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Bridging the Gap: Pre-Service Teachers' Realities of Technology Integration in the Digital Classroom

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Abstract. In the digital era, integrating technology into education is essential for preparing future-ready educators. This qualitative case study explores how pre-service teachers experience and implement digital tools in instructional settings. It focuses on their successes, challenges, and the pedagogical strategies they employ. Drawing on the Technological Pedagogical Content Knowledge (TPACK) framework and experiential learning theory, the study involved 15 pre-service teachers from a university in Semarang. Data were collected through semi-structured interviews and classroom observations, and analyzed using thematic analysis. The findings reveal that pre-service teachers primarily used technology to manage classrooms and engage students—for example, using interactive platforms like Kahoot! to maintain attention and assess understanding in real time. These tools influenced student reactions and led teachers to adapt their instructional strategies dynamically. While digital tools were seen as effective for promoting engagement and understanding, participants faced challenges related to digital literacy, infrastructure limitations, and a lack of mentorship. Technology-based assessment and proactive engagement strategies were less frequently applied, highlighting a gap between theoretical training and classroom practice. The results suggest that teacher education programs should provide more hands-on, guided experiences, reflective practices, and institutional support to develop digital teaching competence. This study contributes to ongoing efforts to align teacher training with the realities of technology-enhanced learning environments

Keywords: Pre-service teachers, technology integration, digital pedagogy, TPACK framework

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Introduction

In the digital era, technology has become an integral part of modern education, reshaping instructional practices, student engagement, and learning outcomes. The rapid advancement of digital tools—such as Learning Management Systems (LMS), Artificial Intelligence (AI), gamification platforms, and virtual classrooms—has transformed how teachers deliver content and interact with learners (Agyei & Voogt, 2011; Kim et al., 2020). In response, teacher education programs are placing increased emphasis on technology integration to ensure that pre-service teachers are prepared to thrive in technology-enhanced learning environments.

However, despite this emphasis, many pre-service teachers struggle to incorporate technology meaningfully into their instructional practices.
Limited hands-on experience, insufficient training, and a lack of pedagogical scaffolding often result in surface-level application of digital tools (Listiyoningsih et al., 2022; Tondeur et al., 2020; Zeng et al., 2022). Although pre-service teachers may possess general technological literacy, transitioning from personal use to pedagogical application requires specialized skills and a solid understanding of instructional design—areas that are often underemphasized in conventional teacher education curricula.

Existing literature reveals a persistent gap between theoretical knowledge about educational technology and its practical application. While digital tools are frequently introduced in coursework, opportunities for hands-on experience and critical reflection remain limited. This disconnect can result in low self-efficacy, poor implementation, and missed opportunities for innovation in teaching (Koehler & Mishra, 2009).

To address this issue, the present study explores how pre-service teachers experience and implement digital tools in real-world classroom settings. Using a qualitative case study design, it captures their lived experiences—successes, challenges, and instructional strategies. By doing so, it aims to inform improvements in teacher education curricula and support more effective digital integration.

Although frameworks such as Technological Pedagogical Content Knowledge (TPACK) have been widely used to conceptualize technology integration (Graham et al., 2012; Mishra, 2019; Wang, 2022)There is still limited empirical evidence on how pre-service teachers apply these frameworks in real-world settings. Furthermore, barriers such as institutional constraints, lack of digital literacy training, and resistance to innovation among educators remain prevalent (Koehler & Mishra, 2009; Mishra, 2019)

Given the growing reliance on digital technologies in both face-to-face and online education, teacher education programs need to evolve in ways that foster digital competence and pedagogical agility. This study contributes to the discourse by providing insights into the practical realities of technology use among pre-service teachers, ultimately aiming to enhance curriculum design and support meaningful technology integration in future classrooms.

The purpose of this study is to explore how pre-service teachers experience and implement digital tools in instructional settings. Specifically, the research seeks to investigate how they integrate technology into their teaching practices, identify the challenges and successes they encounter during the process, and examine the pedagogical strategies that support effective digital integration.

