Volume 7 Number 1 (2026)
January-June 2026
Page: 697-711

E-ISSN: 2722-6794
P-ISSN: 2722-6786
DOI: 10.37680/aphorisme.v7i1.9669

APHORISME
Journal of Arabic Language, Literature, and Education
مجلة اللغة العربية أدبها وتعليمها

THE TRANSFORMATION OF ARABIC LANGUAGE ASSESSMENT: A SYSTEMATIC LITERATURE REVIEW OF TECHNOLOGY-ENHANCED ASSESSMENT (2021–2026)

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Submitted: 13/05/2026 Revised: 23/05/2026 Accepted: 10/06/2026 Published: 29/06/2026

Abstract

This study aims to analyze the development of Technology-Enhanced Assessment (TEA) in Arabic language learning from 2021 to 2026, particularly the shift from conventional evaluation to digital and AI-based assessment. This study employed a qualitative research approach using the Systematic Literature Review (SLR). A Systematic Literature Review (SLR) approach using the PRISMA framework to identify, screen, evaluate, and synthesize relevant studies obtained from Google Scholar, Garuda, and DOAJ databases. From 75 records identified through database searches, 11 studies satisfied the inclusion criteria and were thematically analyzed to examine trends, challenges, and implications of technology-enhanced assessment in Arabic language learning. The findings indicate that Arabic language assessment has undergone a significant shift toward more interactive, adaptive, and student-centered evaluation through the implementation of gamified, web-based, multimedia, authentic, and AI-supported assessment. Gamified assessment emerged as the dominant trend due to its effectiveness in increasing students' motivation and participation. In contrast, AI-based assessment reflects the growing integration of intelligent technologies in educational evaluation. However, TEA implementation still faces challenges related to digital literacy, technological infrastructure, technical limitations, and the validity of AI-supported assessment systems. Therefore, integrating technology into Arabic language assessment requires pedagogical readiness, digital competence, and assessment literacy to support more meaningful, competency-oriented learning practices.

Keywords Arabic Language Learning; Artificial Intelligence; Digital Assessment; Gamified Assessment; Technology-Enhanced Assessment.

INTRODUCTION

In the context of globalization and technological disruption marked by the Fourth Industrial Revolution, the education system faces the challenge of restructuring its orientation and teaching approaches. Educational institutions can no longer focus solely on the reproductive transmission of knowledge; instead, they must be able to develop human resources who are adaptable, reflective, and capable of higher-order thinking (Chabib et al., 2025).

Advances in information and communication technology have accelerated a comprehensive transformation of the education system, including in learning assessment. Digitalization is no longer limited to innovations in teaching methods but has also extended to how educators measure and interpret students' learning achievements (Aslan, 2025). In Arabic language learning, the assessment system holds a strategic position as it serves as a tool to gauge mastery of the four language skills: listening (istimā'), speaking (kalām), reading (qirā'ah), and writing (kitābah) (Kamal, 2025). The transformation of Arabic language assessment in Indonesia began in 2016 and accelerated significantly during the COVID-19 pandemic. This transformation was influenced by the Fourth Industrial Revolution and the need for online learning, which drove the shift from conventional assessment to digital assessment based on web and mobile applications (Rahman et al., 2022).

However, assessment practices that paper-based written tests have long dominated demonstrate several limitations, including slow grading processes, limited formative feedback, and insufficient representation of students' authentic communicative competence (Sahra et al., 2025). These limitations have encouraged the need for more responsive and adaptive assessment models that align with students' developmental needs (Cahyani et al., 2024). The utilization of digital platforms in assessment systems introduces new approaches that enable systematic data processing, technology-based analysis of learning achievement, and more immediate and accurate feedback mechanisms (Fauzan, 2025).

The integration of 21st-century skills into educational practices further demands a shift in orientation from content mastery toward the development of higher-order competencies, including critical thinking, creativity, communication, and collaboration (Patrick Griffin, 2015). Assessment systems play a strategic role in ensuring that these competencies are effectively measured and appropriately facilitated. Without the reformulation of evaluation models, the integration of 21st-century skills risks remaining merely a curricular discourse without significant pedagogical implications (Lase, 2019).

