



TPACK (Technological Pedagogical Content Knowledge)-Based Arabic Language Learning: A Systematic Review

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Abstract

Technological Pedagogical Content Knowledge (TPACK) is widely used to describe how language teachers combine technology, pedagogy, and subject-matter expertise, yet the growing body of research applying this framework to Arabic language teaching had not been mapped systematically. This study conducted a systematic review following the PRISMA 2020 protocol to examine how TPACK has been researched and implemented in Arabic language teaching and learning. Records were retrieved through AI-assisted academic search tools and supplementary web searching, screened against explicit eligibility criteria, and synthesized narratively because the included designs were methodologically too heterogeneous for meta-analysis. Sixteen studies published between 2021 and 2026, most originating from Indonesian madrasah, pesantren, and university settings together with a smaller number from Malaysia, met the inclusion criteria. The review shows that teachers generally hold adequate content and pedagogical knowledge but weaker technological integration, particularly in assessment design, while structured TPACK training and technology-based media consistently raised teacher competence and learner outcomes. Geographic concentration and a scarcity of experimental designs stand out as priorities for future research.

Keywords TPACK; Arabic language learning; technology integration; systematic review

مستخلص البحث

تُستخدم المعرفة التربوية التكنولوجية بالمحتوى (TPACK) على نطاق واسع لوصف كيفية دمج معلمي اللغات بين التكنولوجيا وطرائق التدريس والمعرفة بالمادة العلمية، إلا أن الأدبيات التي طبقت هذا الإطار على تعليم اللغة العربية لم تُرسم خرائطها بمنهجية منظمة من قبل. تهدف هذه الدراسة إلى إجراء مراجعة منهجية وفق بروتوكول PRISMA 2020 لفحص كيفية دراسة إطار TPACK وتطبيقه في تعليم اللغة العربية وتعلمها. جُمعت السجلات عبر أدوات بحث أكاديمي مدعومة بالذكاء الاصطناعي وبحث تكميلي على الإنترنت، ثم عُزلت وفق معايير أهلية واضحة، وحُللت سردياً نظراً لتباين تصاميم الدراسات المشمولة تبايناً منهجياً يمنع إجراء تحليل تلوي. واستوفت ست عشرة دراسة نُشرت بين عامي 2021 و2026، معظمها من سياقات المدارس الدينية والمعاهد الإسلامية والجامعات الإندونيسية إضافة إلى عدد أقل من ماليزيا، معايير الإدراج. وتُظهر المراجعة أن المعلمين يمتلكون عموماً معرفة كافية بالمحتوى وطرائق التدريس، لكن دمجهم للتكنولوجيا أضعف، خصوصاً في تصميم التقويم، في حين أن التدريب المنظم على TPACK والوسائط التقنية رفعاً باستمرار كفاءة المعلمين

المقدمة

Arabic is studied as a foreign or second language by millions of learners worldwide, from national school systems in Southeast Asia to university departments across the globe, and the way teachers integrate digital technology into that instruction has become a defining concern of contemporary Arabic language pedagogy. Technological Pedagogical Content Knowledge, commonly abbreviated TPACK, has emerged as the dominant framework for describing the knowledge a teacher needs to teach a specific subject effectively with technology (Mishra & Koehler, 2006). Building on Shulman's (1986) earlier construct of pedagogical content knowledge, TPACK adds a technological dimension and proposes that effective technology-integrated teaching sits at the intersection of content knowledge, pedagogical knowledge, and technological knowledge, together with their pairwise and joint interactions (Koehler & Mishra, 2009). For Arabic language education specifically, this framework carries particular weight because Arabic instruction confronts learners with a non-Latin script, distinctive phonological features, and four interdependent language skills, so decisions about which digital tools to use, and how to align them with both pedagogy and linguistic content, are rarely straightforward.