Through this exploration, the study aims to generate insights that can inform the design of teacher education curricula and better prepare future educators for the demands of technology-enhanced learning environments

Theoretical Foundations for Technology Integration

Two key frameworks inform effective technology integration in pre-service teacher education: the Technological Pedagogical Content Knowledge (TPACK) model and constructivist/experiential learning theories.

The TPACK model, developed by Koehler & Mishra, (2009) highlights the intersection of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), emphasizing the need for teachers to integrate these domains within specific teaching contexts. As shown in Fig. 1, TPACK illustrates how teachers must strategically combine tools, methods, and content to facilitate meaningful learning. Studies show that TPACK-informed training boosts confidence and competence in using digital tools for instruction (Chai et al., 2010; Polly et al., 2010).

Complementing this framework, constructivist learning theories, as proposed by Vygotsky and Piaget, advocate for active, social, and contextualized learning experiences. Kolb (2015) experiential learning theory further supports the idea that pre-service teachers benefit most from hands-on engagement with technology, which reinforces skill acquisition and promotes reflective practice (Abdulayeva et al., 2025).When applied to technology integration, these approaches ensure that pre-service teachers develop not only technical skills but also the pedagogical insight to use them meaningfully. Together, these theoretical perspectives frame the present study's investigation into how pre-service teachers implement digital tools during their practicum experiences.

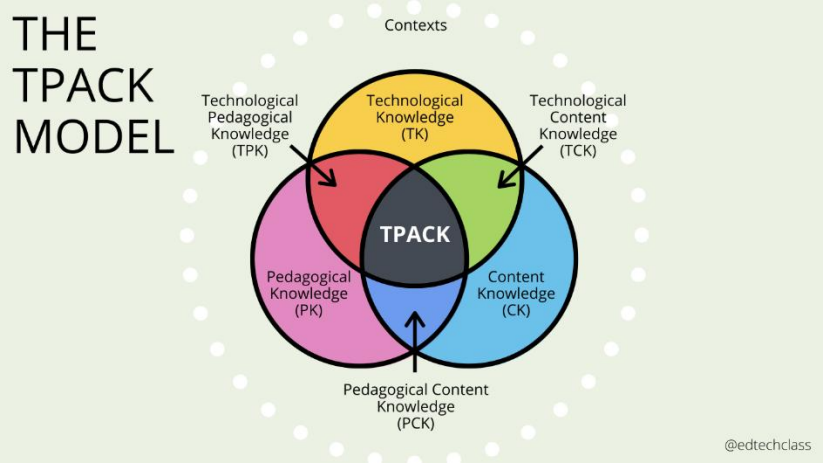

Figure 1. A teacher's guide to the TPACK Tech Integration Model

Challenges in Pre-Service Teacher Technology Integration

Despite the theoretical and practical benefits, pre-service teachers face multiple challenges in integrating technology into instructional settings. One key issue is the disparity in digital literacy, as not all pre-service teachers possess the skills necessary for pedagogical technology use (Tondeur et al., 2020; Vellonen et al., 2025) Resource-related constraints—such as limited access to modern devices and reliable internet—also inhibit training effectiveness (Pitura et al., 2024) Furthermore, many teacher education programs provide only superficial exposure

to technology, focusing more on theoretical instruction than on practical application (Sun et al., 2017)). This lack of depth results in low confidence and competence among pre-service teachers, creating a disconnect between what they learn during training and what is required in real classroom environments (Ertmer & Ottenbreit-Leftwich, 2010)).

