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Pedagogical Competency Gaps in the Implementation of Technological Pedagogical and Content Knowledge among Arabic Language Teachers in Indonesia and Its Implications for Learning Effectiveness

Maftukh Ghulam Mursyidan[1], Anisah Firdausi Nuzula[2], Muhammad Thohir[3]
[1,2,3] Sunan Ampel State Islamic University Surabaya
maftukhg@gmail.com[1], anisahfirdausi07@gmail.com[2], muhammadthohir@uinsby.ac.id[3]

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Abstract:
The rapid digital transformation in 21st-century education demands that Arabic language teachers master not only subject matter but also information and communication technology (ICT) integration. However, a significant gap persists in Indonesia between technological availability and effective pedagogical implementation, often hindered by traditional mindsets. Previous studies frequently focus on general ICT literacy or infrastructure, overlooking the specific intersection of technology and Arabic linguistics. This research aims to analyze the pedagogical competence imbalance within the TPACK framework and its implications for learning effectiveness. This study employs a qualitative approach with a library research and case study design. Field data collection was conducted through a systematic documentation technique of peer-reviewed journal articles, academic books, curriculum documents, and Arabic teacher training modules. Data analysis was processed through a multi-stage qualitative framework consisting of thematic data reduction, data display (matrix synthesis), and conclusion drawing/verification, with data trustworthiness ensured through source triangulation techniques . The results reveal a "pedagogical lag" where high technological knowledge is not synchronized with transformative instructional strategies, often resulting in superficial technology use that leads to student cognitive overload. In conclusion, bridging the pedagogical gap in TPACK is essential for meaningful instruction. The study recommends shifting teacher training toward subject-specific pedagogical technology to honor the richness of the Arabic language in the digital era.

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مستخلص البحث:

مستخلص البحث :تتطلب التحولات الرقمية السريعة في تعليم القرن الحادي والعشرين من معلمي اللغة العربية ليس فقط إتقان المادة العلمية، بل أيضًا دمج تكنولوجيا المعلومات والاتصالات بشكل فعال .ومع ذلك، لا تزال هناك فجوة كبيرة في إندونيسيا بين توافر التكنولوجيا والتطبيق التربوي الفعال، وغالبًا ما تعوقها العقلية التقليدية .ركزت الدراسات السابقة كثيرًا على الثقافة الرقمية

العامة أو البنية التحتية، متجاهلة التداخل النوعي بين التكنولوجيا واللسانيات العربية .تهدف هذه الدراسة إلى تحليل عدم التوازن في الكفاءة التربوية ضمن إطار **TPACK** وآثاره على فعالية التعلم .تستخدم هذه الدراسة المنهج النوعي مع تصميم البحث المكتبي ودراسة الحالة .وتم جمع البيانات الميدانية من خلال تقنية التوثيق المنهجي للمقالات العلمية المحكمة، والكتب الأكاديمية، ووثائق المناهج الدراسية، ووحدات تدريب معلمي اللغة العربية .كما تمت معالجة تحليل البيانات من خلال تحليل نوعي متعدد المراحل يشمل تلخيص البيانات الموضوعية، وعرضها (مصفوفة الاصطناع)، واستخلاص النتائج والتحقق منها، مع ضمان موثوقية البيانات باستخدام تقنيات التثليث للمصادر .أظهرت النتائج وجود "تأخر تربوي" حيث لا تتزامن المعرفة التكنولوجية العالية مع استراتيجيات التدريس التحويلية، مما يؤدي غالبًا إلى استخدام سطحي للتكنولوجيا يسبب عبئًا معرفيًا على الطلاب .وفي الختام، يعد سد الفجوة التربوية في **TPACK** ضروريًا للتعليم الفعال .توصي الدراسة بتحويل تدريب المعلمين نحو التكنولوجيا التربوية الخاصة بالمادة للحفاظ على ثراء اللغة العربية في العصر الرقمي.