Over roughly the past five years, a steadily growing body of empirical work has examined how the TPACK framework plays out in Arabic language classrooms, most of it concentrated in Indonesia and, to a lesser extent, Malaysia. Survey-based studies have profiled the TPACK competence of pre-service and in-service Arabic teachers (Ma'mun et al., 2021; Zakiyah et al., 2022), while qualitative case studies have documented how individual madrasah, pesantren, and university classrooms operationalize TPACK through platforms such as WhatsApp, Google Classroom, Quizizz, and Arabic-language video content (Hasim et al., 2025; Nisa et al., 2025). A smaller set of design-and-development and quasi-experimental studies has gone further and measured the effect of TPACK-based media and professional development on learning outcomes and teacher competence (Ayu, 2025; Ikhsan, 2026; Putri, 2025). Beyond individual studies, at least one prior review has attempted to synthesize this literature narratively across seventeen studies

(Sholahudin et al., 2025), and a separate bibliometric review has mapped Arabic language teaching research more broadly without a specific TPACK lens.

Despite this accumulating evidence, the existing synthesis has three notable limitations that motivate the present review. First, it does not follow a registered, transparent protocol such as PRISMA 2020, so its search strategy, eligibility decisions, and exclusion reasons cannot be independently traced or reproduced. Second, its scope is confined largely to the Indonesian literature and does not explicitly compare findings across countries or across the diversity of research designs used, from descriptive surveys to quasi-experiments and design-based research. Third, no existing review has organized findings around the specific TPACK sub-domains, such as technological knowledge, technological pedagogical knowledge, or technological content knowledge, to show precisely where teachers' competence is strong and where it remains underdeveloped. These gaps leave open basic questions about how much of the Arabic-TPACK evidence base is descriptive versus causal, how geographically concentrated it is, and what methodological blind spots future primary research should address.

This study therefore aims to conduct a systematic review, guided by the PRISMA 2020 reporting protocol (Page et al., 2021), of how the TPACK framework has been researched, implemented, and measured in Arabic language teaching and learning. Specifically, the review asks: (1) what research designs, technologies, and participant groups characterize the Arabic-TPACK literature; (2) what patterns emerge regarding teachers' and learners' TPACK-related competence and outcomes; and (3) what methodological and geographic gaps remain. Its contribution is twofold: it offers the first PRISMA-guided, criterion-explicit synthesis of this specific niche literature, with a transparent and reproducible record of every inclusion and exclusion decision, and it maps findings onto the TPACK sub-domains to identify where future primary research, particularly experimental and non-Indonesian studies, is most needed.

The remainder of this article is organized as follows. The Method section details the review's eligibility criteria, information sources, search strategy, screening process, and synthesis approach, together with an explicit account of its methodological limitations. The Results and Discussion section reports the PRISMA flow of records, summarizes the characteristics of the sixteen included studies, presents a thematic synthesis of their findings, and discusses these findings in relation to the existing literature and to practical implications for Arabic teacher

education. The Conclusion then summarizes the review's main contributions and outlines directions for future research.

طريقة البحث

This study is a systematic review conducted in accordance with the PRISMA 2020 reporting protocol (Page et al., 2021). Because the included studies employed markedly different designs, samples, and outcome measures, a quantitative meta-analysis pooling effect sizes was not appropriate; findings were instead synthesized narratively and thematically, consistent with recommended practice when methodological heterogeneity precludes statistical pooling.

Eligibility criteria were defined using a Population-Concept-Context (PCC) structure appropriate for a review spanning quantitative, qualitative, and design-based research. The population comprised Arabic language teachers, pre-service teacher candidates, lecturers, or learners in formal or non-formal educational settings. The concept of interest was the empirical investigation, application, development, or measurement of the TPACK framework, or of its constituent knowledge domains taken together as an integrated construct. The context was Arabic as a foreign or second language, at any educational level and in any country. Eligible study designs included quantitative surveys, qualitative case studies, quasi-experimental studies, mixed-methods studies, and research-and-development or design-based research reporting primary empirical data. Studies were excluded if they were conceptual papers or narrative/literature reviews without new primary data, if they discussed general technology integration in Arabic teaching without explicitly framing it through TPACK, if they examined only an isolated TPACK sub-component such as content knowledge in isolation from the integrated framework, if their population or context fell outside Arabic language education, or if their authorship or empirical basis could not be independently verified.

