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Examining the Role of Digital Literacy in Enhancing Arabic Language Acquisition Among Non-Native Speakers: Challenges and Opportunities

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Abstract
Given the rapid integration of digital technologies in language education and the unique linguistic complexity of Arabic, urgent research is needed to empirically determine how learners' digital literacy competencies influence Arabic as a Foreign Language acquisition. This mixed-methods study investigates the relationship between digital literacy levels and language proficiency among 124 non-native Arabic learners enrolled in university-level AFL programs. Quantitative data were collected using a validated digital literacy scale adapted from the European Digital Competence Framework (DigComp) and a standardized Arabic proficiency test aligned with ACTFL benchmarks. Qualitative interviews and classroom observations explored learner perceptions and instructional practices. Results revealed statistically significant correlations between digital literacy skills-particularly information navigation, multimodal communication, and content creation-and reading comprehension, writing accuracy, and listening proficiency. Findings indicate that digitally literate learners demonstrate greater autonomy, increased exposure to authentic media, and more effective utilization of learning tools. Key challenges include unequal access to technology, limited pedagogical integration of digital tools, and learner dependency on machine translation. The study underscores the necessity of embedding digital literacy instruction within AFL curricula and provides recommendations for teacher training, curricular design, and future research.

Keywords: Digital literacy; arabic language; educational technology; second-language acquisition.

1. INTRODUCTION

Digital technologies have taken centre stage with the modern approach of teaching foreign language and basically changed the manner in which languages are taught, learnt, and experienced outside the traditional classroom. Multimedia resources, mobile learning, learning management system and the computer-mediated communication have broadened the access to true linguistic input as well as expanded possibilities of interaction, co-operation and independent learning across geographical contexts (Stockwell, 2016; Kukulska-Hulme and Shield, 2008; Larsen-Freeman and Anderson, 2011; Mayer, 2009; Al-Mallahma, 2026). These trends are in line with advocacy of the modernisation of

curriculum in order to go beyond basic literacy to incorporate 21st-century skills like being digital citizens, critical thinkers, and problem solvers so that learners become prepared to meet the requirements of the real world (John, 2024). Education in a broader sense is also conceptualized based on the idea of developing students to be aware of their individuality and purpose, which solidifies the moral and comprehensive intentions of language teaching (Kayode et al., 2016).

Interactive feedback and self-controlled learning Multimodal texts and competent communication Multimodal texts can be used to expose learners to comprehensible input and facilitate competent communication. The Cognitive Theory of Multimedia Learning brings clarity to the fact that processed information that involves a combination of both visual and audio information is more effective in terms of processing and subsequent retention and that digital environments are particularly valuable in learning vocabulary, pronunciation and general language knowledge (Mayer, 2009; Plass and Jones, 2005). The latest tools, mobile-assisted tools, speech-recognition programs, and AI-powered applications provide personalized feedback and encourage learners to practice (Godwin-Jones, 2018; Zou et al., 2023). However, the success will not only be determined by the availability of the tools but also how learners will be able to utilize them in a strategic and critical manner in pedagogically significant manners.

One of the core competences in digitally mediated learning is digital literacy: it has come to include information access, critical literacy, communication, content creation, ethical engagement, and problem solving (Eshet, 2012; UNESCO, 2018; European Commission, 2020; Pritika Reddy et al., 2023). Digital literacy is conceptualized by international frameworks like UNESCO Digital Literacy Framework and the EU DigComp model in terms of information/data literacy, communication and collaboration, content creation, safety and problem-solving. Empirical research suggests that digitally literate students tend to be more academically self-efficacious, more critical thinkers, and more engaged and achieve better results (Hatlevik and Christophersen, 2013; Ng, 2012; Claro et al., 2012; Kong, 2014; Littlejohn et al., 2016; Saad et al., 2025). However, most previous studies are based on self-report or access measures as opposed to objective digital proficiency, and the effects of digital literacy on second-language acquisition, especially of less commonly taught language such as Arabic, have not been well investigated.

