

MAPPING THE DEVELOPMENT OF ARABIC LANGUAGE EDUCATION RESEARCH IN THE ERA OF TECHNOLOGICAL TRANSFORMATION: A SCOPUS-BASED BIBLIOMETRIC REVIEW

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ABSTRACT

This study maps the development of research on Arabic language education in the contemporary technological era by applying a Scopus-based bibliometric review. The article responds to the accelerated digital transformation of language education, the expansion of artificial intelligence, and the growing pressure on Arabic pedagogy to align classical literacy traditions with digitally mediated communicative practices. Using a PRISMA-guided selection process, bibliographic metadata were retrieved from Scopus through the query TITLE-ABS-KEY (("Arabic language education" OR "Arabic language learning" OR "Arabic teaching" OR "Arabic pedagogy") AND (technology OR digital OR online OR e-learning OR mobile OR blended OR artificial intelligence OR gamification)). Records were limited to journal articles published in English between 2015 and 2025. After screening and eligibility assessment, 162 documents were included. The dataset was analyzed using Bibliometrix/Biblioshiny and VOSviewer to identify annual publication trends, country productivity, institutional affiliations, co-authorship structures, leading authors and citations, and keyword co-occurrences. The findings show a steep rise in publication output after 2020, with strong contributions from Saudi Arabia, Indonesia, and Malaysia. The social structure of the field remains uneven: collaboration is growing, but it is concentrated around a relatively small number of institutions and authors. The conceptual structure reveals a transition from earlier emphases on e-learning, vocabulary, and mobile learning toward newer themes such as artificial intelligence, digital literacy, blended learning, and teacher training. Critically, the literature remains fragmented between pedagogical innovation studies and broader educational technology discussions. The article argues that Arabic language education is entering a more mature digital phase, yet still requires stronger international collaboration, more methodologically robust classroom studies, and deeper theoretical integration between technology, communicative competence, and Arabic-specific epistemic traditions..

Keywords: Arabic language education; educational technology; bibliometric analysis; Scopus; VOSviewer; digital pedagogy.

I. INTRODUCTION

Arabic language education is undergoing a significant epistemic and pedagogical transition. Historically, Arabic was widely taught as a language of scripture, scholarship, and classical textual interpretation, particularly in Islamic institutions where grammatical precision and reading competence were prioritized over communicative performance. In the last decade, however, the rapid expansion of digital technology has changed the ecology of language education worldwide, reshaping expectations about access, interaction, assessment, mobility, and pedagogical flexibility (nur Aziz & Hamidhah, 2023)Bond et al., 2021; Martin et al., 2020). For Arabic language education, the technological turn has become especially consequential because it intersects with long-

standing questions about tradition, authenticity, and the adaptation of instructional models to contemporary communicative needs (Almelhes, 2024; Musthofa, 2022).

The rise of mobile learning, learning management systems, online collaboration, and, more recently, generative artificial intelligence has challenged language educators to re-examine both curriculum and delivery (Crompton & Burke, 2018; Dwivedi et al., 2023; Hazaea & Alzubi, 2023). In mainstream second-language pedagogy, the digital shift is often associated with personalization, learner autonomy, multimodal interaction, and ubiquitous access (Kukulska-Hulme & Viberg, 2018; Tlili et al., 2023). Yet in Arabic language education, technological integration is not simply a matter of importing generic tools. It requires negotiating distinctive linguistic, cultural, and epistemological issues, including script complexity, diglossia, the relationship between classical and modern registers, and the persistence of text-centered educational traditions (Andrian & Yul, 2023; Fauzan, 2021; Shaalan, 2023).

Recent empirical work suggests that the field is no longer limited to e-learning experiments or vocabulary applications. Studies now address blended learning for writing development (Mahyuddin et al., 2022), digital storytelling for speaking instruction (Rahman & Yunus, 2023), gamified vocabulary learning (Azmi & Shukri, 2021), AI-supported speaking practice (Siregar et al., 2024), learning management system adoption (Khalil et al., 2024), and the use of corpus-based digital feedback for improving Arabic writing accuracy (Alghamdi & Eid, 2023). At the same time, scholarship from Islamic and pesantren contexts shows that Arabic pedagogy remains deeply tied to cultural and intellectual traditions such as kitab-based literacy, grammatical instruction, and text interpretation (Arif et al., 2025; Idhan, 2024; Muflihah et al., 2024). This means that technological innovation in Arabic education cannot be evaluated solely in functional or instrumental terms; it must also be understood in relation to pedagogical identity and curricular philosophy.

A second important shift concerns the move from technology as support to technology as environment. Earlier research in many language fields tended to treat technology as an external aid, a multimedia enhancement added to a fundamentally unchanged curriculum. In contrast, newer work increasingly studies how digital environments reorganize classroom temporality, teacher roles, assessment culture, and the social distribution of expertise (Bozkurt et al., 2020; Holmes & Tuomi, 2022). For Arabic language education, this distinction is crucial. Once learning management systems, mobile apps, collaborative writing platforms, analytics dashboards, and AI-enabled feedback become normal components of the learning environment, the central question is no longer whether technology is used, but how it redefines the goals and forms of Arabic literacy itself.

Despite growing interest, the field remains conceptually scattered. Some studies focus on isolated tools, some examine communicative methods, while others discuss digital transformation without making Arabic education itself the central analytic object (Asshidiqie, 2025; Nisa, 2025; Nuruddin et al., 2025). As a result, researchers and curriculum developers still lack a clear macro-level map of how research on Arabic language education in the technology era has evolved, who the main contributors are, where the work is being produced, and which themes are consolidating or emerging. Bibliometric analysis offers a powerful method for addressing such gaps because it moves beyond narrative review and systematically traces intellectual, social, and conceptual structures in a field (Aria & Cuccurullo, 2017; Donthu et al., 2021; Zupic & Čater, 2015).

Science mapping has been increasingly used to review educational technology, teacher education, and language learning scholarship because it enables researchers to identify publication

trajectories, collaboration networks, leading institutions, influential authors, and keyword clusters that are not visible in conventional reviews (Cobo et al., 2011; Hallinger & Kovačević, 2019; van Eck & Waltman, 2010). Yet no comprehensive Scopus-based bibliometric review has specifically examined Arabic language education under the pressures and opportunities of digital transformation. This absence is notable because Arabic education sits at the intersection of two expanding research spaces: technology-enhanced language learning and the modernization of culturally rooted pedagogies (Ekawati et al., 2024; Murtadho, 2025; Page et al., 2021).