Within this framework, the transformation from assessment of learning toward assessment for learning and assessment as learning becomes an essential foundation. The relationship between digital literacy and assessment systems is becoming increasingly interconnected as technology is utilized to provide learning analytics, real-time feedback, and online collaborative environments(Izhar & Al-dheleai, 2026). This reorientation aligns with the concept of Technology-Enhanced Assessment as an innovation in Arabic language learning assessment, as it positions digital assessment not merely as a technical instrument, but also as a pedagogical strategy for developing measurable, adaptive, and student-centered 21st-century competencies (Afrianingsih et al., 2025). Technology-Enhanced Assessment (TEA) represents the integration of digital technologies into the entire learning evaluation process, ranging from instrument design to the provision of real-time feedback (Quresh, 2021). This approach not only enhances assessment efficiency but also enables more adaptive, interactive, and student-centered forms of assessment. The implementation of TEA is directed toward improving the effectiveness, objectivity, and overall quality of students' learning experiences (Richardus Eko, Astutiningsih, 2024).

Although studies on Technology-Enhanced Assessment (TEA) in Arabic language learning continue to develop, most previous research remains partial, focusing on specific aspects such as the use of particular platforms, gamified learning, formative assessment, or the development of digital assessment instruments in isolation. Several studies emphasize the effectiveness of platforms such as Quizizz, Kahoot, Wordwall, and Google Forms in improving students' motivation and learning outcomes. In contrast, others are more focused on developing rubric-based assessments or implementing technology-based formative assessment. On the other hand, recent developments indicate the emerging integration of Artificial Intelligence (AI) in Arabic language assessment through mobile applications and intelligent assessment systems. Nevertheless, studies that comprehensively map the development, transformation, and evolutionary direction of Technology-Enhanced Assessment in Arabic language learning, particularly in the transition from conventional to digital and AI-based assessment, remain relatively limited. Therefore, a systematic review is needed to identify the developmental trends, implementation approaches, and challenges of Technology-Enhanced Assessment in Arabic language learning in a more comprehensive manner.

Based on this research gap, this study aims to analyze the development of Technology-Enhanced Assessment in Arabic language learning from 2021 to 2026 through a Systematic Literature Review (SLR) approach. Specifically, this study seeks to identify trends in the

implementation of technology-based assessment, map the transformation of Arabic language assessment from conventional to digital and AI-based assessment, and examine the challenges and pedagogical implications of implementing Technology-Enhanced Assessment in Arabic language learning.

METHOD

This study employed a qualitative research approach using the Systematic Literature Review (SLR) method (Booth, 2016) to analyze the development of Technology-Enhanced Assessment (TEA) in Arabic language learning from 2021 to 2026**.** The SLR approach was utilized as a systematic method for identifying, evaluating, and synthesizing various studies relevant to the research topic comprehensively (Fernández-sáez et al., 2010). The study specifically focused on the development of Technology-Enhanced Assessment (TEA) in Arabic language learning from 2021 to 2026, particularly on the transformation of assessment from conventional to digital and AI-based approaches.

The primary data for this study consisted of selected journal articles on Technology-Enhanced Assessment in Arabic language learning. In contrast, secondary data were obtained from books, proceedings, and supporting references relevant to digital assessment and educational technology. The data sources were obtained through systematic searches in several academic databases, including Google Scholar, Garuda, and DOAJ. The inclusion criteria consisted of peer-reviewed journal articles and conference proceedings published between 2021 and 2026, available in full text, and specifically discussing technology-based assessment in Arabic language learning. Meanwhile, studies unrelated to assessment, non-scientific publications, and inaccessible articles were excluded from the review process.

The population of this study comprised all published studies on Technology-Enhanced Assessment in Arabic language learning, indexed in Google Scholar, Garuda, and DOAJ databases, between 2021 and 2026. The sample consisted of 11 selected articles that met the inclusion criteria. The sampling technique used was purposive sampling based on relevance to the research topic, publication period, accessibility of full-text articles, and suitability with the study's focus. The literature selection process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, including identification, screening, eligibility, and inclusion stages (J Page et al., 2021). The selected studies were analyzed using thematic analysis to identify trends,