Records were identified through two AI-assisted academic search tools, Consensus, which surfaces relevance-ranked results drawn from sources including Semantic Scholar, Scopus-indexed venues, PubMed, and arXiv, and Scholar Gateway, a semantic search tool over a full-text academic corpus, supplemented by targeted web searches used chiefly to verify and complete bibliographic details and to identify a small number of additional candidate records. In the interest of methodological transparency, it should be stated plainly that these tools return relevance-ranked results rather than the fully reproducible Boolean output of a single named bibliographic database such as Scopus or ERIC; this is disclosed as a limitation below rather than described as an exhaustive database search. Search

terms combined the concept "TPACK" or "Technological Pedagogical Content Knowledge" with "Arabic language," "Arabic teaching," "Arabic teacher," or the Indonesian equivalent "bahasa Arab," across six queries submitted to Consensus, one broader query submitted to Scholar Gateway, and several supplementary web searches. All searches were conducted in August 2026, and no lower date boundary was imposed, though in practice all records identified were published between 2021 and 2026, reflecting the recency of this literature.

Selection proceeded in two stages. Titles and abstracts of all identified records were first screened against the eligibility criteria above; records screened out at this stage were predominantly TPACK studies outside the Arabic-language context, or Arabic-education studies that did not explicitly employ the TPACK framework. Records that passed this stage had their full texts assessed for eligibility, at which point conceptual reviews, isolated-sub-component studies, and records with unverifiable primary data or authorship were excluded, with the specific reason recorded for each. During eligibility assessment, one study was found to have been published in two venues with overlapping data and was treated as a single study, citing its more detailed report as the primary source. Screening and full-text assessment were conducted by a single AI-assisted reviewer rather than by two independent human coders with consensus adjudication; this departure from best-practice dual independent screening is disclosed here as a limitation rather than concealed.

For each included study, the following data were extracted: authors and year, country, research design, participants or sample, the technology or TPACK component examined, and the key findings relevant to teacher or learner outcomes. Data were synthesized thematically by grouping studies according to recurring patterns across these extracted items. Formal risk-of-bias or methodological-quality appraisal using a standardized instrument, such as the Mixed Methods Appraisal Tool, was not conducted for the included studies; this is likewise disclosed as a limitation, since a rigorous appraisal of this kind was beyond the scope of what a single review cycle could responsibly complete, and the review's synthesis should be read as descriptive and thematic rather than as a quality-weighted evidentiary judgment.

النتائج والمناقشة

The search identified 47 unique records: 28 from Consensus, 17 from Scholar Gateway, and 2 through supplementary web searching. No records were removed

as duplicates at the identification stage, since the one case of overlapping-data publication described above was detected later, during full-text eligibility assessment, rather than through automatic duplicate matching. All 47 records were screened by title and abstract, and 24 were excluded at this stage, mostly Scholar Gateway records addressing TPACK in subjects other than Arabic, and Consensus records discussing technology integration in Arabic teaching without an explicit TPACK framing. The remaining 23 reports were sought and retrieved in full; all 23 were successfully obtained. Full-text assessment excluded a further 7 reports: four were conceptual papers or narrative/literature reviews rather than primary empirical studies, one examined only an isolated TPACK sub-component, and two had a population or context outside Arabic-language education or could not be independently verified. Sixteen studies therefore met all eligibility criteria and were included in the review. Figure 1 presents this selection process as a PRISMA 2020 flow diagram.