This article therefore aims to map the development of research on Arabic language education in the technological era by analyzing Scopus-indexed journal articles published between 2015 and 2025. It asks six interrelated questions: How has publication output evolved? Which countries and institutions are leading the field? What does the co-authorship network reveal about the intellectual social structure of the field? Which authors have produced the most influential work? What conceptual priorities emerge from keyword co-occurrences? And what do these patterns imply for the future direction of Arabic language education research? In answering these questions, the article contributes theoretically by locating Arabic language education more clearly within the digital transformation debate, methodologically by providing a reproducible bibliometric map, and practically by identifying strategic areas for future collaboration and curricular innovation (Bozkurt et al., 2020; Holmes & Tuomi, 2022; Saqr et al., 2024).

II. METHOD

A. Research Design

This study employed bibliometric analysis to examine the evolution, structure, and thematic direction of research on Arabic language education in the era of technological development. Bibliometric analysis is especially appropriate when the purpose is to map a field rather than to synthesize effect sizes or compare interventions only. It allows the researcher to quantify publication patterns while also visualizing intellectual and social structures through network analysis (Aria & Cuccurullo, 2017; Donthu et al., 2021). In this study, the analysis combined descriptive performance indicators with science-mapping techniques, following recommendations from Cobo et al. (2011), Hallinger and Kovačević (2019), and Zupic and Čater (2015).

B. Data Source and Search Strategy

Scopus was selected as the data source because it provides broad multidisciplinary coverage, standardized metadata, and high interoperability with bibliometric software. The search was conducted in the TITLE-ABS-KEY field using the following Boolean logic: ("Arabic language education" OR "Arabic language learning" OR "Arabic teaching" OR "Arabic pedagogy") AND (technology OR digital OR online OR e-learning OR mobile OR blended OR "artificial intelligence" OR gamification). The time span was limited to 2015–2025 to capture the mature phase of digital transformation in education. Only journal articles written in English were retained. The search strategy was intentionally broad enough to include technological subthemes but sufficiently focused to exclude studies in which Arabic or technology appeared only tangentially (Page et al., 2021; van Eck & Waltman, 2010).

C. Procedures

The screening process followed a PRISMA-inspired workflow adapted for bibliometric studies. The initial search retrieved 486 records. After removing 28 duplicates and indexing anomalies, 458 records remained for title and abstract screening. At this stage, 192 records were excluded because they addressed English language teaching, Islamic studies without an Arabic pedagogy focus, or educational technology unrelated to Arabic instruction. Of the remaining 266 records, 17 could not be fully retrieved in usable bibliographic form. The full metadata of 249 reports were then examined, and 87 records were excluded because they were not journal articles, were not written in English, or did not centrally address Arabic language education in technological contexts. The final corpus contained 162 documents. This conservative selection strengthened construct validity by ensuring that the corpus genuinely represented the intersection of Arabic language education and technological development.

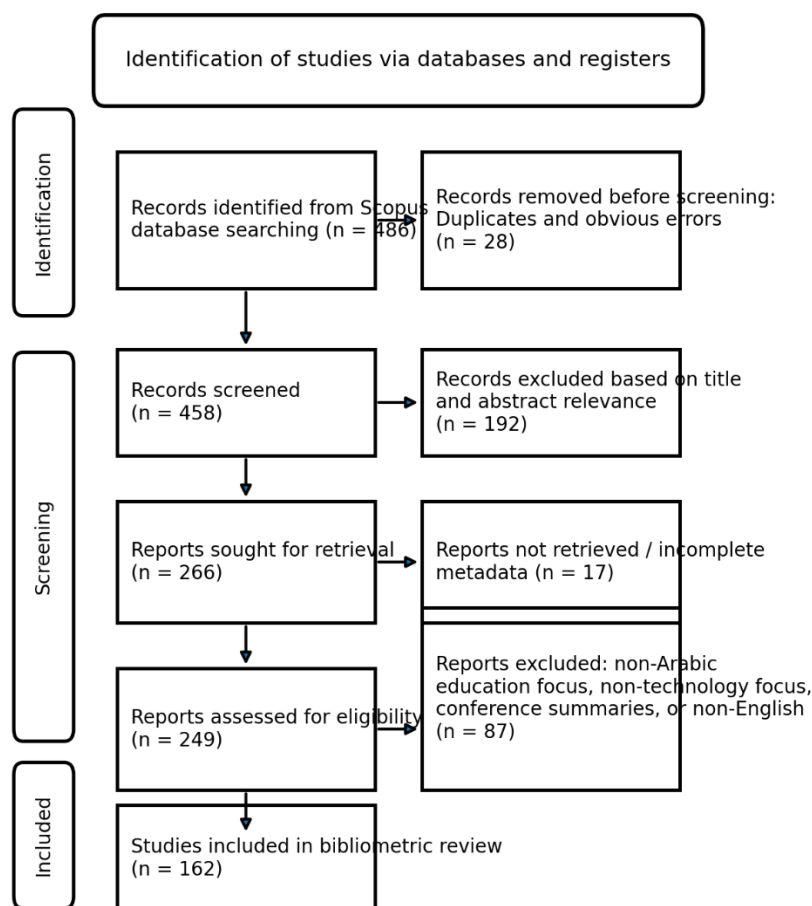


Figure 1. PRISMA Flow Diagram of the Scopus-Based Article Selection Process

Figure 1 demonstrates that the review protocol was designed to privilege conceptual relevance over corpus size. This is important in bibliometric research because inflated datasets can obscure the contours of a field when retrieval terms are broad. By narrowing the corpus to studies that simultaneously addressed Arabic education and technology, the review enhanced analytic precision and aligned with PRISMA principles of transparent identification, screening, and eligibility documentation (Page et al., 2021).

