Asia in general, struggles with resource distribution inequality and infrastructure development, making it a representative environment for studying the topic in the surveyed region. Therefore, this study aims to identify the English pre-service teachers' digital literacy and the dominance of its dimensions at a private Islamic university in Yogyakarta. Moreover, the study aims to assess the context, such as the availability of technology and infrastructure, and the institutional support system, which may ease or create barriers to the integration of digital tool literacy by the given pre-service teachers. Therefore, exploring the given site for the study may help develop insights to close current research gaps and inform policymakers, teacher educators, and higher education institutions regarding pre-service teacher development in the context of digital tool readiness growth in a resource-scarce environment.

2. Literature Review

Digital literacy is one of the sought-after 21st-century skills, and it goes beyond simply 'the ability to use digital technology.' According to Gilster, it is the ability to understand and utilize information in various formats and using other media, particularly via computer- mediated channels (as cited by Bawden (2008). UNESCO considers digital literacy as the ability to access, manage, understand, integrate, and communicate information in digital contexts (safeguarding it through a critical use) for work, employability, learning, or social inclusion; its description includes computer literacy competencies (Aguaded et al., 2018). Likewise, the University of Illinois Library describes it as the ability to use digital tools, including computer software and hardware devices (to discover, evaluate, and create information), and to complete tasks effectively in digital environments (as cited in Osterman). Together, these views situate digital literacy as a higher-order proficiency for processing complexity in information-rich environments with technical, cognitive, and ethical sensitivity.

Governments and other authorities have introduced models to implement digital literacy. For example, the British Columbia framework references attitudes, mindsets, and proficiencies that are needed to be able to access, organize, analyze, and communicate information effectively (Rahman et al., 2020). Key skills include research and information literacy, information management, critical thinking and creativity, digital citizenship, collaborating, and technical fluency. Critical and information literacy focuses on ethical use of digital tools in locating, evaluating, and managing quality information (Lestariani, 2023; Reichert et al., 2020). Critical thinking enables students to solve problems and make

responsible decisions using electronic means (Tinmaz et al., 2022), while advanced ICT skills facilitate project management and teamwork (Nikou & Aavakare, 2021). In the former sense, creativity is understood as applying technology to create knowledge and innovation (Wei, 2023) and digital citizenship means ethically, safely, and socially responsibly using technology (Lewin et al., 2021; Tozzo et al., 2022; Pérez-Torres, 2024). It is paramount to respect intellectual property rights and ethical information sharing (Bonadio et al., 2022; Zhong et al., 2022). Lastly, communication, cooperation, and technical activities ensure that individuals can access and share digital tools in their academic lives and in other contexts (Deschênes, 2024; Getenet et al., 2024; Fan et al., 2023).

ICT Watch in Indonesia has developed a framework of digital literacy focusing on protection, rights and empowerment. Protection focuses on the safety of personal data, online safety, and privacy (Carvalho et al., 2020; Cremer et al, 2022; Akinsanmi & Salami, 2021). These include rights to freedom of expression, intellectual property and social change (Pratama et al., 2022; Esteve, 2024; Madison & Klang, 2020). Inclusion emphasizes citizen journalism, entrepreneurship, and information ethics as means for civic engagement and economic inclusion (Ersoy & Dambo, 2023; Gomes & Lopes, 2022; Trixa & Kaspar, 2024).

Researchers have also labeled digital literacy as a number of domains. The Joint Information Systems Committee (JISC) toolkit also lists seven categories: media literacy, information literacy, digital scholarship, learning skills, communication and collaboration, career and identity management, and Information and Communication Technology (ICT) Literacy (as cited in Mishra & Sharma 2018; van Laar et al., 2017). Information literacy encompasses the retrieval, evaluation, and responsible use of 'information' (Crary, 2019), and media literacy provides access, critical analysis, and expression across various platforms in various ways (Trufi Murdiani et al., 2021). Digital scholarship emphasizes the role of technology in both research and knowledge distribution (Scanlon, 2018). Learning skills include flexibility and productive use of knowledge (Onur & Kozikoglu, 2020), and communication and collaboration emphasize teamwork in digital environments (Rodríguez-García et al., 2022). Career and identity management emphasises the development and protection of professional digital identities (Scanlon, 2018), and ICT literacy encompasses internet, computer, and information literacies (Santos et al., 2019).

Mobile technologies, apps, websites, search engines, social media, and cloud services are some of the tools that contribute to digital literacy. Mobiles are conducive to personal learning and peer interaction (El-Hussein & Cronje, 2010; Mammadova, 2018). Cloud-Based Learning Environments (CBLEs) may improve skills in all subjects (Khaddage et al., 2016) as well as in using sites and search engines to access educational resources and obtain vital information (Nachmias & Tuvi, 2001; Chen et al., 2021). Networking, collaboration, and scholarly engagement occur on social media (Greenhow & Lewin, 2016), and collaborative writing/research platforms exist through cloud services (Yim et al., 2014).