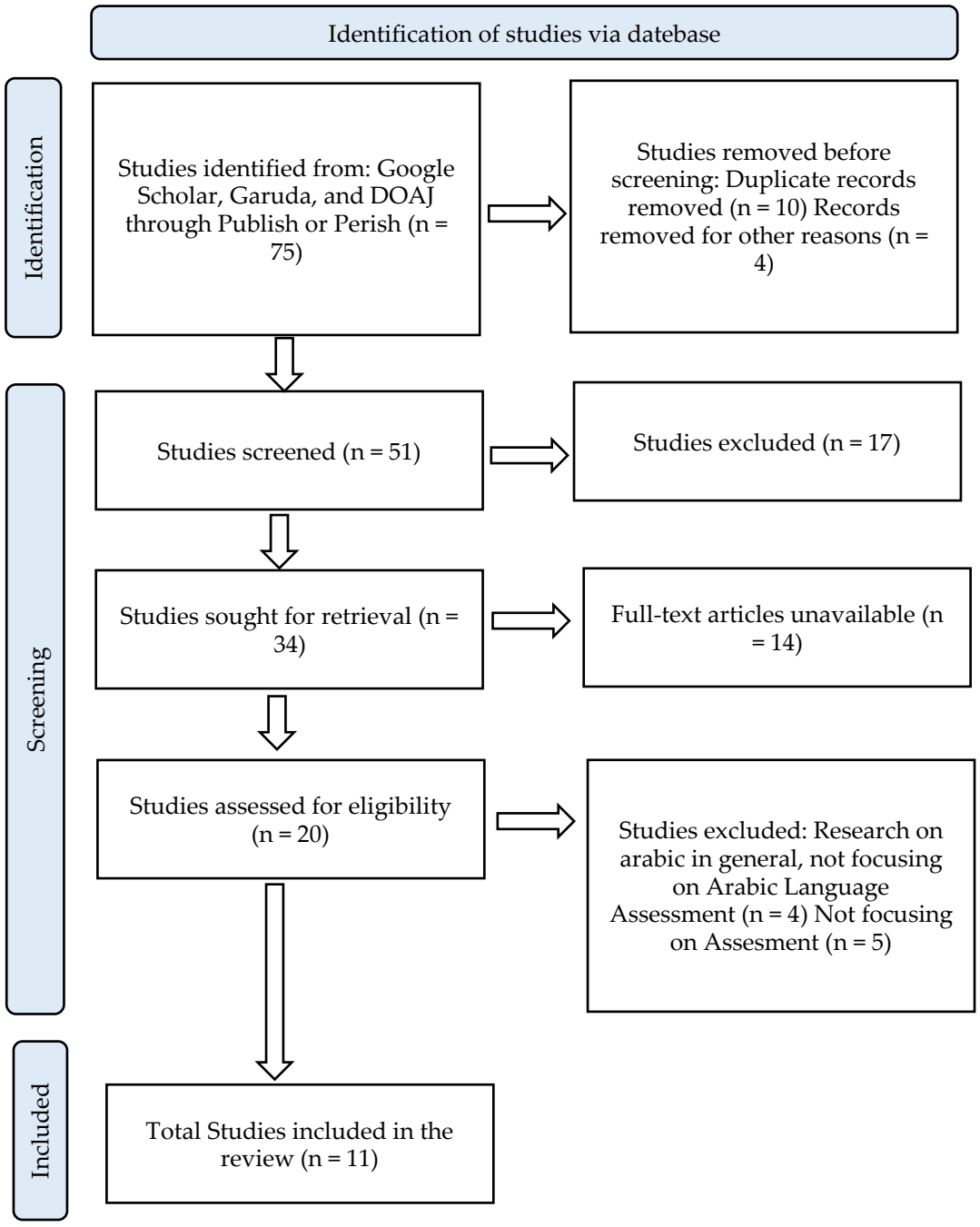
implementation approaches, and challenges of Technology-Enhanced Assessment in Arabic language learning. The inclusion and exclusion criteria applied in this study are summarized in table 1:

Table 1. The Inclusion and Exclusion Criteria Applied

Criteria	Inclusion	Exclusion
Publication Year	Articles published between 2021–2026	Articles published before 2021
Type of Publication	Peer-reviewed journal articles, conference proceedings, and indexed scientific publications	Undergraduate theses, dissertations, non-scientific websites, opinion articles, and unpublished manuscripts
Topic Relevance	Studies discussing Technology-Enhanced Assessment, digital assessment, gamified assessment, formative assessment, AI-based assessment, or web/mobile-based assessment in Arabic language learning	Studies focusing only on learning media, general e-learning, or Arabic language teaching without assessment components

This selection process is summarised in the PRISMA flowchart in Figure 1.