الكلمات المفتاحية: إطارTPACK ، الكفاءة التربوية، معلمو اللغة العربية، فعالية التعلم

Introduction

The digital transformation has fundamentally shifted the educational paradigm in the 21st century, requiring teachers to not only master subject matter but also become proficient in integrating information and communication technology (ICT) to create effective learning environments(Wohlfart & Wagner, 2022). In the global context, technology is no longer an optional tool but an integral part of the learning process that allows for more flexible, interactive, and relevant education(Mustaji et al., 2025). However, the rapid advancement of digital tools is often not matched by a proportional increase in teacher quality, especially regarding the pedagogical wisdom required to utilize these tools effectively(Valverde-Berrocoso et al., 2021). This issue is particularly critical in the landscape of Arabic language education in Indonesia, where a significant gap remains between the availability of sophisticated technology and the actual classroom practices that lead to meaningful learning outcomes(Mazyuna & Mad'ali, 2025). In many madrasahs, the integration of technology is still hindered by traditional mindsets that view digital tools as mere supplements rather than transformative agents.(Sungkowo et al., 224 C.E.) Consequently, there is an urgent need to evaluate how Arabic language educators navigate this digital transition without losing the pedagogical essence of language instruction.

A concise theoretical review reveals that the TPACK framework, originally developed by Mishra and Koehler, evolved from Shulman's Pedagogical Content Knowledge (PCK) which suggests that teaching expertise exists at the intersection of knowing what to teach and how to teach it(Mishra & Koehler, 2006). TPACK adds the technological dimension, creating seven sub-domains of knowledge including Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). Previous studies have extensively documented the general application of TPACK in various subjects, emphasizing that mastery of ICT can significantly enhance student engagement and material accessibility(Usman et al., 2024). In the specific field of language learning, literature often highlights the role of multimedia in improving listening and speaking skills, yet most research remains focused on English rather

than Arabic(Habib et al., 2024). While these studies provide a robust foundation for understanding digital integration, they frequently overlook the unique linguistic and cultural complexities inherent in Arabic pedagogy within the Indonesian Islamic educational system(Kamal, 2025).

Despite the abundance of research on TPACK, there is a visible gap in the literature regarding the specific imbalance of pedagogical competence among Arabic language teachers in Indonesia(Sholahudin et al., 2025). Most existing studies focus heavily on the availability of infrastructure or the basic ICT literacy of teachers, rather than the deep intersection of technology and pedagogy(Lomos et al., 2023). There is a lack of critical analysis on why teachers who possess high technical skills still struggle to implement active and communicative Arabic learning strategies(Soliman & Khalil, 2022). This research fills that gap by identifying the "pedagogical lag" that occurs when teachers possess the technical skills to operate software but lack the deep understanding of how to align those tools with the complex nature of Arabic linguistics(Febriani et al., 2024). By focusing on this specific inequality, the study provides a unique contribution by shifting the focus from technological acquisition to pedagogical maturity. This perspective is essential for understanding the systemic barriers that prevent technology from becoming a truly effective catalyst for language mastery in Indonesian classrooms.

The rationale for conducting this study is rooted in the scientific necessity to bridge the digital divide that exists not in infrastructure, but in the minds and methods of educators(Aleksieva et al., 2025). As Indonesia pushes for the digitalization of madrasahs, it is vital to ensure that this transition does not result in "mechanized" learning where technology is used to replicate ineffective traditional methods(Putra et al., 2025). The urgency of this issue lies in the fact that without a strong pedagogical bridge, the use of digital tools often leads to cognitive overload for students and a dilution of linguistic depth(Skulmowski & Xu, 2022). This study is essential to provide a logical framework for teacher professional development that moves away from generic ICT workshops toward subject-specific pedagogical technology training(Amir, 2023). By analyzing these pedagogical imbalances, the research offers a critical response to the current challenges of 21st-century education, ensuring that the richness of the Arabic language is honored through modern and effective instruction that meets the evolving needs of the next generation.

