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Exploring Pre-Service Teachers' TPACK Competence during Teaching Practicum

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Abstract

This study investigates the Technological Pedagogical Content Knowledge (TPACK) competence of five pre-service teachers during a one-month teaching practicum at MTs N 2 Banyuwangi. The study aimed to measure their overall TPACK competence and identify which domain is strongest and weakest. A descriptive quantitative design was employed using a 15-item self-assessment questionnaire on a 5-point Likert scale, complemented by document analysis of lesson plans, teaching materials, and reflective reports. The findings show that the participants demonstrated a generally high level of TPACK, with CK emerging as the strongest domain, followed by PK, whereas TK remained the weakest. The integrative TPACK score suggests that the pre-service teachers possessed moderate confidence in combining technology, pedagogy, and content during instruction. Document analysis further supported these findings by confirming strong content mastery and adequate pedagogical preparation, while also revealing limited integration of digital tools in classroom practice. These findings highlight the need for more structured technological training and earlier exposure to educational technology within teacher education programs to strengthen pre-service teachers' technological competence.

Keywords: *pre-service teachers; TPACK Competence; teaching practicum*

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Introduction

In modern education, teachers are required to integrate content expertise, pedagogical knowledge, and technological skills. The Technological Pedagogical Content Knowledge (TPACK) framework conceptualizes this intersection and offers guidance for effective technology use in classroom instruction (Mishra & Koehler, 2006). Recent studies affirm that TPACK remains a highly relevant

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framework in the digital era, particularly as teachers are increasingly expected to design technology-enhanced learning environments (Smith et al., 2021; Downie et al., 2021). These contemporary developments highlight that technology integration is not only a matter of technical proficiency but a situated and context-dependent process, consistent with the foundational principles proposed by Mishra and Koehler. In Indonesia, TPACK has become an essential competency for 21st-century teachers. Studies have shown that although Islamic Education teachers demonstrate strong content mastery, their technological and pedagogical integration often remains suboptimal (Saputro et al. 2025). Similarly, Eliyanto et al. (2021) found that religious teachers possess high awareness of TPACK but still have difficulty applying technology effectively in teaching. Recent research in higher education also confirms that both lecturers and students continue to face challenges in integrating technology meaningfully, even when guided by frameworks such as TPACK and SAMR (Ahmada & Rizkiyah, 2025).

Teacher practicums provide an important avenue for pre-service teachers to develop TPACK through real teaching experiences. Jaeni & Ghufron, (2024); Ali & Waer, (2023); and Chang et al. (2025) note that Indonesian practicum students employ various strategies—such as classroom observation, mentoring, and workshops—to enhance their TPACK, despite barriers related to time, facilities, and self-confidence. Building on this context, the present study investigates two questions in the setting of MTs N 2 Banyuwangi: (1) What is the level of pre-service teachers' TPACK competence after a one-month teaching practicum? and (2) Which of the TPACK domains (TK, CK, PK) shows the strongest and weakest development?

Prior Indonesian studies report diverse TPACK profiles, with some identifying strong content and pedagogical knowledge but weaker technological knowledge (Jaeni & Ghufron, 2024), while others highlight different patterns, suggesting that TPACK development is not uniform across contexts and may be influenced by institutional conditions, subject specialization, and practicum experiences (Ningtyas et al., 2024). However, research on TPACK development in Islamic junior high school practicum settings—particularly those embedded in

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pesantren environments—remains limited. Existing studies seldom combine quantitative self-assessment with qualitative document analysis to examine how pre-service teachers demonstrate TPACK in actual lesson planning and classroom practice. This study addresses this gap by analyzing three core domains (CK, PK, TK) and triangulating questionnaire data with practicum documentation from five pre-service teachers across multiple subject areas. This approach provides a more comprehensive understanding of how TPACK is enacted in instructional design and teaching implementation.

Method

This study employed a descriptive quantitative approach supported by qualitative document analysis (Creswell, 2017). The participants were five pre-service teachers from different study programs who completed a one-month teaching practicum at MTs N 2 Banyuwangi.

Data were collected using two main instruments. *First*, a 15-item TPACK self-assessment questionnaire using a 5-point Likert scale (Boone & Boone, 2012). The questionnaire items were adapted from the widely used TPACK instrument developed by Schmidt et al. (2009). While the original instrument consists of seven domains, this study employed only four core components—Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), and the integrative TPACK construct. This selection was made to align with the purpose of assessing foundational competencies during a short, one-month practicum. Advanced domains such as PCK, TCK, and TPK require more extensive teaching experience and consistent technology integration, conditions that were not feasible within the practicum setting. Therefore, limiting the instrument to the four core domains ensured greater relevance, clarity, and validity of the measurement. *Second*, document analysis was conducted on participants' reports including materials, lesson plans, instructional media, and written reflections, following established procedures for qualitative document analysis (Bowen, 2009).