Being a foreign language, the Arabic language has specific linguistic and sociolinguistic issues which make the cognitive load of Arabic learners heavier: right-to-left orthography, context-dependent letter shapes, complicated root-and-pattern morphology, and unknown phonology (Ryding, 2014; Nasirudeen, 2025). The organized and complicated syntax of Arabic can be particularly challenging to those learners who are not familiar with the Semitic systems (Nasirudeen and Chtaibi, 2024). The coexistence of the Modern Standard Arabic and the variety of colloquial dialects also make communicative proficiency even more complicated (McCrocklin, 2016; Al-Batal, 2017). Simultaneously, the cultural, political and economic importance of the Arabic language in the last 20 years makes Arabic education to non-native learners more and more demanded, which places pressure on the effectiveness of pedagogies and digital aids (Nasirudeen & Ishaq, 2025).

Another use of digital technologies is especially promising in overcoming AFL issues through multimodal input, visual-auditory reinforcement, and phonological awareness, vocabulary, and orthographic and morphological building activities (Al-Batal, 2017; Al-Seghayer, 2021; Al-Abdullatif and Alsubaie, 2022). Orthographic and morphological growth and exposure to authentic language can be improved by use of speech-recognition systems, which can also promote pronunciation accuracy and confidence among learners and digital writing and corpus based-tools (McCrocklin, 2016; Zhang and Zou, 2020; Zapata and Lacorte, 2007). It is also through communication networks and social platforms that real life communication with native speakers is facilitated and this enhances linguistic ability and social cultural competence (Guth and Helm, 2010). Notably, the internet-based Arabic teaching is feasible not just based on the resources but also due to pedagogical alignment with the communicative interaction, instructor presence, and culturally appropriate material in accordance with the learner level (Nasirudeen and Lawal, 2025).

The increased use of digital technologies in the process of teaching the foreign language has altered the access to input, interaction between students and teachers and practice (Stockwell, 2016; Kukulska-Hulme and Shield, 2008; Larsen-Freeman and Anderson, 2011; Mayer, 2009; Al-Mallahma, 2026). Digital literacy in turn plays a pivotal role in the process of helping learners navigate online resources in a purposeful manner, the assessment of information critically, and the creation of meaning in language (Eshet, 2012; UNESCO, 2018; European Commission, 2020; Pritika Reddy et al., 2023). Although this is the case, there is scant empirical research that addresses the issue of digital literacy as a determinant of Arabic acquisition, especially in the case of non-native learners of higher education.

This study will focus on two Malaysian higher institutions of AFL learners aged 124 undergraduate learners. Preliminary evidence indicates that the learners have obstacles to effective use of digital language tools: inequalities in access to devices, poor experience with digital platforms, excessive use of machine translators, and poor ability to produce Arabic content on the internet. These aspects probably hinder reading, writing, listening, speaking and vocabulary development which means digital competence can be directly correlated with AFL achievement. The literature gap is that the connection between digital literacy domains (information navigation, content-generation, communication, problem-solving, safety) and language proficiency remains not very well understood; the engagement of tools and basic skills (Nasirudeen and Chtaibi, 2022; Manzoor et al., 2024) allows one to conclude that the mediating role of digital literacy of learners in less common languages such as Arabic has been little studied(Siddique et al., 2016; Nasirudeen & Chtaibi, 2022).

The two Malaysian institutions with varying technological access, the level of digital skills, and language proficiencies created a setting that is contextually relevant to investigate the problem and generate empirical evidence regarding the challenges and opportunities of digital literacy in Arabic learning. Despite the fact that the pedagogical value of digital technologies in AFL is provided, devices, lesson design, and resource access as well as the digital literacy of learners as a factor of outcomes have been examined in much of the literature. Tools have to be useful based on how well learners can work strategically in digital environments, critically assess information, interpret feedback and utilize resources. Students who are not digitally competent might not be able to take advantage of digital feedback and platforms, restricting the advantages of technology-enhanced learning. Conceptualization of digital literacy as a central learner competence that mediate technology-mediated language acquisition is thus in need.