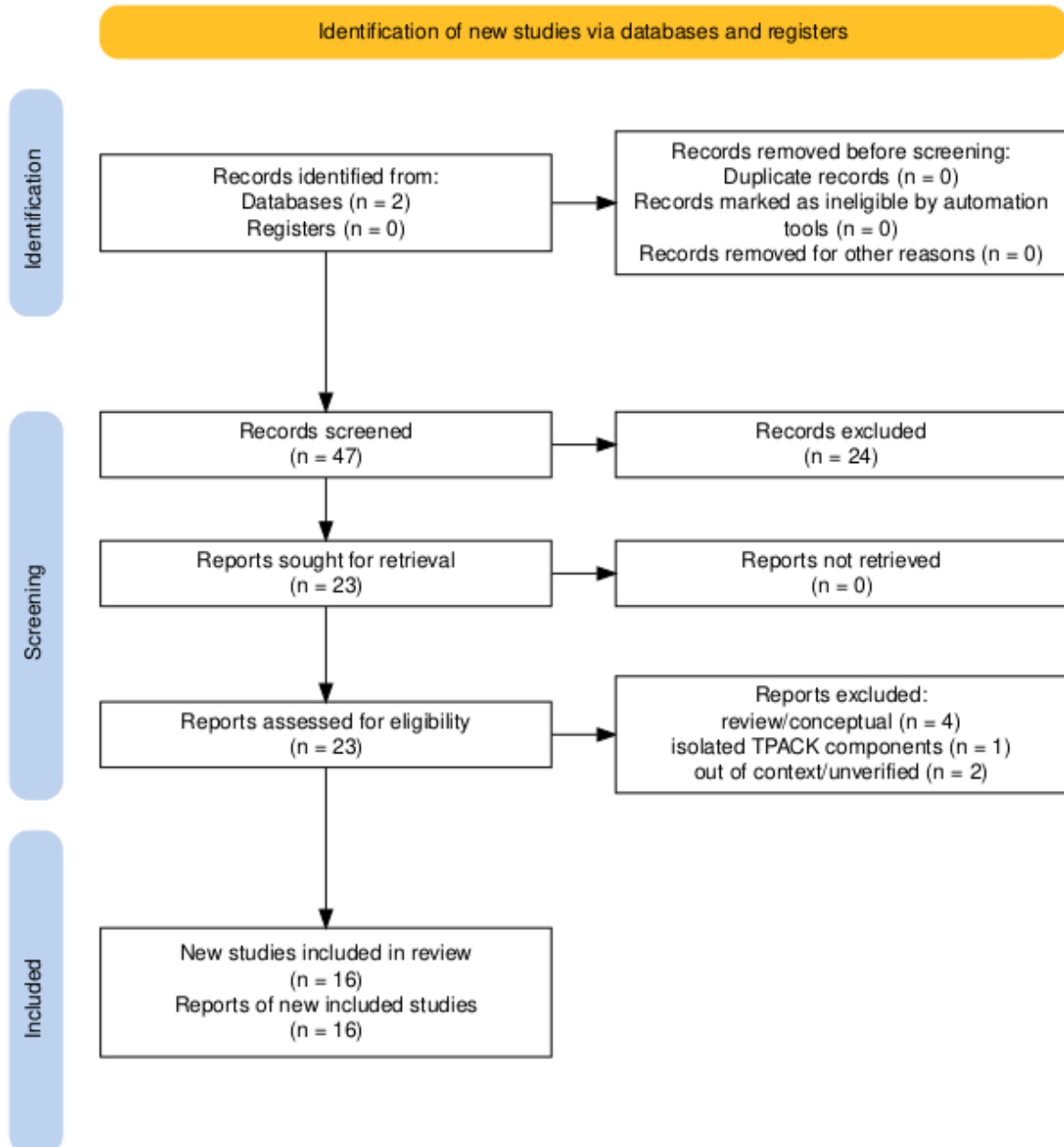


Figure 1. PRISMA 2020 flow diagram of the study selection process.

Table 1. Characteristics of the 16 included studies.

Study (Author, Year)	Country	Design	Participants	Key finding
Zakiyah et al. (2022)	Indonesia	Survey	Pre-service Arabic teacher candidates	Overall TPACK profile "good"; CK, PCK, and TPACK sub-domains need strengthening
Ma'mun et al. (2021)	Indonesia	Survey	320 in-service Arabic (AFL) teachers	Satisfactory overall TPACK; technology underused for