Strategies and Future Directions for Effective Integration

To bridge the gap between theory and practice, several research-based strategies have emerged as effective in enhancing technology integration. Collaborative learning projects allow pre-service teachers to co-design and implement technology-enhanced lessons, fostering innovation and peer support (Tondeur et al., 2020). Mentorship programs that pair novice teachers with tech-savvy educators offer ongoing guidance and real-world perspectives (Vellonen et al., 2025). Additionally, reflective practices—such as maintaining journals or digital portfolios—encourage critical thinking about instructional choices and technology use (Ertmer & Ottenbreit-Leftwich, 2010). Looking forward, a comprehensive roadmap for future integration includes enhancing curricula with applied digital pedagogy, investing in infrastructure, offering continuous professional development, conducting empirical evaluation, and developing supportive policy frameworks (Chai et al., 2010; Koehler & Mishra, 2009)

Method

Research Design

This study employs a qualitative case study approach to explore pre-service teachers' experiences with technology integration in instructional settings. The qualitative design enables an in-depth investigation of participants' perspectives, allowing for rich, contextual understanding of how digital tools are applied in real classroom environments.

Participants

The study involved 15 pre-service teachers (8 female, 7 male), aged 20–21 years, all enrolled in the sixth semester of an English Education program at a university in Semarang (Table 1.). These participants were actively engaged in teaching practicums within classroom environments that provided access to digital tools. Selection criteria included gender balance and varying levels of prior experience with educational technology to ensure diverse perspectives on technology integration.

Table 1 Demographic Profile of Pre-Service Teacher Participants

Demographic Variable	Details
Total Participants	15
Gender	8 Female, 7 Male
Age Range	20–21 years
Study Program	English Education
Semester	6th Semester
Prior Tech Experience	Low to moderate (personal to classroom use)

Data Collection

Data were collected through two primary qualitative methods: semi-structured interviews and classroom observations. The interviews consisted of 10 open-ended questions designed to explore participants' experiences with technology integration, including the digital tools they used, the pedagogical strategies they employed, and the challenges and successes they encountered. Each interview lasted approximately 30–45 minutes and was conducted in a face-to-face (offline) format in a quiet, private setting on campus. With participants' consent, all interviews were audio-recorded and later transcribed verbatim for analysis.

In addition to interviews, two classroom observation sessions were conducted for each participant, with each session lasting approximately 60 minutes. Observations focused on capturing the actual use of digital tools in instructional activities, classroom management, student engagement, and pedagogical decision-making. A structured observation checklist—developed based on the TPACK framework and previous literature (Tondeur et al., 2020)—was used to guide note-taking and ensure consistency across sessions. The combination of interviews and observations allowed for triangulation of data and a richer, more comprehensive understanding of how pre-service teachers implemented technology in real teaching contexts.

Data Analysis

For data analysis, the study utilized thematic analysis (Braun & Clarke, 2024) supported by MAXQDA software. The coding process followed the stages of open, axial, and selective coding, enabling the identification of recurring patterns and core themes related to digital pedagogy. To enhance the validity and reliability of the findings, the study incorporated member checking, data triangulation across multiple sources, and peer debriefing to minimize researcher bias and ensure interpretive accuracy. The interview data were analyzed using MAXQDA with the following categories: Pre-Service Teacher Experiences, Classroom Management & Technology, Instructional Strategies with Technology, Technology & Student Learning Outcomes (Mishra, 2019; Tondeur et al., 2020)

Findings and Discussion

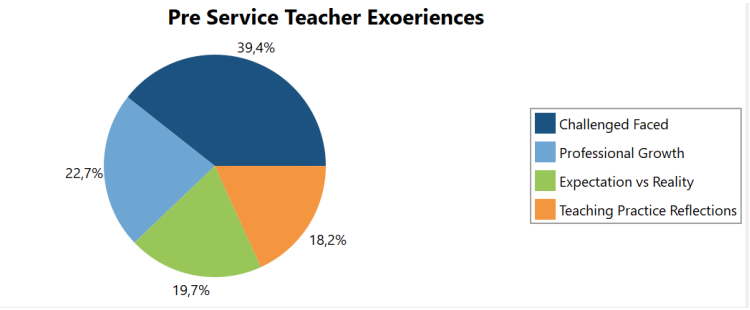

Figure 2. Pre-Service Teacher Experiences

Figure 2. highlights that the most prominent theme in pre-service teachers' experiences was "Challenges Faced" (39.4%), reflecting frequent struggles with technical issues, limited resources, and classroom distractions. Participants often found themselves responding reactively rather than strategically to classroom situations. One noted, *"Sometimes the projector didn't work, or the internet was too slow. I had to switch plans quickly, and it stressed me out"* (P6).

