



Preparing Quality Educators: An Analysis of Pre-Service English Teachers' Digital Competence

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Abstract. The rapid development of Information Communication Technology (ICT) in the 21st-century education environment provides ample opportunities for English classrooms. Unfortunately, research in various education contexts reported that many teachers rarely integrate technology in the classroom. Therefore, teacher education institutions need to focus not only on initial preparation of pedagogy and subject matter knowledge but also on various skills to utilize digital educational tools. This research aims at mapping Indonesian pre-service English teachers' (n=204) digital competence. The data were gathered from a specifically designed for planning education-questionnaire which measured five areas of digital competency, i.e. information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. The analysis shows that the pre-service English teachers have moderate digital competence. Likewise, their perceived level of digital competencies varies significantly. The result of this study would likely inform teacher-training policies on the areas of digital competence that should be focused on teacher education programs.

Keywords: Digital Competence, Pre-service English Teachers, Teacher Education.

1 Introduction

In the rapidly evolving landscape of 21st-century education, the integration of technology has become an indispensable component of effective teaching and learning practices. The 21st century has ushered in a new era of educational paradigms, where traditional teaching methods are being supplemented, and in some cases replaced, by innovative digital approaches. The integration of Information and Communication Technology (ICT) in education has become a critical factor in enhancing the quality of teaching and learning processes, improving student engagement, and preparing learners for the challenges of a digitally connected world. As a result, there is a growing expectation for teachers to possess a robust set of digital skills and competencies that enable them to effectively leverage technology in their pedagogical practices.

Recognizing the pivotal role of teachers in this digital transformation of education, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has

developed the ICT Competency Framework for Teachers (Organization, 2018). This framework serves as a comprehensive guide for educational systems worldwide, outlining the necessary competencies that teachers should possess to effectively integrate technology into their teaching practices. The framework encompasses various dimensions of digital competence, including understanding ICT in education, curriculum and assessment, pedagogy, organization and administration, and teacher professional learning. However, despite the increasing emphasis on digital competence in teacher education programs, recent studies have revealed a concerning trend among pre-service teachers, particularly in Asia and Europe. Studies have consistently shown that pre-service teachers in these regions demonstrate low levels of ICT competence (Al Khateeb, 2023; Çebi & Reisoglu, 2020; Haskova & Zahorec, 2020; Wardani & Santosa, 2022). This gap between the expected digital proficiency and the actual competence of future educators raises significant concerns about the readiness of the next generation of teachers to meet the technological demands of modern classrooms.

Studies have demonstrated that being a digital native does not automatically translate into the ability to integrate ICT effectively in educational contexts (Cabezas-González et al., 2021; Li & Ranieri, 2010; List, 2019). While these individuals may be comfortable with technology in their personal lives, the skillset required for educational technology integration is distinct and requires explicit training and development. It is no longer sufficient to assume that exposure to technology in daily life will naturally lead to effective ICT integration in teaching practices (Instefjord & Munthe, 2017; Røkenes & Krumsvik, 2016). Instead, teacher education programs must explicitly train pre-service teachers in various skills related to the utilization of digital educational tools, pedagogical approaches to technology integration, and the development of digital literacy among their future students (Tondeur et al., 2020; Uerz et al., 2018).

The importance of addressing this gap in digital competence among pre-service teachers cannot be overstated. Teachers who are not adequately prepared to leverage digital tools and resources may find themselves at a significant disadvantage, potentially compromising the quality of education they can provide to their students (Nagel et al., 2023; Siddiq et al., 2024). Moreover, in an increasingly globalized and digitally connected world, teachers play a crucial role in preparing students to become digitally literate citizens capable of navigating the complexities of the information age.

The development of digital competence among pre-service teachers is not only about technical skills but also encompasses a broader understanding of how technology can be used to enhance teaching and learning processes. This includes the ability to critically evaluate digital resources, design technology-enhanced learning experiences, address issues of digital equity and accessibility, and foster digital citizenship among students (Limbong & Wadham, 2024; Radiamoda et al., 2024; Sudimantara, 2023).

In light of these challenges and the growing importance of digital competence in education, this study aims to reveal the self-perceived digital competencies of pre-service English teachers. While previous research across countries has measured pre-service teachers' digital competence level, the current research seeks to formulate a teaching education program specifically to improve future educators' readiness to integrate technology into their professional practice. By gaining a deeper understanding of how

pre-service teachers perceive their own digital competencies, teacher educators and policymakers can design more targeted and effective interventions to address gaps in knowledge and skills. This, in turn, can lead to the development of more comprehensive and relevant digital competence training within teacher education programs.