The primary objectives of this research are explicitly stated to provide a clear direction for investigating these educational challenges. First, (1) to analyze the specific manifestations of pedagogical competence imbalance in the implementation of TPACK among Arabic language teachers across various madrasahs in Indonesia. Second, (2) to identify the internal and external factors that contribute to the widening gap between technological mastery and pedagogical application in the Arabic classroom. Third, (3) to evaluate the direct implications of this competence inequality on the overall effectiveness of the learning process and the achievement of student linguistic outcomes. It is expected that the outcomes of this research will provide a new perspective on curriculum adjustments and teacher training models that prioritize pedagogical tech-fluency. Ultimately, this study aims to establish a baseline for future policies, ensuring that every digital tool chosen by a teacher is a deliberate decision aimed at enhancing communicative competence. Through this systematic inquiry, the research seeks to

transform the landscape of Arabic language education into a more adaptive and digitally meaningful environment.

Method

The methodology of this research is meticulously designed to provide a comprehensive explanation of how the study was executed, ensuring academic rigor and transparency throughout the process. The authors chose the phenomenon of pedagogical competence imbalance as the primary focus because of the visible gap between the rapid adoption of digital tools and the stagnant quality of instructional methods in Arabic classrooms(Sugiyono, 2013). This issue is critical to investigate as it directly affects the linguistic outcomes of students in the digital era, where technical mastery often overshadows pedagogical wisdom. To address this, the study employs a qualitative approach with a library research and case study design to gain an in-depth understanding of how teachers integrate technology within the specific linguistic demands of the Arabic language(Sugiyono, 2019). This framework allows for a systematic exploration of existing theories and empirical data regarding the implementation of TPACK in the Indonesian educational landscape. The data used in this research consist of scholarly articles, academic books, and official educational documents that capture the complex and nuanced nature of pedagogical challenges in naturalistic settings.

The selection of data sources was conducted through a systematic documentation process to ensure that the materials provided rich and relevant information regarding the research focus. The primary sources include peer-reviewed journals, research reports, and curriculum documents that discuss digital learning initiatives and teacher competence in various madrasahs in Indonesia. These sources were selected based on their relevance to the TPACK framework and their focus on Arabic language pedagogy in the digital age. To gather this data, several techniques were employed to ensure the validity and reliability of the findings. First, (1) an intensive literature search was conducted across digital databases to explore theoretical perceptions of the TPACK framework. Second, (2) a case study analysis was performed on specific research reports to record the actual implementation of digital tools in language classrooms. Third, (3) documentation analysis was utilized to review official teacher training modules and student assessment rubrics to verify if technological choices were supported by sound pedagogical planning in previous implementations.

The data analysis follows a systematic multi-stage qualitative process, starting with data reduction, followed by data display, and finally, conclusion drawing and verification(Sugiyono, 2013). During the reduction phase, the vast amount of raw data collected from various literature and documents was categorized into specific themes such as "pedagogical lag," "technological barriers," and "linguistic effectiveness." The analysis specifically looked for patterns of imbalance where high technological mastery documented in previous reports did not translate into effective language pedagogy. To ensure the validation of the research results, triangulation techniques were applied by comparing data from different types of documents and diverse scholarly perspectives, such as cross-referencing theoretical frameworks with reported classroom outcomes(Morgan, 2024). This comparative analysis was conducted to confirm the accuracy of the researcher's interpretations of the systemic gaps in teacher competence. It can be concluded that this methodological structure provides a robust foundation for identifying the implications of competence inequality for the future of Arabic language pedagogy.

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Results and Discussion

Result

1. Manifestations of "Pedagogical Lag" in the Classroom: Technology as a Static Substitute

As the primary data in this literature and case study, we extracted characteristics of technology integration from various secondary sources. The results of this data reduction regarding the actual forms of ICT utilization are summarized in the following synthesis table:

Table 1. Technology Utilization Synthesis Matrix Based on Literature Review

NO	Digital Media/Applications	Real Activities in the Field (Case Study Results)	Kategori TPACK (Mishra & Koehler)	Sumber Literatur Terkait
1	LCD Projector & PPT	Display text *Qira'ah* static from PDF of printed book.	TK Dominance, TPK Weakness (*Substitution*).	(Ma'mun et al., 2021) (Mas et al., 2024)
2	Platform YouTube	Playing video *Hiwar* without further communicative assignments.	TK Dominance, PK Passive Traditional.	(Habib et al., 2024) (Soliman & Khalil, 2022)
3	WhatsApp group	Send one-way assignment instructions & memorization photos *Mufradat*.	Substitution of Conventional Administrative Tools.	(Mazyuna & Mad'ali, 2025)

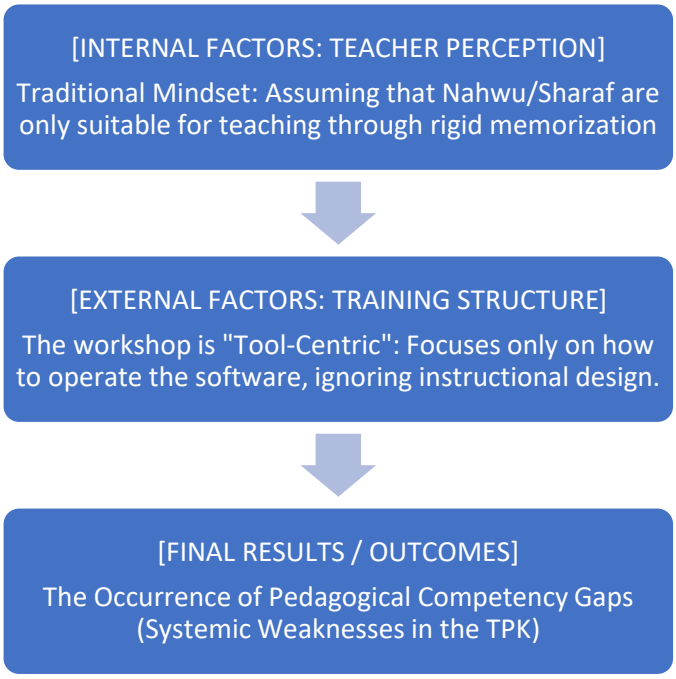
Based on **Table 1**, literature synthesis data confirms that the availability of digital infrastructure in madrasas is not aligned with the maturity of teachers' instructional design. Arabic language teachers are caught in a "substitution trap," where digital media is used only to duplicate traditional lecture methods. High technological mastery (TK) is separated from an understanding of how that technology should facilitate active language acquisition.

2. Internal and External Factors that Widen the Competency Gap

To visualize the factors causing this gap, a conceptual relationship mapping was conducted based on the analysis of training documents and pedagogical journals. This relationship is depicted in the chart below:

Figure 1. Causal Factor Flowchart *Pedagogical Competency Gap* to Arabic Language Teacher:

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Through the groove on **Figure 1** Data interpretation suggests that this disparity stems from two directions. Internally, there are psychological barriers where teachers view technology as a cosmetic tool unsuitable for complex linguistic material. Externally, teacher professional training documents demonstrate a technical bias. The training teaches *What* the tool, but forget the aspect *Why* And *How* designing the tool to be relevant to the linguistic characteristics of Arabic.

3. Implications of Competency Inequality on Students' Cognitive Load and Learning Effectiveness

The impact of*pedagogical lag*This data is synthesized from digital-based learning observation report documents. Data regarding the distribution of students' cognitive attention is summarized in the following table:

Table 2. Distribution of Students' Cognitive Attention in ICT-Based Arabic Language Learning:

Attention Observation Aspect	Student Focus and Actual Behavior in Class	Impact of Language Skills
Navigation & Technical Issues	**60% Mental Energy:** Out of stock for procedures*log-in*, resolve error (*error*), and application interface.	Students experience*mental fatigue*(mental fatigue) before entering the core material.
Focus on Language Material	**25% Mental Energy:** Used to understand Arabic texts and rules.	The depth of linguistic understanding becomes shallow.
Authentic Language Interaction	**15% Mental Energy:** Remaining time for active simulation (*Estimate* & *Takallum*).	Students' productive-communicative skills have stagnated.