Another added, *"Students got distracted easily when I used interactive apps—they focused more on the features than the learning"* (P3). Additionally, "Expectation vs Reality" (22.7%) revealed a gap between theoretical preparation and classroom realities, as expressed by a participant: *"In theory, it looked easy to integrate videos and games. But when I tried it, managing time and students' attention was much harder than expected"* (P1).

Despite these challenges, "Professional Growth" (19.7%) and "Teaching Practice Reflections" (18.2%) show that participants developed confidence and digital teaching skills through hands-on experience. One participant shared, *"I became more confident using apps like Wordwall and Padlet. At first, I was nervous, but now I enjoy creating interactive lessons"* (P10). Reflective practice also emerged as a key part of their learning process, with one teacher noting, *"After each lesson, I would reflect on what went well and what didn't. It helped me plan better next time—especially in using tech more effectively"* (P13). These findings underscore the need for teacher education programs to bridge the gap between theory and practice through experiential learning, mentorship, and structured reflection.

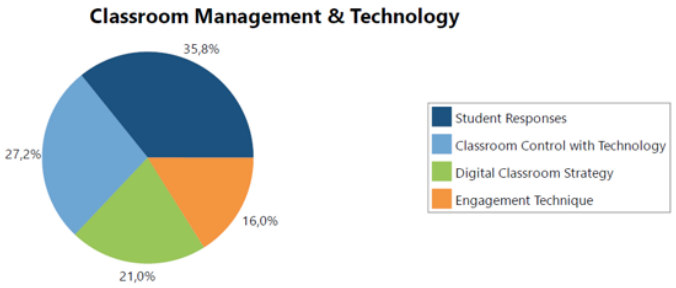

Figure 3. Classroom Management with Technology

Fig. 3 illustrates the key areas of focus in pre-service teachers' experiences with technology integration. he largest thematic category was Student Responses (35.8%), suggesting that participants primarily evaluated their tech use based on how students reacted. One participant noted, *"When I used a quiz app, they got excited, but some got distracted easily. So I had to adjust quickly." (P4)*

Classroom Control with Technology (27.2%) was another major focus, highlighting efforts to manage routines using timers, digital check-ins, or LMS tools. Digital Classroom Strategy (21.0%) and Engagement Technique (16.0%) were less prevalent, indicating a more reactive than proactive approach to technology use. This trend reveals an imbalance in TPACK domains: strong in TK and some PK (e.g., managing behavior), but weaker in integrating content knowledge and fostering motivation through digital pedagogy.

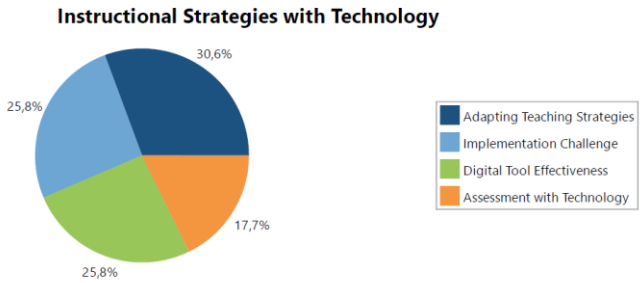

Figure 4. Instructional Strategies with Technology

Figure 4 illustrates that the most prominent theme among pre-service teachers was adapting teaching strategies (30.6%), suggesting that many participants revised their instructional approaches to accommodate the use of digital tools. One participant explained, *"I had to change how I gave instructions when using Kahoot—it needed to be more visual and faster-paced to keep students focused"* (P4). This reflects their effort to modify lesson delivery to suit the digital medium and maintain learner engagement.