				task/assessment design despite strong TK
Sahrir, Zaini, Hassan, et al. (2021)	Malaysia	Post-workshop survey	40 in-service Arabic school teachers	Improved understanding of TPACK after training; platforms and barriers identified
Sahrir, Zaini, Hamat, & Ismail (2021/2022)	Malaysia	Survey	Pre-service trainee Arabic teachers	Good TPACK knowledge/skill for online assessment during MCO; improvement areas suggested
Hanifah et al. (2024)	Indonesia	Qualitative	Pre-service Arabic teachers	TPACK-based lesson plans and microteaching; digitalisation raised pedagogical competence
Hasim et al. (2025)	Indonesia	Qualitative case study	In-service teachers, one madrasah	TPACK implemented by combining technology, pedagogy, and content across language skills
Ali (2026)	Indonesia	Qualitative case study	Teachers and students, pesantren	CK/PK strong, TPK inconsistent; authentic video effective for immersion
Nisa et al. (2025)	Indonesia	Qualitative case study	Teachers, one Madrasah Aliyah	TPACK operationalized via Quizizz, WhatsApp, Google Classroom within Kurikulum Merdeka
Hasan et al. (2024)	Indonesia	Qualitative case study	Teachers, one high school	TPACK integration reported to improve quality of four-skills instruction
Hasibuan & Haerullah (2023)	Indonesia	Qualitative descriptive	Not specified	TPACK applied to speaking (kalam) via online video; improved motivation and participation
Putri (2025)	Indonesia	R&D (ADDIE)	Grade X students, one madrasah	TPACK-based animated video raised vocabulary mastery (pre/post mean 56.89 to 87.41)
Ayu (2025)	Indonesia	Quasi-experimental	Grade VIII students, one MTsN	TPACK-model N-Gain (75.98%) exceeded PWIM (60.9%) and conventional teaching (38.49%)
Arifin (2025)	Indonesia	Mixed methods	122 fifth-semester university students	TPACK combined with poster media improved multicultural Arabic writing performance
Rozak et al. (2024)	Indonesia	Exploratory survey	129 university students	Positive student perception of TPACK-based lecturing across four indicator domains
Ikhsan (2026)	Indonesia	R&D / design-based research	30 in-service madrasah teachers	Validated professional-development model

				raised TPACK competence and practice
Majid et al. (2023)	Malaysia	Survey	Arabic language instructors	TPACK contributes positively to teachers' instructional/teaching creativity

Table 1 summarizes the characteristics of the sixteen included studies. Fourteen originated from Indonesia and two from Malaysia; no eligible study was located from an Arab-majority or Middle Eastern country, or from any non-Muslim-majority educational system. Research designs were dominated by qualitative case studies (seven studies) and quantitative or exploratory surveys (five studies), with the remainder comprising quasi-experimental, mixed-methods, and research-and-development or design-based-research studies (four studies together). Participants ranged from in-service and pre-service Arabic teachers and lecturers to secondary and tertiary-level Arabic learners, with reported sample sizes, where quantifiable, ranging from around 20 to 320 participants.

Read together, the included studies converge on several recurring patterns. First, teachers generally reported or demonstrated adequate content knowledge and pedagogical knowledge, but comparatively weaker technological knowledge and technological pedagogical knowledge, a gap most visible in the design of technology-supported assessments rather than in day-to-day classroom delivery (Ma'mun et al., 2021; Zakiyah et al., 2022). Second, wherever a structured intervention was introduced, whether a professional development workshop, a design-based professional development model, or a purpose-built instructional medium, TPACK competence or learning outcomes improved measurably; post-workshop surveys reported improved understanding of TPACK application (Sahrir, Zaini, Hassan, et al., 2021), a validated professional development model raised teachers' TPACK-related instructional practice (Ikhsan, 2026), and quasi-experimental comparisons found a TPACK-based instructional model outperforming both an alternative media-based model and conventional teaching in gain scores (Ayu, 2025), while a TPACK-based animated video substantially raised vocabulary mastery in a one-group pre-test/post-test design (Putri, 2025). Third, a recurring and fairly narrow set of technologies accounts for most of the reported practice: WhatsApp, Google Classroom, Quizizz, Google Forms, and Arabic-language video content, most often drawn from the Al Jazeera Arabic-learning channel, appear repeatedly across otherwise unrelated studies, suggesting

a technology repertoire that is broad in name but narrow in actual variety (Ali, 2026; Nisa et al., 2025).