By examining the self-perceived digital competencies of pre-service English teachers, this study aims to address several key questions:

1. What is the current level of self-perceived digital competence among pre-service English teachers?
2. Are there specific areas of digital competence where pre-service teachers feel more confident or less prepared?
3. How can the findings inform the development and improvement of teacher education programs to better prepare future educators for technology integration?

2 Method

This study employed a cross-sectional survey model to investigate the self-perceived digital competence of pre-service English teachers. The cross-sectional design was chosen as it allows for the collection of data from a specific population at a single point in time, providing a snapshot of the current state of digital competence among the participants (Cummings, 2018).

The study involved 204 pre-service English teachers enrolled in a public university in Indonesia. Participants were selected using a convenience sampling method, ensuring a representative sample of students across different years of study within the English education program. The sample size was determined to be sufficient for conducting meaningful statistical analyses while also being manageable within the constraints of the research timeline and resources.

Data collection was conducted using the DigiComp questionnaire for teachers, which is based on the work of (Carretero et al., 2019) and adapted by (Çebi & Reisoglu, 2020). This instrument was chosen due to its comprehensive coverage of digital competence areas relevant to educators and its established validity and reliability in previous studies. The DigiComp questionnaire assesses five key areas of digital competence, i.e. Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem-solving. Each area contains multiple items rated on a Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), allowing participants to self-assess their perceived competence in various digital skills and knowledge areas. The questionnaire was administered online using a secure survey platform, allowing participants to complete it at their convenience within a specified timeframe. This digital administration method was chosen to facilitate easier data collection and reduce the potential for data entry errors.

Upon completion of data collection, responses were exported from the survey platform and prepared for analysis. Statistical analyses were performed using SPSS software. Descriptive statistics, including means, standard deviations, and frequencies, were calculated for each item and competence area to provide an overview of the participants' self-perceived digital competence levels.

3 Results and Discussion

This study focuses on analyzing the digital competence of pre-service English teachers which information helps to prepare the student teacher for delivering quality education in an increasingly technology-driven educational environment. The results of this study have the potential to contribute to the ongoing dialogue about the role of technology in education and the preparation of teachers for the digital age.

3.1 Self-Perceived Pre-Service English Teachers' Digital Competence

Table 1 presents the result of a descriptive analysis of the pre-service English teachers' self-perceived digital competence. It was seen that the subjects' average responses in the area of "information and data literacy", "communication and collaboration", as well as "safety" were 3.8 and above. The student teacher admitted that they "identify needs when searching for data, information or digital content" ($M=4.216$; $SD=0.861$). Unfortunately, they reported that they have a low ability to "critically evaluate the accuracy of the data, information or digital content I access" ($M=3.814$; $SD=0.851$). In the area of "communication and collaboration", the pre-service teachers admitted that they "use digital technologies to communicate in online environments" ($M=4.581$; $SD=0.749$).

Similarly, Turkish pre-service teachers reportedly had a good level of "information and data literacy" as well as "communication and collaboration" competence (Çebi & Reisoglu, 2020). Another study also delineated that pre-service English teachers in the Philippines exhibit a very high level of digital competence, particularly in storing, managing and deleting digital content (Radiamoda et al., 2024). Indeed, student teachers admitted to effectively secure their personal data (Wardani & Santosa, 2022).

Meanwhile, the pre-service's response on "digital content creation" was relatively lower. Interestingly, the respondents admittedly "produce digital content by making changes to ready-made contents" ($M=3.547$; $SD=0.94$) and "can develop content in different formats (videos, visual, animation, etc.) using digital technologies" ($M=4.154$; $SD=0.931$). However, many pre-service teachers are proficient in using social media and basic software applications but struggle with more complex educational technologies and their pedagogical applications (Instefjord & Munthe, 2017). Similarly, Norwegian pre-service English teachers had relatively high self-efficacy in using digital tools for personal purposes but lower confidence in applying these tools for teaching (Røkenes & Krumsvik, 2016). Further analysis revealed some challenges that the student teachers faced in creating digital teaching resources, such as resource availability and access (Limbong & Wadham, 2024) as well as their digital capabilities (Sudimantara, 2023).

Last, the lowest reported digital competence was "problem-solving". While the pre-service teachers are generally able to improve their digital competence by following new developments, they lack in ability to identify ($M=3.488$; $SD=0.94$) and solve technical problems ($M=3.402$; $SD=0.939$). A similar finding from Saudi Arabia was reported that pre-service English teachers need to improve their problem-solving ability (Al Khateeb, 2023).