Equally emphasized were the themes of implementation challenges (25.8%) and digital tool effectiveness (25.8%). Participants acknowledged the dual nature of using technology—its potential to enhance learning, as well as the difficulties it posed. One noted, *"Sometimes the app didn't load properly, and I had to restart the activity or go back to manual methods"* (P8), highlighting how technical issues disrupted instructional flow. Conversely, another teacher observed, *"Using Quizziz helped me check comprehension instantly, and students were more motivated to participate"* (P11), demonstrating perceived effectiveness. Meanwhile, assessment with technology received the least attention (17.7%), indicating that using digital tools for evaluation was not a major focus. This suggests a need for more structured training in technology-supported assessment design within teacher education programs.

Figure 5 shows that student reactions (32.9%) were the most frequently discussed theme, highlighting pre-service teachers' focus on how learners responded emotionally and behaviorally to digital tools. One participant noted, *"Students were more excited when I used interactive quizzes—they competed and paid more attention"* (P7). Close behind, learning improvements (29.3%) reflected observed gains in comprehension and engagement, with another teacher sharing, *"They understood the material better when I showed a short video before the activity"* (P12). Success indicators (22.0%), such as quiz results and task completion, were moderately mentioned, suggesting some assessment use. Meanwhile, student barriers (15.9%)—like poor internet access or low digital skills—received the least attention, implying these challenges were underreported.

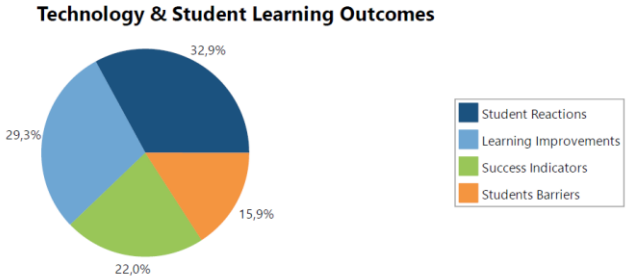

Figure 5 Technology and Student Learning Outcomes

Overall, the study found that pre-service teachers integrated digital tools mainly to manage classrooms and engage students, with a strong focus on student reactions and adapting teaching strategies. While they experienced some success in increasing participation and modifying instruction, challenges such as limited digital literacy, infrastructure issues, and lack of mentor support persisted. Assessment and engagement techniques using technology were less emphasized, highlighting a gap between theory and practice. Overall, the results suggest that pre-service teachers need more hands-on, guided experience to apply technology effectively and confidently in real classroom settings.

Conclusion

This study sheds light on the complex challenges and growth opportunities faced by pre-service teachers as they integrate technology into classroom instruction. While digital tools were generally perceived as effective for enhancing engagement and learning, their use was often reactive—driven by immediate needs rather than strategic pedagogical planning. Participants focused largely on adapting teaching methods and managing student responses, while proactive engagement strategies and digital assessments received less attention.

Although frameworks like TPACK provided a theoretical foundation, the study highlights a clear need for more hands-on, context-based training. Limitations such as the small sample size, single geographic setting, and reliance on self-reported data should be acknowledged, offering directions for broader future research. To address the persistent gap between theory and practice, teacher education programs should incorporate structured digital practicum modules, mentorship with experienced tech-integrated educators, and training in technology-based assessment.

Empowering future educators with practical digital competence is not only essential—it is urgent for building classrooms that are adaptable, inclusive, and future-ready.