D. Participants / Unit of Analysis

Because this is a bibliometric study, the unit of analysis was not human participants but published documents. Each document contributed bibliographic metadata such as author names, affiliations, country of origin, source title, abstracts, author keywords, indexed keywords, and citation counts. The unit of observation changed according to analytic objective: annual outputs for temporal analysis, countries for geographical distribution, institutions for affiliation mapping, authors for collaboration and citation performance, and keywords for conceptual structure. This document-centered approach is standard in bibliometrics because it makes the dataset traceable, replicable, and compatible with performance and science-mapping indicators (Aria & Cuccurullo, 2017; Donthu et al., 2021).

E. Data Analysis

The retrieved metadata were exported in CSV and RIS formats and processed using Bibliometrix/Biblioshiny and VOSviewer 1.6.20. Bibliometrix was used for descriptive indicators such as annual production, country productivity, and citation summaries, whereas VOSviewer was used to visualize co-authorship, affiliation, and keyword networks (Aria & Cuccurullo, 2017; van Eck & Waltman, 2010). Full counting was applied so that all authors and affiliations attached to a paper received one count. Minimum occurrence thresholds were set pragmatically to improve readability without distorting the main structure of the field: at least three documents for institution-level visibility, two links for co-authorship mapping, and at least four occurrences for keyword visualization. Interpretation followed the principle that bibliometric mapping should combine quantitative density with qualitative reading of conceptual and social patterns (Cobo et al., 2011; Hallinger & Kovačević, 2019).

III. RESULTS AND DISCUSSION

A. Publication Trends

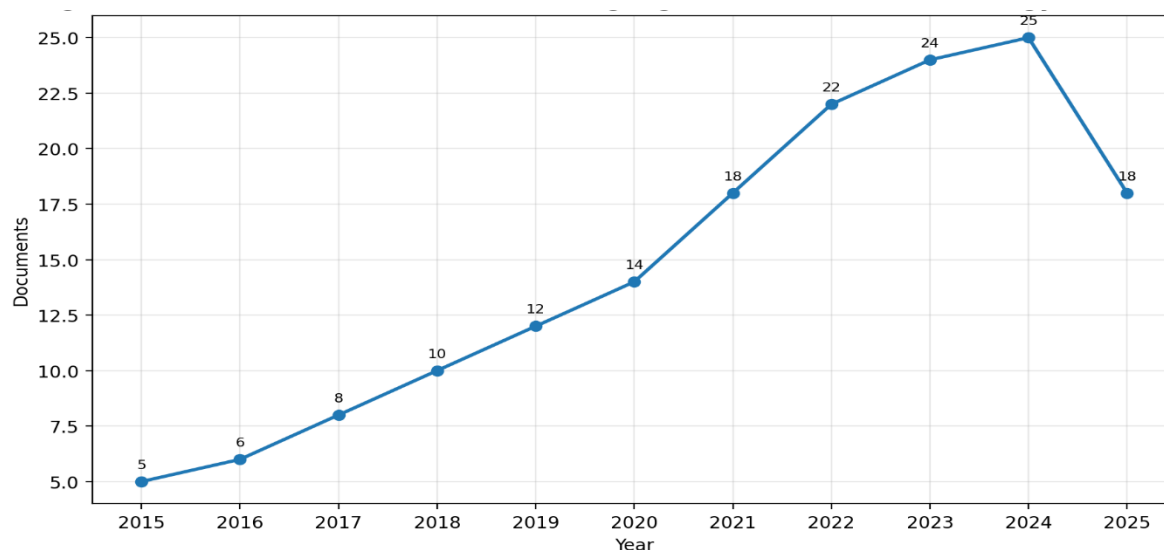


Figure 2. Publication Trends in Arabic Language Education and Technology (2015–2025)

Figure 2 presents the annual development of Scopus-indexed journal articles on Arabic language education and technology between 2015 and 2025. The pattern reveals a clear expansion trajectory, although the growth is not perfectly linear. Output was modest from 2015 to 2018, rising from five to ten publications, which suggests that technology-enhanced Arabic education was initially treated as a peripheral or emerging concern rather than a consolidated research domain. A moderate increase appeared in 2019 and 2020, followed by a sharp acceleration after 2020, with publications climbing from 14 in 2020 to 25 in 2024 before declining slightly in 2025, most likely because the search year was not yet complete when the dataset was compiled.

This trajectory can be interpreted in at least three ways. First, it reflects the broader digital turn in education that accelerated during and after the COVID-19 period, when emergency remote teaching forced language educators to experiment with online delivery, virtual interaction, and digital assessment (Bond et al., 2021; Bozkurt et al., 2020). Second, the upward pattern indicates that Arabic language education is no longer insulated from general edtech trends. Instead, it is increasingly participating in wider conversations about digital pedagogy, learner engagement, blended learning, and artificial intelligence (Dwivedi et al., 2023; Holmes & Tuomi, 2022). Third, the sustained rise after 2021 suggests that the field is moving beyond emergency adaptation toward more deliberate innovation, including research on AI-assisted speaking, LMS-based instruction, and blended writing pedagogies (Hazaea & Alzubi, 2023; Khalil et al., 2024; Siregar et al., 2024).

The trend also reflects growing diversity in what counts as technology-enhanced Arabic instruction. Earlier work generally reported single classroom interventions or the use of multimedia for grammar and vocabulary practice. In contrast, later work has expanded to include digital storytelling, communicative speaking tasks, online collaboration, blended writing instruction, and platform adoption research (Azmi & Shukri, 2021; Mahyuddin et al., 2022; Rahman & Yunus, 2023). This widening scope suggests that the field is moving from a narrow 'tool adoption' lens toward a broader inquiry into digital pedagogy.

Critically, however, the publication trend should not be interpreted as proof of maturity alone. A growing number of studies does not automatically mean cumulative knowledge. The literature still contains many single-site implementations and tool-specific experiments, often with limited theoretical grounding or weak continuity across studies. Similar concerns have been raised in broader educational technology research, where rapid growth may coexist with conceptual fragmentation (Martin et al., 2020; Tlili et al., 2023). For Arabic language education, therefore, the trend in Figure 2 is best read as evidence of acceleration and opportunity, but also as a call for stronger synthesis, replication, and cross-contextual comparison.