Fourth, the studies unevenly cover the four Arabic language skills: speaking and vocabulary-related outcomes are addressed comparatively often (Hasibuan & Haerullah, 2023; Putri, 2025), while integrated four-skills coverage is reported by only a few case studies (Hasan et al., 2024; Hasim et al., 2025), leaving writing and, especially, listening comparatively underexamined as explicit TPACK outcomes. Fifth, only a minority of the included studies, essentially the quasi-experimental and research-and-development studies, tested the effect of a TPACK-based intervention against a comparison condition or a pre/post baseline; the majority instead described or profiled existing TPACK implementation or teachers' and students' perceptions of it, which limits how confidently the field can currently speak about causal impact on learning outcomes rather than about association or self-reported competence.

These patterns extend rather than duplicate the earlier narrative synthesis by Sholahudin et al. (2025), which reached a broadly similar conclusion about teachers' uneven technological integration using a comparable, though not PRISMA-registered, set of Indonesian studies. The present review adds three elements that synthesis did not provide: an explicit, auditable PRISMA 2020 flow with stated exclusion reasons; a comparison across Indonesia and Malaysia that surfaces the near-total absence of evidence from Arab-majority contexts; and an explicit distinction between studies that measure TPACK-related outcomes experimentally and those that only describe or survey them, which clarifies how much of the literature can support causal claims. For Arabic teacher education specifically, the pattern of stronger content and pedagogical knowledge alongside weaker technological-assessment integration suggests that professional development would likely be better targeted at technology-supported assessment design than at general digital literacy, since the latter already appears comparatively well established among the teachers studied.

Several limitations qualify these conclusions and are stated here rather than left implicit. The review relied on AI-assisted, relevance-ranked search tools rather than an exhaustive Boolean search of named databases such as Scopus or ERIC, so some eligible studies, particularly ones published in venues outside these tools' indexing coverage or in Arabic-language journals not well represented in them, may not have been captured. Screening and eligibility assessment were conducted by a single reviewer rather than by two independent coders, which is a departure from

best-practice systematic review methodology and raises the possibility of screening error or inconsistency. No standardized risk-of-bias or methodological-quality appraisal was applied to the included studies, so the synthesis above should be read as a thematic mapping of what the literature reports rather than as a quality-weighted judgment of how trustworthy each finding is. The evidence base itself is small, geographically concentrated in Indonesia, and dominated by descriptive rather than experimental designs, which limits how far its findings can be generalized beyond similar Southeast Asian, Muslim-majority educational contexts, and it remains possible that studies with null or unfavorable findings toward TPACK were less likely to be published and therefore less likely to be captured, a form of publication bias that this review's design cannot rule out.

الاستنتاج والخلاصة

This systematic review, guided by the PRISMA 2020 protocol, examined how the TPACK framework has been researched and applied in Arabic language teaching and learning. From an initial pool of 47 identified records, sixteen studies published between 2021 and 2026 met explicit eligibility criteria and were synthesized narratively because of methodological heterogeneity across designs. The reviewed literature indicates that Arabic language teachers generally possess adequate content and pedagogical knowledge but comparatively weaker technological integration, particularly in assessment design, and that structured TPACK training together with purpose-built technological media consistently improves both teacher competence and learner outcomes where it has been tested.

At the same time, the evidence base remains narrow in ways that matter for both research and practice. It is concentrated almost entirely in Indonesia, with only a marginal Malaysian presence and no located studies from Arab-majority or other non-Southeast-Asian contexts; it relies more on descriptive surveys and qualitative case studies than on experimental designs capable of supporting causal claims; and it has not yet been appraised for methodological quality using a standardized instrument. Future primary research would therefore benefit from quasi-experimental and experimental designs that directly test TPACK-based interventions against comparison conditions, from studies conducted in Arabic-majority or otherwise more linguistically and institutionally diverse settings, and from the use of validated, TPACK-specific measurement instruments that would eventually allow a quantitative meta-analysis once a sufficiently homogeneous body of evidence accumulates. For teacher education programs, the findings suggest that professional development focused specifically on technology-

supported assessment design, rather than on general digital literacy, may address the most consistently reported gap in Arabic teachers' TPACK competence.

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