Figure 1. PRISMA Flow Diagram of Literature Selection Process



The literature selection process in this study followed the PRISMA framework, which consists of four main stages: identification, screening, eligibility, and inclusion (Page et al., 2021). During the identification stage, literature searches were conducted on Google Scholar, Garuda, and DOAJ using the Publish or Perish application, with keywords such as Technology-Enhanced Assessment, digital assessment, Arabic-language *assessment*, and *AI-based assessment*. A total of 75 articles were identified during the initial searching process. Subsequently, duplicate articles (n = 10)

and inaccessible full-text articles (n = 4) were removed, leaving 51 articles to proceed to the screening stage.

During the screening stage, articles were evaluated based on the relevance of their titles and abstracts to the study's focus. At this stage, 17 articles were excluded for irrelevance to the research topic, leaving 34 for further assessment. In the eligibility stage, full-text articles were thoroughly reviewed to ensure alignment with the study's objectives. A total of 14 articles were excluded due to limited full-text availability, leaving 20 eligible articles. In the final inclusion stage, a further evaluation was conducted to ensure the substantive relevance of the articles to Technology-Enhanced Assessment in Arabic language learning. Nine articles were excluded because they discussed Arabic language learning in general without specifically addressing assessment aspects or Arabic Language Assessment. Consequently, 11 final articles met all inclusion criteria and were systematically analyzed to identify developmental trends, implementation patterns, and challenges of Technology-Enhanced Assessment in Arabic language learning from 2021 to 2026.

By applying these procedures and criteria, the literature selection process was conducted systematically and rigorously to yield findings relevant to the focus of this study, namely the analysis of trends and challenges in Technology-Enhanced Assessment in Arabic language learning.

FINDINGS AND DISCUSSION

Findings

The findings presented in this study consist of the results of the analysis and synthesis of selected studies on Technology-Enhanced Assessment (TEA) in Arabic language learning from 2021 to 2026. These findings are systematically presented in Table 2, which summarizes the classification of technology-based assessment, the assessment types, the focus skills, the main findings, and the trend categories identified in the reviewed studies. The findings further describe several major trends in Arabic language assessment, including the dominance of gamified assessment, the shift toward authentic and adaptive assessment, the emergence of AI-based assessment, and the challenges and pedagogical implications of implementing Technology-Enhanced Assessment in Arabic language learning.

Development of Technology-Enhanced Assessment

The findings indicate that Arabic language assessment has undergone a significant transformation from conventional paper-based evaluation to digital, technology-supported

assessment systems. The reviewed studies demonstrate that the integration of digital technology into assessment practices has expanded rapidly between 2021 and 2026, particularly after the acceleration of online learning during and after the COVID-19 pandemic.

Table 2. Classification of Technology-Enhanced Assessment in Arabic Language Learning

Technology	Assessment Type	Focus Skill	Main Findings	Trend Category
Digital Storytelling (Azhari, 2025)	Multimedia Assesment	Speaking and Writing	Encouraged productive language performance and creativity	Multimedia-Based Assessment
HOTS-Based Assessment (Chabib et al., 2025)	Cognitive Digital Assessment	Listening & comprehension	Promoted higher-order thinking skills in Arabic learning	Cognitive-Based Assessment
Spring (Mila Aftina, Muasomah, 2025)	Mobile/App-Based Assessment	Qira'ah & Vocabulary	Increased interactive and flexible assessment practices	Mobile-Based Assessment
Kahoot (Roziqi et al., 2026)	Gamified Assessment	Vocabulary & comprehension	Improved engagement and classroom participation	Gamified Assessment
Quizziz (Ichsani et al., 2025)	Gamified Assessment	Material comprehension	Enhanced motivation and interactive learning	Gamified Assessment
Google Forms (Kamal, 2025)	Web-Based Assessment	Multi-skill	Enabled efficient and flexible assessment	Digital Test Assessment
QR Code (Nailis Sa'adah, 2025)	Hybrid Print - Digital	Vocabulary	Supported interactive blended assessment	Hybrid Assessment
LMS + AI (Thayyibah et al., 2025)	Adaptive Assessment	Multi-skill	Facilitated data-driven and personalized evaluation	AI-Based Assessment
Assessment Rubric Based on KKNI (Boeriswati et al., 2023)	Rubric-Based Digital Assessment	Writing	Improved structured and standardized writing assessment	Authentic Assessment
Web-Based Interactive Assessment (Aisyah et al., 2025)	Interactive Web Assessment	Multi-skill	Stimulated students' interest and participation in Arabic learning	Web-Based Assessment

Word Puzzle-Based Formative Assessment (Chamidah & Jundi, 2024)	Gamified Formative Assessment	Vocabulary & comprehension	Tracked student progress through interactive	Gamified Assessment