In general, evaluation of all items of the 5 digital competence areas shows that the pre-service teachers' self-perceived digital competence was above the average. Nevertheless, further analysis indicated the area that required further improvement to equip the pre-service with digital competency as technology continues to play a significant role in education. The following section discusses strategies to improve digital competence among pre-service English teachers.

Table 1. Result of descriptive analysis of pre-service English teachers' digital competence (n=204)

Digital Competence Areas	Questionnaire Item	MEAN	SD
Information and data literacy	1. I identify my needs when searching for data, information, or digital content in online environments	4.216	0.861
	2. I use information search strategies to access data, information, and digital content in online environments	4.181	0.807
	3. I critically evaluate the accuracy of the data, information, or digital content I access	3.814	0.851
	4. I access the data, information, and digital content I need in online environments	4.270	0.769
	5. I investigate from different sources whether the data, information, or digital content I access is reliable	4.108	0.903
	6. I pay attention to source and citation representatives when sharing data, information, or digital content.	4.103	0.862
Communication and Collaboration	1. I easily organize and store data, information, and content in online environments	3.917	0.887
	2. I use digital technologies to communicate in online environments	4.581	0.749
	3. I share data, information, or digital content using different digital technologies	4.267	0.874
	4. I use digital technologies to collaborate in online environments	4.015	0.857
	5. I comply with behavioral norms (ethical rules) when interacting in online environments	4.392	0.820
Digital content creation	1. I develop content in simple forms using digital technologies	3.650	0.975
	2. I can develop content in different formats (videos, visuals, animation, etc.) using digital technologies	4.158	0.931
	3. I pay attention to copyrights and licensing when developing digital content	3.936	0.910
	4. I produce digital content by making changes to ready-made content.	3.547	0.940

Safety	1. I know what to look out for when creating a digital identity (profile) in online environments.	4.271	0.821
	2. I am aware that I leave a digital footprint when I navigate online environments	4.319	0.860
	3. I am aware of the risks and threats in online environments	4.488	0.734
	4. I take different measures to protect my digital device and content	4.202	0.886
	5. I take precautions about safety and privacy in online environments	4.284	0.852
	6. I protect personal data and privacy in online environments	4.471	0.784
	7. When sharing my personal information online, I take precautions to protect the personal data of others (not to tag them in a photo without permission, etc.)	4.039	1.031
	8. I am aware of the effects of digital technology use on health (physical, and psychological).	4.230	0.788
	9. I am familiar with data policies (how to use personal data) of the digital services that I am a user of (social networking, etc.)	4.054	0.826
	11. I know how to deal with online threats	3.588	0.940
	1. I identify the causes of technical problems I encounter when using digital media and devices	3.488	0.967
Problem-solving	2. I solve the technical problems I encounter when using digital media and devices	3.402	0.939
	3. I use different digital technologies to create innovative solutions	3.701	0.906
	4. I identify opportunities for the development of my digital competencies	3.734	0.895
	5. I develop my digital competence by following new developments	4.049	0.875

3.2 Developing Digital Competency: Navigating Teaching Education Program

Based on the descriptive analysis of the self-perceived digital competency, there are two areas that needs to be developed, i.e. “digital content creation” and “problem-solving”. Hence, context of teaching training, some strategies could be implemented to improve the student teacher’s competence.

First, it is important to integrate the technology across the curriculum to develop pre-service teachers’ digital competence. As classrooms become increasingly digitalized, teachers must be equipped with the skills to effectively utilize technology in their instruction (Tondeur et al., 2017). By incorporating technology into teacher education programs, pre-service teachers gain hands-on experience with digital tools, enhancing their ability to create engaging and interactive learning experiences for students

(Insteffjord & Munthe, 2017). Ultimately, technology-enhanced teacher education prepares pre-service teachers to meet the demands of 21st-century classrooms, fostering innovation and adaptability in their teaching practices (Ottenbreit-Leftwich et al., 2012). This approach ensures that new teachers enter the profession with the digital competence necessary to support student learning in an increasingly technology-driven world.

Modeling effective technology use by teacher educators is also likely to foster the pre-service teachers' digital competence development. By integrating technology into their teaching practices, educators provide concrete examples of how digital tools can enhance instruction, thereby bridging the gap between theory and practice (Lindfors et al., 2021). This modeling not only demonstrates the practical application of technology but also cultivates pre-service teachers' self-efficacy in using digital tools (Uerz et al., 2018). Furthermore, it exposes future teachers to a variety of educational technologies and pedagogical strategies, preparing them for the evolving demands of 21st-century classrooms (Nagel et al., 2023). Ultimately, this approach fosters a technology-rich learning environment that encourages pre-service teachers to develop critical digital skills and integrate technology meaningfully in their future teaching practices.