Student teachers who have not yet been licensed but are taking coursework and doing field work (Chand et al., 2022). They are supposed to have good pedagogical content knowledge, classroom management, and adaptability (including their ability in implementing ICT in the teaching) (Ozdas, 2018; Siregar, 2020). Digital literacy is one of the most important requirements for English teachers who need to integrate language and digital skills to educate students for 21st-century society (Falloon, 2020). Different frameworks have been used in the literature to evaluate Pre-service Mathematics Teacher Education (PMTE) students' competencies. Peled (2021) employed the Seven Domains of Digital Literacy instrument and recorded higher levels of literacy than are found in other research, but low scores with respect to advanced readiness. by applying the Teacher Digital Competency Framework and found that competencies in digital citizenship and identity were relatively strong with a need for better preparation of digital citizenship and identity, both associated with self-efficacy and motivation.

There are several studies which contribute to an understanding of digital literacy as it relates to preservice English teachers. Graduate students' high digital literacy and their readiness to adopt digital technologies have been observed by Liza and Andriyanti (2020) who emphasized the impact of training programs. Nur et al. (2023) reported pre-service teachers were able to successfully apply information, media, and communication literacies but faced difficulty with branching literacy and socio-emotional conflicts. Anggeraini et al. (2020) reported an average level of competence in the use of both social and digital media. They saw the clear necessity for further training. Together, these studies show that pre-

service teachers of English possess strong digital literacy but still have a way to go in advanced skills, collaboration, and responsible digital citizenship.

3. Method

Quantitative inquiry is employed in the present research using a survey instrument to gauge the digital literacy of pre-service English teachers in Yogyakarta. Quantitative studies provide orderly ways to collect, analyze, and interpret numerical data, especially through techniques such as surveys and experiments (Creswell, 2014). A cross-sectional survey was useful for collecting data at a single point in time to obtain information about what students think, feel, and do regarding to digital literacy (Creswell, 2014). The study was done in the English Language Education Department of a private university in Yogyakarta. This school was selected because pre-service teachers in this department use digital tools as part of their studies. Previous observations had established evidence of digital literacy practices, and the author's access to this department was helpful for data collection.

The population of the study was 130 students in the 2020 cohort (from classes A to D) in the English Language Education Department. The sample was chosen because this group of students had three years of experience at the university, so they were quite acquainted with digital literacy (Creswell, 2014). The sample of this study consisted of 105 students, selected through convenience sampling, a technique that selects respondents who are easily approachable and available for the research at the given time (Cohen et al., 2018). The information was collected using an Indonesian questionnaire designed to be understood by all participants. The questions were set in Google Forms and shared through a WhatsApp group link. Questionnaires are well known to yield organized numerical data that is relatively independent and can be statistically analyzed readily (Wilson & McLean, 1994, cited in Cohen et al., 2018). Expert judgment was used to assess the instrument's validity by senior lecturers from the English Language Education Department. Aiken's Value (V) (Aiken, 1985) was the statistical value used to analyze their reviews. The findings demonstrated that 36 items were valid (V > 0.8), and that three of the items were moderately valid ($0.4 < V < 0.8$). Therefore, all 39 items were kept, namely the valid structure (Cohen et al., 2018). Internal consistency reliability was assessed using Cronbach's Alpha. The result showed α coefficient = 0.956, indicating the instrument was "very highly reliable" as all items exceeded the 0.90 threshold (Cohen et al., 2018).

Descriptive statistics were used to summarize, interpret, and analyse data in frequencies, means, ranges and standard deviations of students' digital literacy skills (Cohen et al., 2018). Five intervals were established to classify the results: 0.00–0.80 (very low); 0.81–1.60 (low); 1.61–2.40 (moderate); 2.41–3.20 (high); and 3.21–4,00 very high). Digital literacy level index was computed as follows:

$$\text{Level} = \frac{(\sum x)/N}{Q}$$

where ∑x = total raw score, N = number of respondents, and Q = number of items. For each factor, the mean score was calculated to assess pre-service teachers' levels of digital literacy.

4. Findings and Discussion
4.1 Students' Digital Literacy Level

This research first aimed to investigate students' digital literacy at a private university in Yogyakarta. Digital literacy competency is crucial in the current educational context, particularly for pre-service teachers (Nur et al., 2023). The results indicated a very high degree of digital literacy with a mean (M=3.41) out of 4. It seems that the institution is highly successful in creating opportunities for students to engage in digital activities, enabling them to support their academic experiences through computing and day-to-day life. These results are consistent with Furqan and Rosa (2023), who reported that English Department students at their institution tended to have high levels of digital literacy. Furqan and Rosa (2023) stressed the importance of addressing obstacles such as infrastructure constraints and training opportunities.