Data on **Table 2** shows that when technology is introduced into the classroom without a well-developed pedagogical filter, the digital intervention actually acts as an instructional distraction. Students' cognitive energy is drained trying to understand how the device operates, drastically reducing their working memory capacity for learning Arabic language rules (*cognitive overload*This phenomenon explains why the digitalization of madrasas has not been positively correlated with a significant increase in students' language proficiency scores.

Discussion

The findings presented in the results section underscore a significant disparity in the TPACK domains of Arabic language teachers in Indonesia, particularly the gap between their technical proficiency and pedagogical application. It can be concluded that while teachers possess high levels of Content Knowledge (CK) and moderate-to-high Technological Knowledge (TK), there is a visible "pedagogical lag" where digital tools are used merely to replace traditional media without transforming instructional strategies. This manifestation of competence imbalance is characterized by the use of technology for superficial purposes, such as projecting static text, rather than facilitating immersive or communicative language experiences(Guanuche et al., 2025). These data points suggest that the current implementation of TPACK is fragmented, leaving the intersection of pedagogy and technology (TPK) as the weakest link in the educational process(Zakiyah & Shodiq, 2022). Consequently, the presence of digital infrastructure in madrasahs has not yet translated into a modernized teaching-learning ecosystem that effectively addresses the complex linguistic needs of students in the 21st-century context.

This persistent imbalance is rooted in several critical causes that emerge from both internal teacher perceptions and external professional development structures. Internally, a traditionalist view remains dominant among many Arabic educators who believe that classical linguistic structures, such as Nahwu and Sharaf, are best taught through rote memorization and teacher-centered methods(Baharun, 2025). This mindset creates a psychological barrier where technology is viewed as an external addition rather than an internal catalyst for pedagogical innovation. Externally, most teacher training programs in Indonesia focus heavily on technical "how-to" sessions, such as operating specific applications, while neglecting the deep pedagogical theories required to integrate those tools into language-specific instruction(Mardani & Syafei, 2025). This results in a "tool-centric" approach where teachers possess the skills to use software but lack the professional wisdom to align it with communicative language teaching goals. Thus, the gap is not a lack of hardware or basic digital literacy, but a systemic failure to bridge the divide between technical capability and pedagogical intent.

The interpretation of these causes reveals serious consequences for the overall effectiveness of Arabic language learning, leading to a state of "digital stagnation" where technology hinders rather than helps student mastery. When teachers implement technology without a solid pedagogical foundation, it often results in cognitive overload for students who must focus more on navigating complex digital interfaces than on the linguistic content itself(Ma'mun et al., 2021). This misalignment prevents the development of high-level communicative skills, such as *istima'* and *takallum*, as the technology fails to simulate authentic and interactive linguistic environments. Furthermore, the reliance on superficial digital

substitution limits the students' exposure to diverse and meaningful language resources, ultimately reducing their motivation and engagement in the classroom. In the long term, this competence inequality perpetuates an outdated educational model under the guise of modernization, failing to prepare students for the global demands of Arabic communication(Mohideen, 2024). The lack of pedagogical fluently essentially renders the digital transformation of madrasahs ineffective, maintaining a divide between potential and reality.

When comparing these findings with previous studies, a clear contrast emerges regarding the nature of the digital divide in Indonesian education. While earlier research often emphasized the lack of infrastructure and basic ICT literacy as the primary obstacles to technology integration, this study reveals that the current challenge has shifted toward the quality of pedagogical application(Imaduddin & Firdaus, 2025). Previous literature suggests that multimedia resources can significantly enhance language learning experiences; however, this study finds that such benefits are only realized when the teacher possesses strong TPK(Wan & Yang, 2025). Unlike general education studies that focus on the ease of use of digital tools, this research highlights the unique linguistic complexities of Arabic that require a more nuanced pedagogical approach. The "substitution trap" identified in this study aligns with some findings in English language teaching research but is more pronounced in the Arabic context due to the heavy emphasis on classical grammar over communicative competence. This comparison underscores the need for a shift in the academic discourse from technological acquisition to subject-specific pedagogical maturity.