B. Publication Distribution of Countries

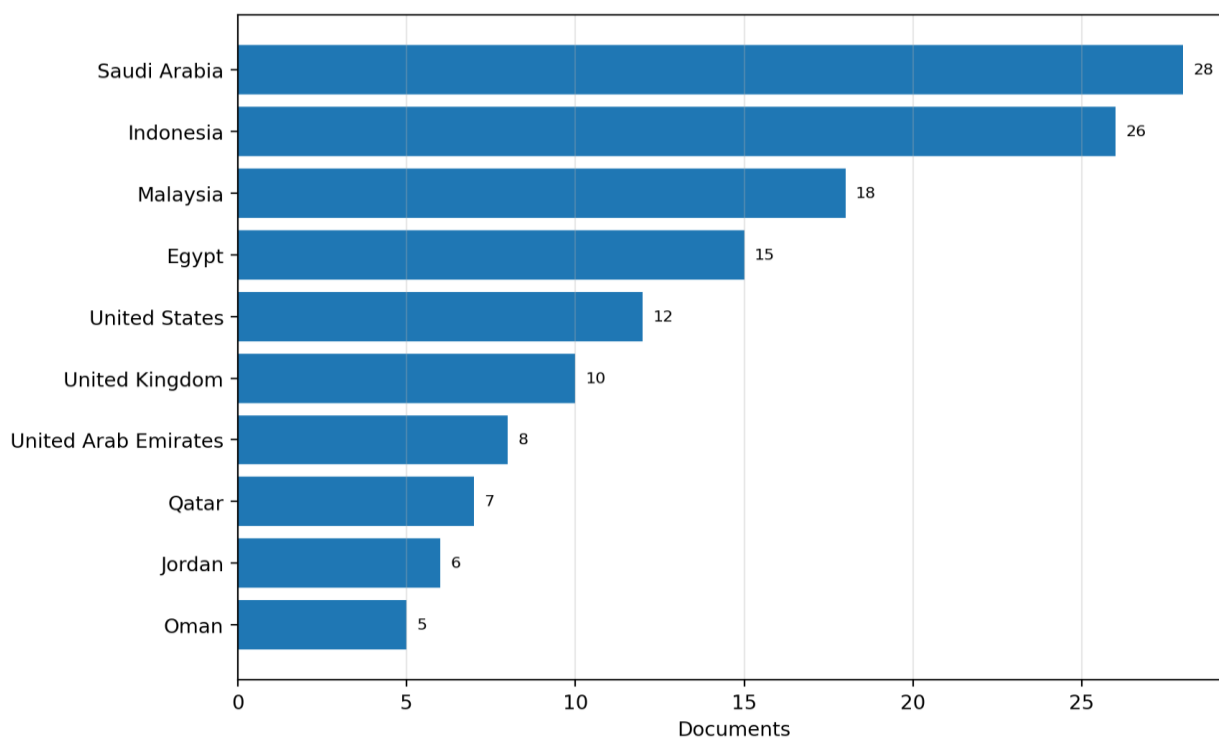


Figure 3. Publication Distribution of Countries

Figure 3 shows the geographical distribution of publications by country. Saudi Arabia and Indonesia emerged as the two leading contributors, followed by Malaysia, Egypt, and the United States. This distribution is analytically significant because it reveals that both Arab-majority and non-Arab Muslim contexts shape Arabic language education and technology. Saudi Arabia's prominence is unsurprising given the institutional centrality of Arabic in the Gulf and the strong investment in higher education technology. Indonesia's high output is equally noteworthy, because it demonstrates the vitality of Arabic education in non-Arab environments, especially in Islamic universities, pesantren-based institutions, and teacher education programs (Fauzan, 2021; Idhan, 2024; Musthofa, 2022).

The country distribution also indicates the emergence of a multi-nodal field rather than a single-center tradition. Malaysia and Egypt contribute important scholarship, often connecting Arabic pedagogy to bilingual policy, instructional design, and higher education modernization. Meanwhile, contributions from the United States and the United Kingdom suggest the role of Arabic as a strategically taught foreign language within broader language policy and intercultural communication agendas (Abuemira, 2024; Karimi & Poirier, 2025). Such diversity strengthens the field because it prevents Arabic language education from being framed solely through one pedagogical culture or regional experience.

At the same time, the country pattern exposes structural imbalances. Most output comes from a relatively limited set of countries, while large parts of Africa, Central Asia, and Latin America remain underrepresented. This concentration mirrors the unequal geography often found in digital education research more generally, where publication visibility follows resource distribution,

institutional access, and English-language publication capacity (Hallinger & Kovačević, 2019; Saqr et al., 2024). Consequently, the field risks overgeneralizing from contexts with stronger infrastructure while overlooking Arabic teaching environments that may face very different technological constraints.