Quantitative data were analyzed using descriptive statistics by calculating mean scores for Technological Knowledge (TK), Pedagogical Knowledge (PK),

Darussalam English Journal (DEJ)
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Content Knowledge (CK), and the integrative TPACK construct. Qualitative data were examined using Miles, Huberman, and Saldaña's interactive model, which consists of data reduction, data display, and conclusion drawing (Miles et al., 2020). An inductive coding process was applied to identify recurring patterns related to content mastery, pedagogical strategies, and classroom technology use (Saldaña, 2016). Triangulation between quantitative and qualitative findings was implemented to enhance credibility and strengthen interpretation.

Finding

Questionnaire Result

Tables 1–4 present the overall mean scores for each TPACK domain. The results show that Content Knowledge (CK) achieved the highest average score (4.3), indicating that pre-service teachers possessed strong subject-matter mastery and were confident in connecting lesson content to real-world contexts. Pedagogical Knowledge (PK) followed with an average score of 4.05, reflecting solid understanding of instructional strategies and classroom management. In contrast, Technological Knowledge (TK) recorded the lowest average score (3.3), suggesting limited confidence and proficiency in the use of digital tools. The integrative TPACK construct also showed a moderate mean score (3.55), indicating that while participants could conceptualize the combination of technology, pedagogy, and content, their practical implementation remained developing. These domain-level findings collectively highlight CK as the strongest and TK as the weakest area of competence.

Table 1. Technological Knowledge (TK)

Code	Questionnaire Item	Mean
TK1	I can use various digital tools (such as PowerPoint, Zoom, and Canva) to support teaching activities.	3.8
TK2	I often experience difficulties when using digital tools for teaching.	2.6
TK3	I can easily learn new technologies related to teaching and learning.	4.4
TK4	I rarely try new technologies during the teaching process.	2.4
The overall mean score for TK domain		3.3

Darussalam English Journal (DEJ)
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Table 2. Pedagogical Knowledge (PK)

Code	Questionnaire Item	Mean
PK1	I can design lesson plans that encourage active student participation.	4.0
PK2	I find it difficult to adjust teaching methods to students' learning needs.	3.8
PK3	I can manage classroom activities effectively.	4.6
PK4	I often feel confused about choosing the right teaching strategy.	3.8
The overall mean score for PK domain		4.05

Table 3. Content Knowledge

Code	Questionnaire Item	Mean
CK1	I have a good understanding of the subject matter I teach.	4.6
CK2	I often find it difficult to explain concepts in my subject area.	3.5
CK3	I can relate the subject matter to real-life examples relevant to students.	4.8
The overall mean score for CK domain		4.3

Table 4. TPACK

Code	Questionnaire Item	Mean
TPACK1	I can choose technologies that align with the teaching methods I use.	4.2
TPACK2	I feel unsure about how to use technology to enhance classroom interaction.	3.6
TPACK3	I can evaluate how effectively technology helps students achieve learning outcomes.	3.8
TPACK4	I still feel hesitant about using technology in teaching.	2.6
	The overall mean score for integrated TPACK	3.55

Source. (Schmidt et al., 2009)

Document analysis result

The document analysis drew upon two data sources: (1) the compiled practicum reports of five pre-service teachers from different study programs, and (2) mentor teachers' evaluation sheets. Together, these documents provided complementary evidence regarding the participants' Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), and integrative TPACK performance during the one-month teaching practicum at MTs N 2 Banyuwangi.

Darussalam English Journal (DEJ)
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Content Knowledge (CK). Across all practicum reports, the five pre-service teachers demonstrated strong mastery of their respective subject matter. The participant prepared well-structured learning materials covering key topics such as rational numbers, geometry, and arithmetic operations. Similarly, other participant presented accurate explanations of linguistic concepts, text structures, and vocabulary, indicating confidence in content delivery. Classroom reflections further showed that they were able to clarify concepts effectively and respond to students' misunderstandings. These findings reinforce the questionnaire results, which identified CK as the strongest domain.

Pedagogical Knowledge (PK). The reports reveal that the pre-service teachers employed a variety of pedagogical strategies, including group discussions, project-based learning, demonstrations, presentations, and structured drills. They followed standard lesson sequences—opening, core, and closing activities—and adapted their teaching approaches according to student needs. Although several participants initially experienced challenges in classroom management, improvements were observed following feedback from their mentor teachers. The mentor teacher also support this pattern, with pedagogical competence scores ranging from 86 to 89, indicating consistently strong PK across participants.

Technological Knowledge (TK). Evidence of technology integration in classroom practice was limited across the participants. While some used projectors, slides, audio recordings, or short videos, most relied predominantly on conventional tools such as textbooks, worksheets, and whiteboards. Several reports noted constraints such as limited digital equipment, unstable internet access, and varying levels of digital proficiency. For example, some pre-service teachers relied almost entirely on printed materials, while others who attempted to use audiovisual resources encountered various technical issues. Overall, technological integration remained minimal, aligning with the questionnaire findings that identified TK as the weakest domain.