The findings in Table 2 indicate that Arabic language assessment has undergone a significant shift from conventional evaluation to technology-supported, interactive assessment models. The reviewed studies demonstrate the increasing use of web-based platforms, gamified applications, multimedia tools, and AI-supported systems in Arabic language learning. This transformation reflects a shift toward more flexible, adaptive, and student-centered assessment practices. The findings further reveal that gamified assessment platforms such as Kahoot and Quizizz, as well as word-puzzle-based assessments, remain dominant trends in Technology-Enhanced Assessment. In addition, the emergence of rubric-based, web-interactive, and AI-supported assessment indicates a growing orientation toward authentic, competency-based evaluation. However, most digital assessments still focus on receptive and objective language skills, while technology-based assessments for productive skills such as speaking and writing remain relatively limited.

The Dominance of Gamified Assessment

The findings reveal that gamified assessment has become the most dominant trend in Technology-Enhanced Assessment within Arabic language learning. Platforms such as Kahoot, Quizizz, and word-puzzle-based assessments were widely implemented as interactive evaluation tools, particularly in formative assessment. The increasing adoption of gamification reflects a pedagogical shift from conventional assessment toward more engaging, participatory, and student-centered evaluation models. Several studies have demonstrated that gamified assessment positively affects students' motivation, classroom participation, and learning engagement. The integration of game elements, such as competition, instant feedback, scoring systems, and interactive quizzes, created a more dynamic assessment environment and encouraged active student involvement throughout the learning process. In most cases, gamified assessment was used to evaluate vocabulary mastery, reading comprehension, and general understanding of Arabic-language materials. Despite its positive impact, the findings indicate that the implementation of gamified assessment still tends to focus on objective, lower-order cognitive assessment formats, particularly multiple-choice and short-answer activities. Consequently, the potential of gamification to assess higher-order thinking skills and productive language competencies has not yet been fully optimized.

Shift Toward Authentic and Adaptive Assessment

The findings indicate a gradual shift from conventional objective testing toward more authentic and adaptive assessment practices in Arabic language learning. Several studies highlighted the use of rubric-based assessment, formative assessment, digital storytelling, and interactive web-based assessment to support more meaningful and competency-oriented evaluation. These approaches enabled broader assessment of students' language performance, particularly in productive skills such as speaking and writing, while also providing continuous feedback through formative evaluation. The findings further suggest that Arabic language assessment is gradually moving toward more student-centered and competency-based practices. However, authentic digital assessment remains less dominant than gamified and objective assessment models, suggesting that the development of more comprehensive assessment systems still requires further exploration.

Emergence of AI-Based Assessment

The findings indicate the emerging integration of Artificial Intelligence (AI) in Arabic language assessment, particularly through adaptive learning systems and Learning Management System (LMS)-supported evaluation. AI-based assessment enables automated scoring, personalized feedback, and data-driven evaluation, supporting more adaptive and efficient assessment practices. The use of LMS integrated with AI technologies also demonstrates a shift toward intelligent assessment systems capable of monitoring students' learning progress in real time. Furthermore, AI-supported assessment reflects the broader transformation of educational practices in the era of digitalization and Education 4.0. Although its implementation in Arabic language learning remains relatively limited, the emergence of AI-based assessment indicates significant potential for developing more personalized, responsive, and competency-oriented assessment systems in the future.

Challenges of Technology-Enhanced Assessment

Despite the positive developments in Technology-Enhanced Assessment, several challenges remain in its implementation. The findings reveal that limited digital literacy among teachers and students, unequal access to technological infrastructure, and technical constraints continue to hinder the effectiveness of digital assessment practices. These issues are particularly significant in institutions with limited technological support and internet accessibility. In addition, most technology-based assessments still focus primarily on objective and receptive language skills, while

productive competencies such as speaking and writing remain underdeveloped. The implementation of AI-based assessment also raises concerns about scoring validity, algorithmic bias, and educators' pedagogical readiness to integrate intelligent technologies into assessment practices effectively.

Pedagogical Implications

The transformation of Arabic language assessment toward technology-enhanced models has important pedagogical implications for teaching and learning practices. The integration of digital assessment encourages educators to adopt more innovative, flexible, and student-centered evaluation approaches that align with 21st-century learning demands. Technology-based assessment also supports formative learning environments through immediate feedback, interactive evaluation, and continuous monitoring of students' progress. Moreover, the emergence of authentic and AI-supported assessment highlights the need for teachers to strengthen their digital competence and assessment literacy. Educators are required not only to understand technological tools but also to design meaningful assessment practices capable of measuring higher-order thinking skills, communicative competence, and real-world language performance in Arabic language learning.