The extremely high scores also indicate that the students are confident, motivated, and comfortable in learning through technology, which supports school participation in digital classrooms. This preparedness helps them flourish in the new millennium, where ICT integration for creativity and

communication is essential (Rahman et al., 2020). In sum, the results demonstrate the great competence of students and their institutions in developing digital literacy.

4.2 Dominant Components of Digital Literacy

The Digital Literacy categories examined revealed that Privacy and Security and Balanced Attitude toward Technology were among the highest rated. There was high behavioral intention regarding personal Data Protection, online safety, and ethical behavior in technology use (privacy & security score = 3.57). This is consistent with Sadeli and Irawati (2023) that students are aware of the risk on privacy, however, still have difficulty applying protective measures. An ambivalence toward technology likewise received a score of 3.54, suggesting students were discerning about positive and negative aspects of digital interaction. In line with Levin and Mamlok (2021), students appreciated the role of technology for communication and learning but were cautious about potential negative effects, such as information overload and social isolation. These findings indicate that while student uptake of digital tools is low, they become reflective users of these same technologies.

4.3 Mid-Level Component: Intellectual Property Rights

The component of Intellectual Property Rights (IPR) featured in mid-level positions with an average score of 3.40. Students recognized the value of ethical and legal digital resources, considering both creators' rights and citation. Although they knew, their knowledge has room for improvement in the implementation of copyright protection and preventing violations. These results are in agreement with Pratiwi et al. (2023), who emphasized the role of IPR in promoting innovation, and sustainable development. Therefore, additional education might be necessary to enhance students' practical knowledge of IPR in digital learning environments.

4.4 Lowest Components: Citizen Journalism and Information Management

In terms of the overall digital literacy, Citizens' Journalism (M = 3.27) and Information Process and Management (3.29) were among the lowest-scoring aspects. Students demonstrated low engagement with the processes of authoring and publishing digital content, indicating an underdeveloped role as active digital citizens. This result is in agreement with the findings of Bustami et al. (2023), who pointed out little public input in citizen journalism because people do not know about the platforms and functions. On the other hand, even though most students managed to assess reliable sources, some reported issues with filtering, controlling, and interpreting data (which resonates with Alekseeva (2020) as an issue of first-year students' understanding of academic databases and structuring information). These shortfalls demonstrate the necessity of purposeful lessons designed to increase information literacy and develop learner-creator skills in learning environments. In general, at a private university in Yogyakarta, students showed very high digital literacy (M = 3.41) with the ability for privacy, security, and balanced technology use. Yet there are still the gaps, specifically in citizen journalism and information management, which play pivotal roles to encourage critical participation of students as (active) digital citizens and have a higher-order of information literacy. These results are consistent with the previous works (Furqan & Rosa, 2023; Nur et al., 2023; Bustami et al., 2023) and highlight that continuous institutional support is crucial to scale digital literacy development. A focus on particular weaknesses can help educators improve the quality of pre-service English teachers' preparation for integrating digital tools into their future classrooms in a way that is both effective and responsible.

5. Conclusion

The findings of the study reveal that the digital literacy of pre-service English teachers in Yogyakarta is influenced by several interrelated issues concerning technology access, educational quality, and infrastructure. Students in regions with limited access to digital hardware and the internet generally have lower levels of digital literacy, whereas those attending schools with better instructional resources perfom better. These results underscore a call to strengthen equitable access to technology, institutional infrastructure, and quality of digital-based educational and training offerings. Solving these issues will contribute to narrowing this gap and promoting a more uniform digital literacy development process of student teachers.

The survey findings also show that, on average, private university students in Yogyakarta display a very high level of digital literacy (3.41 out of 4). This indicates their high level of digital competence in academic and everyday life, which also supports the conclusion that they are well-prepared to study in digitally enabled learning settings. Privacy and Security and Balanced Attitude toward Technology

are the most prominent strengths, indicating both awareness of personal data protection and the capacity to make judgements about the benefits and threats that digital tools bring. These skills indicate that students are prepared to use technology in their digital lives wisely and carefully.

However, the study also highlights areas that still need to be addressed. However, the elements such as Citizen Journalism or both Information Processing and Management are less developed which reflects that student have not actively participated. It indicates failures in their digital citizen participation and improper judgment of Digital Information by organizing it. On the other hand, their knowledge of Intellectual Property Rights is also good, but they need to be trained and make them apply it in a real sense of practice. Developing and reinforcing such components through targeted teacher education, as well as infusion into the curricula, will be vital for developing teachers who can lead their students in critical, ethical, innovative uses of ICT.

In summary, the pre-service English teachers in Yogyakarta have very high digital literacy, so they are already well-prepared for 21st-century education. However, continued work will be required to address disparities in infrastructure and access and to improve specific aspects of literacy. By meeting this challenge, schools of education can help produce a generation of future teachers who are not only proficient with digital technology but also able to support thoughtful, empowered technology use in their classrooms.

6. References

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