

# 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*

**ABSTRAK.** Penelitian ini menyelidiki kompetensi Technological Pedagogical Content Knowledge (TPACK) dari lima calon guru (pre-service teachers) selama praktik mengajar selama satu bulan di MTs N 2 Banyuwangi. Penelitian ini bertujuan untuk mengukur tingkat kompetensi TPACK secara keseluruhan serta mengidentifikasi domain yang paling kuat dan paling lemah. Penelitian ini menggunakan desain kuantitatif deskriptif dengan instrumen berupa kuesioner self-assessment berjumlah 15 butir menggunakan skala Likert 5 poin, yang dilengkapi dengan analisis dokumen berupa RPP, bahan ajar, dan laporan refleksi. Hasil penelitian menunjukkan bahwa para peserta memiliki tingkat TPACK yang secara umum tinggi, dengan Content Knowledge (CK) sebagai domain terkuat, diikuti oleh Pedagogical Knowledge (PK), sementara Technological Knowledge (TK) merupakan domain terlemah. Skor TPACK terintegrasi menunjukkan bahwa para calon guru memiliki tingkat kepercayaan diri yang sedang dalam menggabungkan teknologi, pedagogi, dan konten dalam pembelajaran. Analisis dokumen juga mendukung temuan ini dengan menunjukkan penguasaan materi yang kuat dan kesiapan pedagogis yang memadai, namun integrasi alat-alat digital dalam praktik pembelajaran masih terbatas. Temuan ini menegaskan perlunya pelatihan teknologi yang lebih terstruktur serta paparan awal terhadap teknologi pendidikan dalam program pendidikan guru guna memperkuat kompetensi teknologi calon guru.

**Kata kunci:** *calon guru, kompetensi TPACK, praktik mengajar*

## 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 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 pesantren environments, remains limited. Previous studies have predominantly focused on general school contexts or higher education, with little attention to how pre-service teachers enact TPACK during teaching practicum in Islamic educational institutions. Moreover, most existing studies rely solely on self-assessment questionnaires without triangulating the findings with actual teaching documents such as lesson plans, teaching materials, and reflective reports.

To address this gap, this study combines quantitative self-assessment data with qualitative document analysis to provide a more comprehensive understanding of how pre-service teachers demonstrate TPACK in real classroom practice. This mixed evidence approach, situated within an Islamic junior high school and pesantren-based context, constitutes the main novelty of this research.

## 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), 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.

## RESULT AND DISCUSSION

### Result

#### Questionnaire Result

Tables 1–4 indicated an uneven pattern of TPACK competence among the five pre-service teachers. Content Knowledge (CK) emerged as the strongest domain ( $M = 4.3$ ), followed by Pedagogical Knowledge (PK) ( $M = 4.05$ ). In contrast, Technological Knowledge (TK) recorded the lowest mean score ( $M = 3.3$ ), suggesting comparatively limited confidence and proficiency in the use of digital tools for instructional purposes. The integrated TPACK score was moderate ( $M = 3.55$ ), indicating that while participants conceptually recognized the interplay between technology, pedagogy, and content, their practical integration of these components remained developing. Overall, the quantitative findings reveal a consistent pattern of strong content mastery and solid pedagogical understanding, juxtaposed with weaker technological competence and only moderate confidence in integrative TPACK application.

**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

**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 corroborated the questionnaire findings and provided further insight into how TPACK was enacted in classroom practice. With regard to Content Knowledge (CK), all participants demonstrated strong subject-matter mastery, as evidenced by well-structured lesson materials, accurate conceptual explanations, and the ability to address students' misconceptions during instruction.

In terms of Pedagogical Knowledge (PK), pre-service teachers employed a range of instructional strategies, including group discussions, project-based learning, and structured drills, and generally adhered to standard lesson sequences. Although initial classroom management challenges were observed, participants showed improvement following mentor feedback, which was reflected in consistently high pedagogical evaluation scores (86–89).

Technological Knowledge (TK), however, remained limited in practice. While some participants utilized projectors, slides, or audiovisual materials, most relied predominantly on conventional tools such as textbooks, worksheets, and whiteboards. Constraints related to limited digital infrastructure, unstable internet access, and varying levels of digital proficiency further restricted technology use.

Regarding integrative TPACK, evidence of meaningful technology integration was present but inconsistent. Digital tools were typically used as supplementary resources rather than as transformative elements of pedagogical design. Consequently, opportunities to demonstrate advanced technological-pedagogical-content integration (e.g., TCK and TPK) were limited.

Three key patterns emerged across the data sources. First, CK and PK consistently appeared as strengths, while TK was the weakest domain. Second, a gap was evident between lesson planning and actual classroom technology use, indicating that technological integration was often more conceptual than practical. Third, when technology was employed, it primarily functioned as a supplementary aid rather than as a means to transform instructional practice. Collectively, these patterns suggest an imbalanced TPACK profile characterized by strong content and pedagogical but constrained technological integration in authentic teaching contexts.

## **Discussion**

The perspective of the TPACK framework (Mishra & Koehler, 2006), which emphasizes the dynamic and interdependent relationship among technological, pedagogical, and content knowledge, 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). While strength in CK and PK reflects solid disciplinary and instructional foundations, TPACK theory suggests that such strengths alone are insufficient for effective technology-integrated teaching unless they are meaningfully interconnected with Technological Knowledge (TK).

Consistent with this pattern, previous studies have also reported relatively strong TPACK profiles among pre-service teachers. 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 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 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. While these insights are valuable, the small sample size, short practicum duration, and reliance on self-reported data may limit generalizability; future research could involve larger and more diverse samples, adopt longitudinal designs, and incorporate classroom observations or video based analyses to more directly capture technology integration in practice.

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