Discussion

The results of this study show that Arabic language assessment has shifted considerably from traditional paper-based testing to Technology-Enhanced Assessment (TEA) (Nieminen et al., 2023). This shift reflects the growing influence of digital technology and the adoption of 21st-century educational approaches in learning practices (Rahman et al., 2022). The use of gamified applications, web-based platforms, multimedia tools, and AI-assisted systems demonstrates that assessment is increasingly viewed not only as a tool for measuring achievement, but also as a strategy to improve students' engagement and learning participation (Saputri, 2025).

The findings also indicate that gamified assessment is the most widely implemented form of Technology-Enhanced Assessment in Arabic language learning. Applications such as Kahoot and Quizizz create interactive learning environments through instant feedback, scoring systems, and competitive activities that encourage students to participate more actively during the learning process (Saefudin, 2025). These findings reinforce previous studies stating that gamification can support formative assessment and increase students' learning motivation (Ardianto & Fakhirah, 2025) . However, most gamified assessments remain limited to objective testing and lower-level cognitive skills, particularly vocabulary and comprehension tasks. As a result, the use of

gamification for assessing productive language abilities and higher-order thinking skills remains relatively underdeveloped (L. Li et al., 2024).

In addition, the study reveals a gradual movement toward authentic and adaptive assessment practices (Baiq Nabila, Q Qothrunnada, 2025). Several reviewed studies highlighted the implementation of rubric-based assessment, digital storytelling, and AI-assisted evaluation to support more meaningful and competency-oriented assessment processes (Ulstad et al., 2025). This development indicates a transition from assessment practices focused solely on learning outcomes toward approaches that also facilitate learning processes through feedback, reflection, and continuous evaluation. Such findings are in line with current educational perspectives emphasizing learner-centered and competency-based assessment in digital learning contexts (Alruwais et al., 2018).

Another notable finding is the growing emergence of AI-based assessment in Arabic language learning. Although its implementation is still limited, AI-supported systems offer opportunities for more efficient and adaptive assessment practices through automated scoring, personalized feedback, and learning analytics(Tools et al., n.d.)(Caspari-sadeghi, 2023). The integration of AI with LMS platforms further demonstrates the movement toward intelligent educational systems capable of monitoring students' progress more effectively and continuously(Zawachki Ricter O, Marind V.I, 2021).

Despite these developments, several challenges remain in implementing Technology-Enhanced Assessment. The reviewed studies identified limitations in digital literacy, unequal access to technological facilities, and technical issues as major barriers affecting the effectiveness of digital assessment practices (Ansori & Sudi, 2026). Concerns regarding the accuracy, fairness, and validity of AI-based scoring systems also continue to emerge. Therefore, the success of Technology-Enhanced Assessment depends not only on technological advancement, but also on teachers' readiness, institutional support, and assessment literacy (Xia et al., 2024). Overall, this study highlights the important implications of Technology-Enhanced Assessment for Arabic language learning. Digital assessment practices can create more interactive, flexible, and competency-oriented learning environments while supporting the development of 21st-century skills. Consequently, educators are expected to improve their digital competence and develop assessment models that are capable of evaluating communicative competence, critical thinking, creativity, and authentic language performance more comprehensively (J. Li et al., 2025).

CONCLUSION

This study concludes that Arabic language assessment has undergone a substantial transformation from conventional paper-based evaluation to Technology-Enhanced Assessment (TEA) during the period 2021–2026. The findings demonstrate that gamified, web-based, multimedia, authentic, and AI-supported assessments have increasingly been implemented to support more interactive, adaptive, and student-centered learning evaluations. Gamified assessment emerged as the dominant trend due to its effectiveness in enhancing students' motivation and participation. In contrast, the emergence of AI-based assessment reflects the growing integration of intelligent technologies in educational evaluation. Nevertheless, TEA implementation still faces several challenges, including limited digital literacy, unequal access to technological infrastructure, technical constraints, and concerns about the validity of AI-supported assessment systems. Therefore, integrating technology into Arabic language assessment requires not only technological readiness but also pedagogical competence and assessment literacy to support more meaningful, competency-oriented, and sustainable learning practices.

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