To address these systemic issues, several actionable recommendations are proposed as solutions within the framework of policy and method. Conceptually, there must be a shift from generic ICT training to a "Subject-Specific TPACK" model where technology is taught strictly through the lens of Arabic pedagogy and linguistic goals(Rozak et al., 2024). From a policy perspective, educational institutions and stakeholders should develop standardized digital-pedagogical rubrics that guide teachers in selecting and utilizing tools based on their specific instructional objectives(Mas et al., 2024). Practically, professional development must move away from one-off workshops toward continuous, classroom-based coaching that focuses on the "why" and "how" of technology integration rather than just the "what." Additionally, future researchers and curriculum designers should collaborate to create Arabic-specific digital resources that include built-in pedagogical scaffolds to support teachers in the transition from traditional to transformative methods. By implementing these strategic changes, the landscape of Arabic language education can move toward a more balanced and effective implementation of TPACK, ensuring that technology serves as a meaningful bridge to linguistic excellence.

Conclusion

The primary findings of this research highlight a significant manifestation of "pedagogical lag" within the TPACK framework among Arabic language teachers in Indonesia, where a high level of technical proficiency does not correspond with effective instructional delivery. It can be concluded that while educators possess strong Content Knowledge (CK) and adequate Technological Knowledge (TK), they consistently struggle with Technological Pedagogical Knowledge (TPK), leading to a superficial integration of digital tools. Technology in the Arabic classroom is frequently utilized as a mere substitute for traditional media—such

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as using digital projectors for static texts—rather than as a transformative agent for communicative immersion. This imbalance results in a "substitution trap" that fails to foster active student engagement or authentic linguistic development. Furthermore, the study identifies that the lack of pedagogical fluency often leads to cognitive overload for students, as the instructional design focuses more on the mechanics of technology than on the linguistic goals of *istima'* and *takallum*. Consequently, the current state of digital adoption in madrasahs remains fragmented, emphasizing hardware acquisition over the necessary evolution of teaching methodologies.

This study provides a significant conceptual and theoretical contribution to the field of language education by redefining the digital divide as a pedagogical crisis rather than a lack of infrastructure. By applying the TPACK framework specifically to the nuances of Arabic pedagogy, the research introduces the concept of "Subject-Specific TPACK," emphasizing that technology integration must be filtered through the unique linguistic and cultural requirements of the subject. Conceptually, this study challenges the traditional model of teacher professional development, suggesting that generic ICT literacy is insufficient for language instruction in the 21st century. Methodologically, the use of a qualitative case study approach allowed for a deeper exploration of the psychological and professional barriers that prevent teachers from moving beyond teacher-centered digital use. These insights offer a robust theoretical foundation for future policies, advocating for a shift toward "pedagogical tech-fluency" as the primary goal of teacher training. By highlighting the intersection of pedagogy and technology as the critical bridge for effective learning, this research serves as a catalyst for a more adaptive and meaningful curriculum in Islamic educational institutions.

Despite the comprehensive nature of these findings, this study acknowledges certain limitations that provide fertile ground for future investigation and recommendations for the academic community. First, the research scope was restricted to a specific group of madrasahs in Indonesia, which may not fully represent the diverse geographical and infrastructural variations across the entire archipelago. Second, the study primarily focused on teacher perspectives and classroom observations, leaving room for a more quantitative analysis of student learning outcomes related to specific digital interventions. Future studies are encouraged to utilize mixed-method designs to measure the long-term impact of TPACK-based professional development on student linguistic proficiency scores. Additionally, there is a clear need for subsequent research to explore the development of Arabic-specific artificial intelligence tools and their effectiveness when integrated with communicative pedagogical scaffolds. Addressing these gaps will be essential to building a more holistic understanding of how digital transformation can be sustained in language education. Ultimately, these recommendations aim to ensure that the journey toward digitalizing Arabic instruction continues to evolve from technical adoption to profound pedagogical innovation.

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