Integrative TPACK. Instances of integrated use of technology, pedagogy, and content were present but inconsistent. While participants consistently

Darussalam English Journal (DEJ)
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demonstrated strong CK and adequate PK, these were seldom combined with purposeful or transformative uses of technology. Multimedia resources—such as short videos and visual slides—were occasionally used to support instruction; however, these tools functioned largely as supplementary materials rather than being meaningfully integrated into the pedagogical design of the lesson. In many cases, the limited presence of digital tools during instructional delivery also restricted opportunities for the development of TCK and TPK, as pre-service teachers were unable to demonstrate how technology could enhance or transform content representation and pedagogical strategies. This pattern was also reflected in mentor teachers' evaluations, which showed consistently high scores for subject mastery and pedagogy but noticeably lower ratings for the use of innovative or technology-based instructional media. These findings indicate that although pre-service teachers were able to plan and deliver lessons effectively, their ability to meaningfully integrate digital resources remained constrained.

Discussion

The findings of this study indicate that pre-service teachers achieved a moderately high level of TPACK competence after a one-month practicum, particularly in Content Knowledge (CK) and Pedagogical Knowledge (PK). Abel et al. (2022) and Ningtyas et al. (2024) similarly reported high TPACK levels among pre-service teachers, although the slightly lower scores in this study may be attributed to the shorter practicum duration. The strong CK observed also supports the findings of Saputro et al. (2025) and Muhammad Shahrir Mohamed Shafieek et al. (2024) , who emphasized that Islamic school teachers tend to possess solid subject-matter mastery.

In contrast, Technological Knowledge (TK) emerged as the weakest domain. Participants reported low confidence in using digital tools, and this was reflected in their limited use of technology during classroom instruction. This pattern is consistent with studies showing that Indonesian preservice teachers often face limited ICT infrastructure, insufficient training, and low confidence in technology implementation (Jaeni & Ghufron, 2024; Eliyanto et al., 2021). Ahmada & Rizkiyah, (2025) likewise noted that technology integration in Indonesian

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higher education remains inconsistent, with both lecturers and students encountering challenges in applying frameworks such as TPACK and SAMR. Their findings reinforce the idea that technology use in education depends not only on teacher competence but also on institutional readiness.

Data from the qualitative component of this study provides additional explanation for the low TK scores. Although the participants planned their lessons using sound pedagogical strategies, they were only able to utilize technology to a limited extent during classroom practice. This was primarily due to constraints such as limited ICT facilities, unstable internet access, and the continued reliance on conventional instructional media. These findings are consistent with previous studies conducted in Islamic school contexts, which report that limited digital infrastructure and gaps in technological literacy frequently hinder the implementation of technology-enhanced learning (Lubaba & Andriani, 2025; Ndibalema, 2025).

Institutional policies within pesantren-based teacher education programs may also influence the development of technological competence among pre-service teachers. Such policies often regulate or restrict the use of digital devices during the early stages of study. While intended to support student discipline and focus, these restrictions can unintentionally limit early exposure to educational technologies, contributing to lower technological confidence during practicum placements. This contextual factor aligns with broader findings suggesting that institutional culture and policy play an important role in shaping teachers' readiness to integrate technology effectively (Suresman et al., 2025; Sudir et al. 2025).

The combined results suggest that enhancing technological competence among pre-service teachers requires systemic support rather than isolated training. Improvements in digital infrastructure, earlier and more sustained exposure to educational technologies during coursework, and institutional policies that facilitate—not hinder—technology use are essential. As Lubaba & Andriani, (2025) emphasize, successful technology integration in Islamic educational settings must be both pedagogically meaningful and contextually

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grounded. Incorporating insights from Ahmada & Rizkiyah, (2025), this study suggests that effective technology integration requires not only teacher competence but also supportive institutional structures.

Overall, this study contributes to the understanding of TPACK development in Islamic school practicum settings and underscores the need to strengthen technological competence within teacher education programs. Future research may investigate longer practicum durations, compare institutions with different levels of ICT readiness, or explore the long-term development of TPACK through longitudinal designs.

Conclusion

This study contributes to the growing body of research on TPACK by providing an integrated quantitative and qualitative analysis of pre-service teachers' technological, pedagogical, and content competencies during practicum in an Islamic junior high school context—an area that remains underexplored in the Indonesian context. The findings reveal strong content and pedagogical knowledge, yet limited technological confidence and restricted use of digital tools in classroom practice. These results highlight the need for teacher education institutions to strengthen technological preparation within their programs. Providing earlier and more structured exposure to educational technologies, supported by guided practice and reflection, may help reduce the gap between theoretical understanding of TPACK and its application in real classroom situations. Institutional contexts, including policies that influence access to digital devices, should also be reviewed to ensure that they support rather than hinder the development of technological competence.

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