References

Abdulayeva, A., Zhanatbekova, N., Andasbayev, Y., & Boribekova, F. (2025). Fostering AI literacy in pre-service physics teachers: inputs from training and co-variables. *Frontiers in Education, 10*. https://doi.org/10.3389/feduc.2025.1505420

Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education*, *56*(1), 91–100. https://doi.org/10.1016/j.compedu.2010.08.017

Braun, V., & Clarke, V. (2024). Supporting best practice in reflexive thematic analysis reporting in Palliative Medicine: A review of published research and introduction to the Reflexive Thematic Analysis Reporting Guidelines (RTARG). *Palliative Medicine*, *38*(6), 608–616. https://doi.org/10.1177/02692163241234800

Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2010). Facilitating Preservice Teacher'Development of Technological, Pedagigical, and Content Knowledge (TPACK). *Educational Technology and Society*, *13*(4), 63–73.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). *Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect* (Vol. 42, Issue 3). www.iste.org/jrte

Graham, C. R., Borup, J., & Smith, N. B. (2012). Using TPACK as a framework to understand teacher candidates' technology integration decisions. *Journal of Computer Assisted Learning*, *28*(6), 530–546. https://doi.org/10.1111/j.1365-2729.2011.00472.x

Kim, H.-S., Cha, Y., & Kim, N.-Y. (2020). Impact of Mobile Interactions with AI on Writing Performance. *Modern English Education*, *21*(2), 1–13. https://doi.org/10.18095/meeso.2020.21.2.1

Koehler, M. J., & Mishra, P. (2009). *What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education* (Vol. 9, Issue 1). http://www.tpck.org/.

Kolb, D. A. (2015). Experiential Learning- Experience as the Source of Learning and Development (2nd Edition). In *Person Education, Inc.* (Vol. 53, Issue 9).

Listiyoningsih, S., Hidayati, D., & Winarti, Y. (2022). Strategi Guru Menghadapi Transformasi Digital. *Jurnal Ilmiah Profesi Pendidikan*, *7*(2b), 655–662. https://doi.org/10.29303/jipp.v7i2b.389

Mishra, P. (2019). Considering Contextual Knowledge: The TPACK Diagram Gets an Upgrade. In *Journal of Digital Learning in Teacher Education* (Vol. 35, Issue 2, pp. 76–78). Routledge. https://doi.org/10.1080/21532974.2019.1588611

Pitura, J., Kaplan-Rakowski, R., & Asotska-Wierzba, Y. (2024). The VR-AI–Assisted Simulation for Content Knowledge Application in Pre-Service EFL Teacher Training. *TechTrends*. https://doi.org/10.1007/s11528-024-01022-4

Polly, D., Mims, C., Shepherd, C. E., & Inan, F. (2010). Evidence of impact: Transforming teacher education with preparing tomorrow's teachers to teach with technology (PT3) grants. *Teaching and Teacher Education*, *26*(4), 863–870. https://doi.org/10.1016/j.tate.2009.10.024

Sun, Y., Strobel, J., & Newby, T. J. (2017). The impact of student teaching experience on pre-service teachers' readiness for technology integration: A mixed methods study with growth curve modeling. *Educational Technology Research and Development*, *65*(3), 597–629. https://doi.org/10.1007/s11423-016-9486-x

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2020). Enhancing pre-service teachers' technological pedagogical content knowledge (TPACK): a mixed-method study. *Educational Technology Research and Development*, *68*(1), 319–343. https://doi.org/10.1007/s11423-019-09692-1

Vellonen, V., Sointu, E., Valtonen, T., & Tukiainen, M. (2025). Pre-Service Special Education Teachers' Perceptions of Applying Technologies in Education. *Journal of Special Education Technology*. https://doi.org/10.1177/01626434251314044

Wang, A. Y. (2022). Understanding levels of technology integration: A TPACK scale for EFL teachers to promote 21st-century learning. *Education and Information Technologies*, *27*(7), 9935–9952. https://doi.org/10.1007/s10639-022-11033-4

Zeng, Y., Wang, Y., & Li, S. (2022). The relationship between teachers' information technology integration self-efficacy and TPACK: A meta-analysis. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1091017