The learning activity can be done in Project Based Learning (PBL) which offers a compelling approach to developing student teachers' digital competence in teacher education programs. By engaging students in authentic, technology-rich projects, PBL provides hands-on experience with digital tools and pedagogies (Kokotsaki et al., 2016). This approach allows pre-service teachers to develop critical digital skills while simultaneously learning how to integrate technology meaningfully into their future classrooms. PBL also fosters collaborative problem-solving and creativity, essential components of digital competence in today's interconnected world (Ambarwati et al., 2024). It provides opportunity to collaborate on technology-enhanced projects which allows for digital competencies development while promoting peer learning (Tondeur et al., 2017). Furthermore, the iterative nature of PBL projects encourages continuous learning and adaptation to new technologies, preparing teachers for the rapidly evolving digital landscape they will encounter in their careers. By simulating real-world teaching scenarios, PBL helps bridge the gap between theory and practice, ensuring that pre-service teachers are better equipped to leverage digital tools effectively in their future professional roles (Howard et al., 2021).

All in all, research on digital competency of pre-service English teachers highlights the need for comprehensive and integrated approaches to technology preparation in teacher education programs. By addressing the factors influencing digital competency development and implementing effective strategies for improvement, teacher educators can better prepare future English teachers for the technological demands of 21st-century classrooms.

4 Conclusion

This study aimed to investigate the self-perceived digital competence of 204 Indonesian pre-service English teachers using the DigiComp questionnaire for teachers developed

by Çebi & Reisoglu (2020). The results showed that pre-service teachers demonstrated higher levels of competence in data literacy, communication and collaboration, and safety compared to digital content creation and problem-solving. This pattern suggests that while these future educators possess strengths in certain areas of digital competence, there is room for improvement in others. However, the lower scores in digital content creation and problem-solving highlight areas that require attention in teacher education programs. The ability to create and modify digital content is crucial for modern educators, as it enables them to develop engaging and interactive learning materials. Similarly, problem-solving skills in the digital realm are essential for troubleshooting technical issues and adapting to rapidly evolving technological landscapes in education. These findings underscore the need for targeted interventions to enhance pre-service teachers' competencies in these areas.

Based on these results, several strategies can be implemented in teacher education institutions to improve student teachers' digital competence. First, the integration of technology across the curriculum would provide pre-service teachers with many opportunities to engage with digital tools and develop their competencies in various educational contexts. Next, teacher educators can model effective technology by consistently demonstrating effective and innovative uses of technology in their teaching, they can inspire and guide pre-service teachers to develop their digital competencies. Lastly, incorporating PBL approaches that require the use of technology can help pre-service teachers develop their digital content creation and problem-solving skills. These projects could involve creating digital learning resources, designing online assessments, or developing technology-enhanced lesson plans.

To support these strategies, it is recommended that teacher education institutions establish continuous professional development programs for teacher educators. These programs should focus on enhancing the digital competencies of faculty members, and keeping them updated on the latest educational technologies and pedagogical approaches. By investing in the digital skills of teacher educators, institutions can ensure that pre-service teachers receive high-quality, technology-enhanced instruction throughout their training. Additionally, improving digital infrastructure and resources within teacher education institutions is crucial. This may involve upgrading hardware and software, ensuring reliable internet connectivity, and providing access to a wide range of digital tools and platforms. A well-equipped learning environment will allow pre-service teachers to explore and experiment with various technologies, fostering their digital competence development.

The findings of this study also have implications for educational policy-making in Indonesia. Policymakers should consider revising teacher education curricula to place greater emphasis on digital competence development, especially in the areas of digital content creation and problem-solving. This may involve setting specific standards for digital competence that pre-service teachers must meet before graduation or incorporating digital skills assessments into teacher certification processes. Furthermore, collaboration between teacher education institutions and schools should be encouraged to ensure that pre-service teachers have opportunities to apply their digital skills in real-world teaching contexts. This could involve internships or practicum experiences that specifically focus on technology integration in the classroom.

While this study provides valuable insights, it is important to acknowledge its limitations. The use of self-perceived competence measures may not always accurately reflect actual skills and abilities. Future research could benefit from incorporating objective assessments of digital competence alongside self-report measures to provide a more comprehensive picture of pre-service teachers' capabilities. Moreover, the cross-sectional nature of this study offers a snapshot of digital competence at a single point in time. Longitudinal studies that track the development of digital competence throughout teacher education programs could provide valuable information on the effectiveness of various interventions and strategies.

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