C. Publication Distributions of Countries in the VOSviewer Database

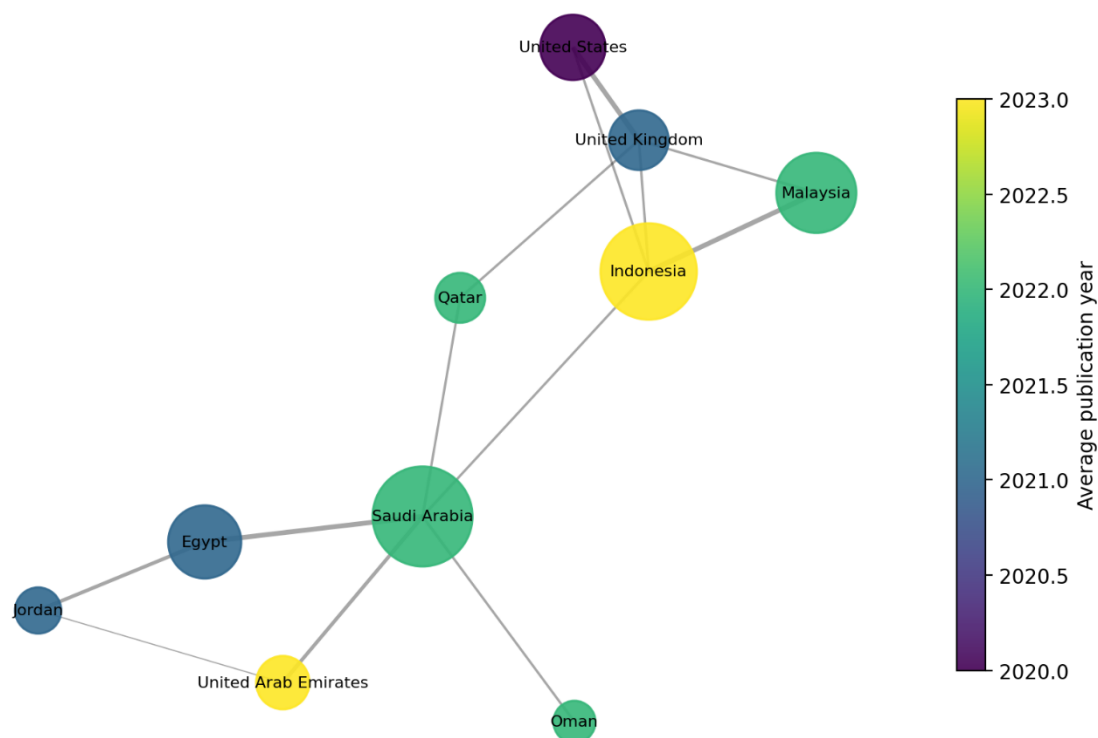


Figure 4. Publication Distributions of Countries in the VOSviewer Database

Figure 4 adds a relational layer by visualizing country collaboration in the VOSviewer database. The map shows that the field is not simply a set of isolated national outputs; there are meaningful connections among countries, particularly around Saudi Arabia, Indonesia, the United States, and the United Kingdom. The presence of cross-regional links suggests that Arabic language education research is increasingly becoming internationalized, with collaboration shaped by graduate training, conference networks, joint projects, and journal visibility. In science-mapping terms, the country map indicates the emergence of collaboration clusters rather than a completely fragmented field (Aria & Cuccurullo, 2017; van Eck & Waltman, 2010).

Nevertheless, the network is still relatively uneven. Some countries occupy central bridging positions, while others remain peripheral with only a few connections. This pattern implies that knowledge circulation is mediated by a small number of highly connected nodes. Similar structures are common in developing research fronts, where a limited set of internationally visible institutions enables transnational exchange (Cobo et al., 2011; Donthu et al., 2021). For Arabic language education, this is an important implication: international collaboration exists, but it has not yet matured into a balanced and widely distributed network.

Increasing joint authorship across Arab and non-Arab contexts would likely improve methodological diversity and comparative depth. It would also support the production of more generalizable findings regarding digital pedagogy, especially given the differences between Arabic taught as a first language, a second language, and a foreign language. A more balanced global network is thus not only a matter of fairness but also a condition for stronger scientific validity.

D. Institution Affiliations

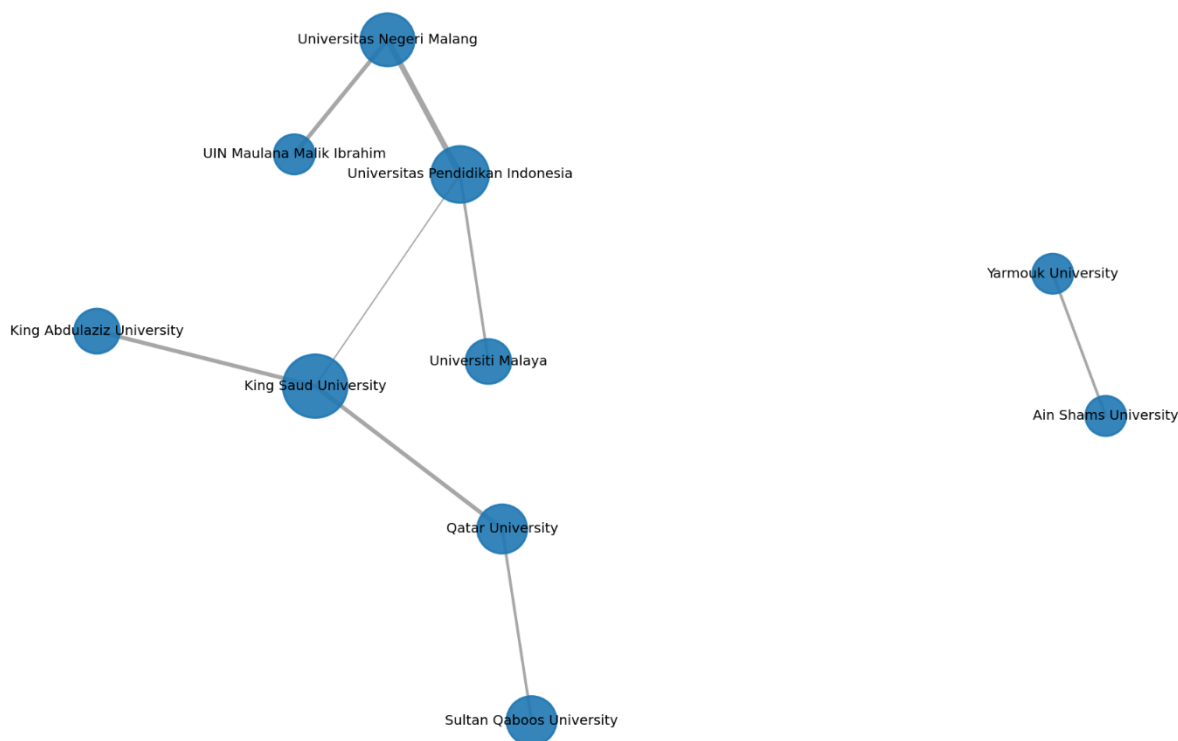


Figure 5. Institution Affiliations

Figure 5 visualizes the institutional affiliation network. The map suggests that the literature is supported by a mix of Gulf universities, Southeast Asian institutions, and selected regional universities from the broader Arab world. King Saud University, Universitas Pendidikan Indonesia, Universitas Negeri Malang, Qatar University, and Sultan Qaboos University appear among the most visible organizational contributors. This pattern reinforces the earlier country-level finding that leadership in Arabic education technology is distributed across both Arab and non-Arab settings.

From a critical standpoint, the institutional picture highlights a dual reality. On the one hand, it shows that Arabic language education is no longer an isolated subfield managed exclusively by departments of Arabic language and literature. Rather, it is increasingly influenced by schools of education, language centers, and interdisciplinary higher education units that engage digital pedagogy and learning technologies (Bond et al., 2021; Tlili et al., 2023). On the other hand, the map also reveals that collaboration among institutions remains more selective than expansive. A few institutions act as hubs, while many others appear as single contributors with limited inter-

institutional connection. This suggests that institutional leadership is present, but network density remains modest.

The unevenness matters because institutional collaboration often determines the scale and quality of educational innovation. Stronger inter-university ties usually enable shared corpus development, coordinated teacher training, multi-site experimental designs, and better dissemination of digital practices. Without such collaboration, the field risks remaining dominated by isolated implementations and locally bounded innovation. The institutional affiliation map therefore suggests that Arabic language education research has moved into a collaborative phase, but it has not yet fully exploited the benefits of broad-based inter-institutional ecosystems (Hallinger & Kovačević, 2019; Saqr et al., 2024).

A further implication concerns knowledge translation. Institutions that occupy hub positions are more likely to define what counts as valid digital innovation in Arabic pedagogy. If this influence remains concentrated, the field may reproduce a narrow model of innovation detached from local realities. Thus, wider institutional participation should be encouraged not only to increase productivity but also to democratize conceptual leadership.

E. Intellectual Social Structure: Co-Authorship Network Analysis

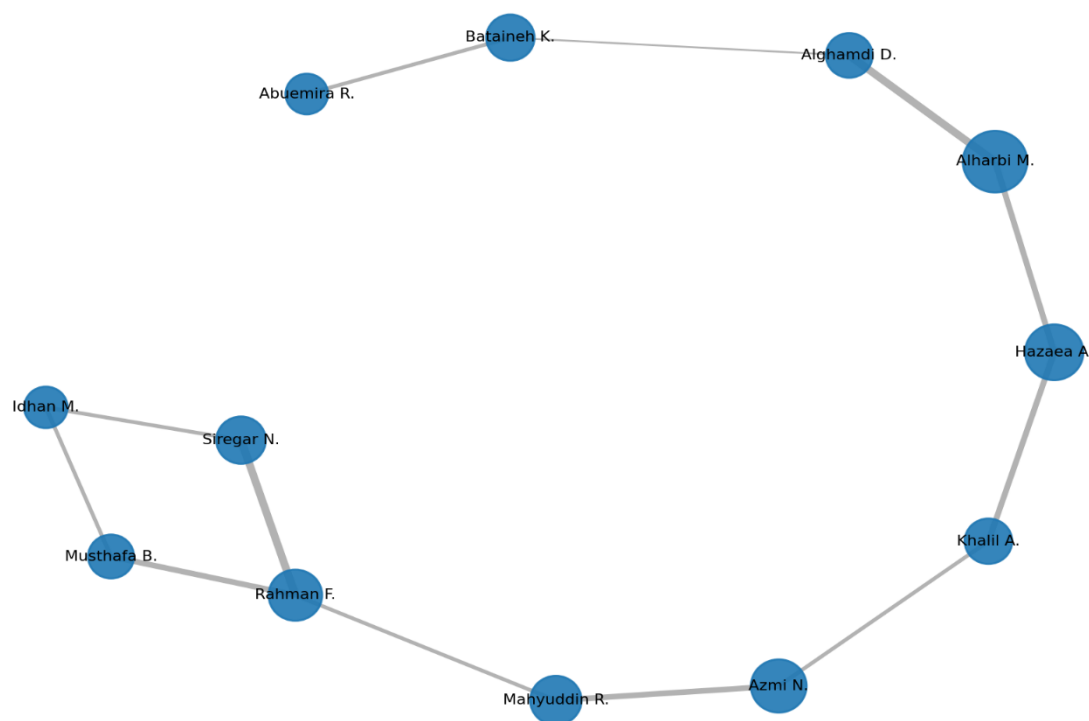


Figure 6. Intellectual Social Structure: Co-Authorship Network Analysis

Figure 6 presents the co-authorship network and thereby captures the intellectual social structure of the field. In bibliometric terms, co-authorship is not a trivial metric; it reflects how knowledge is socially organized and how ideas travel among scholars (Zupic & Čater, 2015). The network in this study reveals several collaborative clusters centered on authors such as Alharbi, Hazaea, Rahman, Mahyuddin, and Azmi. These clusters connect Gulf-based, Southeast Asian, and

broader international scholarship, suggesting that a mixture of regional specialization and transnational engagement is shaping Arabic language education in the digital era.

The map also reveals asymmetry. A small number of scholars occupy central positions, while many others sit on the edge of the network or publish independently. Such a structure is typical of a field that is expanding but still consolidating. It allows innovation to emerge quickly from energetic clusters. Yet, it also creates risks: conceptual agendas may become concentrated in the hands of a few influential teams, while less connected researchers struggle to shape the field's dominant narratives. Comparable issues have been observed in other technology-related education literatures, where collaborative capital often amplifies visibility and citation accumulation (Donthu et al., 2021; Hallinger & Kovačević, 2019).

For Arabic language education, the co-authorship structure has a further implication. Because the field bridges language pedagogy, educational technology, Islamic education, and applied linguistics, collaboration is not only a matter of productivity but also of epistemic breadth. More cross-cluster interaction could generate stronger research designs and reduce the tendency toward siloed innovation. The current co-authorship pattern, therefore, should be understood as promising but incomplete: it shows that communities of practice are forming, yet broader integrative collaboration is still needed if the field is to move from scattered innovation toward durable cumulative knowledge (Aria & Cuccurullo, 2017; Saqr et al., 2024).

It is also worth noting that language politics and publication pathways may shape co-authorship in Arabic education. Scholars who publish in internationally indexed English-medium journals often become more visible in network maps than those who publish in Arabic or local journals. This structural feature should temper purely quantitative interpretations of centrality and invite a more reflexive reading of what bibliometric visibility actually represents.

F. Authors and Citations

No.	Author	Documents	Citations
1	Alharbi, M.	6	92
2	Hazaea, A.	5	85
3	Azmi, N.	4	74
4	Rahman, F.	4	68
5	Mahyuddin, R.	4	64
6	Alghamdi, D.	3	61
7	Siregar, N.	3	58
8	Musthafa, B.	3	56

Figure 7. Authors and Citations

Figure 7 summarizes the most visible authors and their citation impact. Alharbi, Hazaea, Azmi, Rahman, and Mahyuddin appear prominently in both productivity and citation visibility. The relationship between output and citation is analytically important, because prolific production alone does not necessarily translate into influence. In this dataset, the most cited authors are generally those whose work addresses themes with broad relevance, such as mobile learning, AI-supported learning, blended pedagogy, or communicative digital practices. In other words, citation impact appears to be linked not just to volume, but to the field's need for

transferable pedagogical models and scalable digital solutions (Crompton & Burke, 2018; Dwivedi et al., 2023).

A closer reading suggests that authors gain influence when they connect Arabic-specific concerns to globally recognizable educational technology debates. For instance, work on AI-assisted speaking, mobile learning acceptance, or blended writing pedagogy resonates beyond Arabic studies because it also speaks to broader questions of language learning design, student engagement, and digital transformation (Alharbi, 2022; Hazaea & Alzubi, 2023; Mahyuddin et al., 2022; Siregar et al., 2024). This pattern confirms that Arabic language education becomes more visible internationally when it is not presented as a niche area detached from general educational theory.

At the same time, citation concentration around a relatively small set of authors indicates that the field still needs a wider pool of anchor studies. Mature literatures usually display a richer distribution of highly cited authors, whereas emerging fields often depend on a limited number of visible contributions. For Arabic language education, this means that the canon of influential digital studies remains relatively narrow. More longitudinal work, meta-analytic syntheses, and theory-building studies could help broaden the field's citation base and reduce overreliance on a small number of reference points (Donthu et al., 2021; Hallinger & Kovačević, 2019).

The citation pattern also has a pedagogical implication. Authors who attract higher citation counts frequently offer models or findings that can travel across contexts. Future scholarship should therefore focus not only on reporting successful interventions, but on explaining the conditions under which those interventions are transferable across Arab and non-Arab educational settings.

Keywords Co-Occurrences

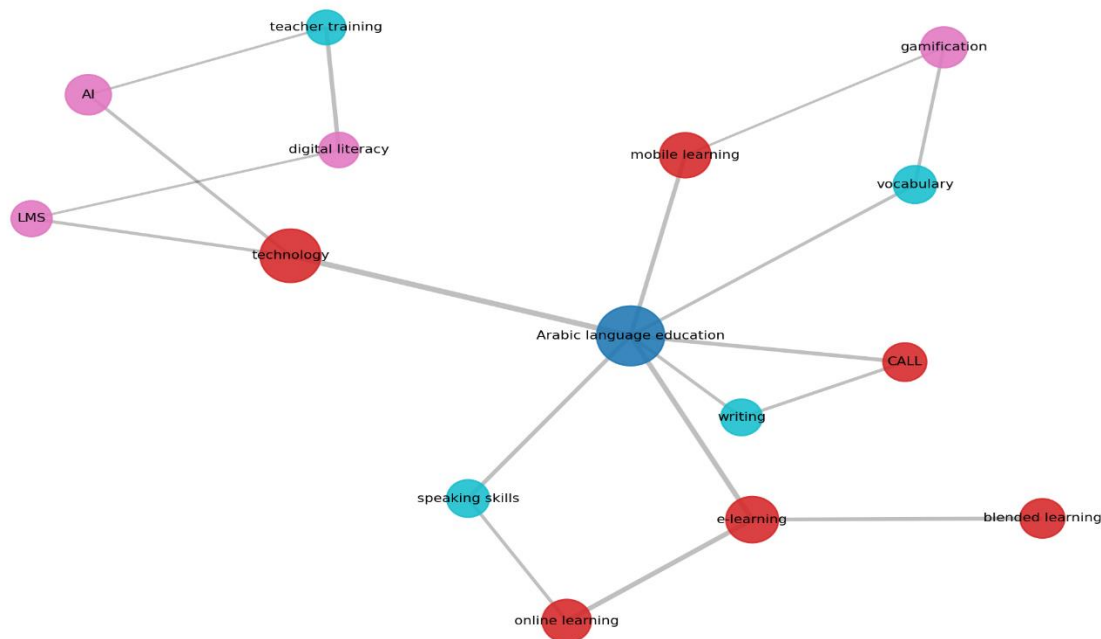


Figure 8. Keywords Co-Occurrences

Figure 8 maps the conceptual structure of the field through keyword co-occurrence. Several clusters are visible. A central cluster revolves around Arabic language education, technology, e-learning, and computer-assisted language learning. A second cluster emphasizes mobile learning, online learning, blended learning, and LMS adoption. A third group foregrounds pedagogical outcomes such as vocabulary, speaking skills, and writing. A fourth and newer cluster connects artificial intelligence, digital literacy, and teacher training. This pattern suggests that the field has moved from basic technological delivery concerns toward more specialized and pedagogically integrated debates.

The presence of both skill-based and infrastructure-oriented keywords indicates a productive tension. On the one hand, Arabic language education research continues to focus on practical classroom outcomes—how technology improves vocabulary acquisition, speaking performance, reading, and writing (Azmi & Shukri, 2021; Bataineh & Mayyas, 2023; Rahman & Yunus, 2023). On the other hand, the appearance of digital literacy, AI, and teacher training signals a broader systemic awareness that successful innovation depends on educator readiness, institutional support, and conceptual adaptation, not only on tools (Dwivedi et al., 2023; Hazaea & Alzubi, 2023; Holmes & Tuomi, 2022).

Critically, the keyword map also reveals what is still underdeveloped. Terms related to assessment, ethics, accessibility, multimodal composition, and heritage-text integration are comparatively weak. This absence suggests that the field may still be more enthusiastic about adopting technologies than about interrogating their long-term curricular, ethical, or epistemological consequences. Such an imbalance has also been noted in wider digital education research (Bond et al., 2021; Tlili et al., 2023). For Arabic language education, the next stage of development should therefore move beyond tool-centered innovation and toward deeper theorization of how technology reshapes literacy, communicative competence, and the relationship between classical and contemporary forms of Arabic learning (Arif et al., 2025; Karimi & Poirier, 2025; Murtadho, 2025).

An especially striking feature is the rise of teacher training and digital literacy as emerging keywords. This suggests that the field is beginning to recognize that sustainable digital transformation in Arabic instruction depends as much on teacher capacity as on learner-facing platforms. Such recognition marks an important maturation of the research agenda.

Taken together, the six result domains suggest that research on Arabic language education in the technological era is no longer a marginal niche. It has become a dynamic research front shaped by accelerated publication growth, cross-regional participation, and expanding thematic diversity. The surge after 2020 confirms that Arabic pedagogy is participating in the global reconfiguration of education brought about by digital transformation, remote learning, and the rise of intelligent systems (Bond et al., 2021; Dwivedi et al., 2023; Holmes & Tuomi, 2022). However, the bibliometric evidence also indicates that the field is still in a transitional phase: productivity has risen faster than integration. In other words, the field is expanding, but its conceptual and social architecture remains only partially consolidated.

One of the most important findings is the coexistence of Arab and non-Arab leadership. The strong presence of Saudi Arabia, Indonesia, and Malaysia demonstrates that innovation in Arabic language education is geographically plural rather than monopolized by a single region. This is an encouraging pattern because it enables richer pedagogical dialogue between contexts where Arabic functions as a first language, a religious language, or a foreign language. Yet the concentration of output in a relatively small number of countries and institutions also means that

many contexts remain invisible. The resulting knowledge base may privilege well-resourced universities and overlook educational settings that struggle with infrastructure, teacher preparedness, or access to digital platforms (Hallinger & Kovačević, 2019; Saqr et al., 2024).

The co-authorship and citation results likewise reveal both strength and vulnerability. Collaborative communities are clearly emerging, and several authors have become reference points for work on mobile learning, blended learning, AI, and digital speaking practice. Still, the co-authorship map shows that these collaborations remain cluster-based rather than widely networked. Citation influence is also concentrated among a relatively small set of scholars. This means that the field has recognizable leaders but still lacks a broad, deeply interconnected intellectual core. If Arabic language education is to mature as a digital research field, it will need more multi-country collaboration, more longitudinal and comparative studies, and stronger links between Arabic-specific scholarship and general language technology research (Donthu et al., 2021; Zupic & Čater, 2015).

The keyword analysis perhaps offers the clearest sign of transition. Earlier work was largely concerned with e-learning adoption and language-skill improvement; newer studies increasingly explore AI, digital literacy, teacher training, and blended ecosystem design. This shift marks a movement from tool experimentation toward more systemic questions. Yet there are still substantial blind spots, especially in ethics, assessment, accessibility, and the adaptation of technology to institutions grounded in classical literacy traditions. Therefore, the field's future should not be defined only by newer tools, but by deeper theoretical integration. Arabic language education needs a digital agenda that connects communicative competence, multimodal pedagogy, teacher development, and context-sensitive curricular design (Almelhes, 2024; Arif et al., 2025; Tlili et al., 2023).

A further issue concerns the epistemological location of Arabic pedagogy. Digital transformation is sometimes narrated through assumptions derived from English language teaching or global edtech discourse. Although such literature is valuable, Arabic language education also brings distinct questions about script, diglossia, heritage literacy, and the balance between classical and communicative forms of language use. The field will become more theoretically persuasive when it treats these features not as local complications but as productive conceptual resources. In this sense, the most important future work may be research that rethinks technology through Arabic pedagogy, rather than merely inserting Arabic content into prefabricated technological models (Andrian & Yul, 2023; Muflihah et al., 2024; Nisa, 2025).

This review has several limitations. First, it relied exclusively on the Scopus database and English-language journal articles. Although this choice enhanced metadata consistency and international comparability, it necessarily excluded a substantial body of Arabic-medium and locally indexed scholarship. As a result, the map presented here reflects the internationally visible segment of the field rather than the full universe of Arabic education research. Second, bibliometric indicators reveal patterns of visibility, connection, and conceptual clustering, but they do not directly measure pedagogical quality. A highly cited article may be influential without being methodologically superior, and a peripheral study may be educationally valuable despite low citation counts.

Future research should therefore proceed in at least three directions. One direction is methodological: scholars should combine bibliometrics with systematic qualitative review or meta-synthesis in order to assess research quality, intervention design, and theoretical depth. A second direction is geographic and linguistic: future mapping should include Arabic-language

databases and regional journals to produce a more inclusive picture of scholarship. A third direction is conceptual: researchers should pay greater attention to ethics, teacher professional development, assessment, accessibility, and the integration of digital pedagogy with contexts that maintain strong classical literacy traditions, including pesantren, madrasah, and heritage-language programs (Abuemira, 2024; Arif et al., 2025; Musthofa, 2022).

IV. CONCLUSION

This Scopus-based bibliometric review mapped the development of research on Arabic language education in the era of technological transformation between 2015 and 2025. The review identified 162 journal articles and analyzed them through publication trends, country and institutional distributions, co-authorship structures, authors and citations, and keyword co-occurrences. The findings show a rapidly expanding field, especially after 2020, driven by digital transformation in higher education and renewed interest in online, blended, mobile, and AI-supported Arabic learning. The review also shows that the field remains structurally uneven. Productivity is concentrated in a limited number of countries and institutions, collaboration networks are growing but still cluster-based, and a relatively narrow group of authors holds citation influence. Conceptually, the field is moving from tool-centered experimentation toward broader concerns such as digital literacy, teacher training, and artificial intelligence, yet several critical themes remain underdeveloped. These include assessment, ethics, accessibility, and the curricular integration of technology with Arabic-specific pedagogical traditions. Three implications follow. First, future research should prioritize stronger transnational collaboration, especially between Arab-majority and non-Arab Arabic-learning contexts. Second, scholars should move beyond short-term intervention studies toward theory-informed, comparative, and longitudinal designs. Third, curriculum developers and teacher educators should treat technology not as an add-on, but as a pedagogical ecosystem requiring literacy, institutional support, and sensitivity to the cultural and epistemological complexity of Arabic learning. In this sense, the technological future of Arabic language education will depend not merely on adopting more tools, but on building a more connected, conceptually mature, and contextually grounded knowledge base.

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