This paper fills that gap by conceptualizing digital literacy based on Sociocultural Theory (Vygotsky, 1978; Chapelle, 2009) and Technology Acceptance Model (Davis, 1989) along with frameworks like UNESCO and DigComp as a necessary competence that facilitates that meaningful interaction with digital learning spaces. The study will focus on assessing the influences of different levels of digital literacy on reading, writing, listening, speaking and vocabulary in Arabic; establishment of digital literacy profiles among learners; correlations and predictive elements of digital literacy on proficiency; barriers that can hinder successful digital interaction, as well as, suggestions to be made to promote AFL learning. This research will offer empirical advice by pre-empting the digital competence of learners as one way of more effectively and contextually relevant pedagogies in digitally mediated Arabic learning.

2. METHODS

Research Design

The convergent mixed design was used as a combination of quantitative correlation and regression analysis with qualitative thematic interpretation.

Participants

The respondents were 124 AFL undergraduate students (68 females, 56 males) learning beginner to advanced Arabic courses in two Malaysian universities. The students that participated in the study had 16 first language backgrounds.

Instruments

The following tables present the instruments used in this study to measure the key variables of digital literacy and Arabic language proficiency among non-native learners. These instruments were carefully selected and adapted from established frameworks and standardized assessment practices to ensure validity, reliability, and alignment with the study's objectives.

Table 1 presents the digital literacy instrument domains adapted from the European Commission's DigComp framework. The table outlines the five core competency areas assessed in this study: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Each domain represents a critical dimension of learners' ability to effectively and responsibly use digital technologies in Arabic language learning contexts. The table also provides descriptions and sample items illustrating how each competency was operationalized and measured. These domains collectively provide a comprehensive profile of learners' digital literacy, which serves as a key independent variable in this study.

Table 1. Digital literacy instrument domains

Domain	Description	Sample Item
Information & Data Literacy	Searching, evaluating, organizing Arabic digital sources	"I can select reputable Arabic learning websites."
Communication & Collaboration	Online interaction using Arabic	"I participate in Arabic forums or chats."
Digital Content Creation	Producing Arabic media	"I create digital presentations or recordings in Arabic."
Safety	Data protection & digital ethics	"I understand privacy settings on learning platforms."
Problem-Solving	Troubleshooting tool use	"I can independently resolve basic technical problems."

Note. Adapted from DigComp (European Commission, 2020).

Following the measurement of digital literacy, Table 2 presents the Arabic language proficiency variables used to assess learners' linguistic competence across the major language skill areas. The table outlines the five core proficiency components-reading, writing, listening, speaking, and vocabulary-along with their respective assessment methods and scoring scales. These measures were designed to capture both receptive and productive language abilities and to generate a composite proficiency score representing overall Arabic language acquisition. Together, these variables provide a multidimensional assessment of learners' Arabic proficiency, which serves as the primary outcome variable for examining the relationship between digital literacy and language acquisition.

Table 2. Arabic proficiency variables

Skill Area	Assessment Method	Scale
Reading	Paragraph interpretation test	0–20
Writing	Guided essay scoring rubric	0–20
Listening	Audio comprehension items	0–20
Speaking	Interview rated by ACTFL rubric	0–20
Vocabulary	Timed recognition test	0–20
Total Score	Composite proficiency index	0–100

Data Collection

Online surveys and standardized proficiency exams were used to administer the surveys. Digital experiences of learners were discussed with the help of interviews (n = 20). Instructional technology was observed in classrooms.

Data Analysis

Braun and Clarke (2006) presented a thematic analysis model consisting of six phases, which offers a methodological approach to the discovery, analysis, and interpretation of patterns of meaning in qualitative data. The thematic analysis was applied in this research to analyse the experiences and perceptions of learners with respect to the role of digital literacy in Arabic as a Foreign Language (AFL) acquisition. The stages are discussed below regarding the current research setting:

1. Familiarization with the Data

This first level entails the engagement of the self into the qualitative information to have a full view of its contents. The researcher, in the framework of the given study, has read and re-read the interview transcripts and open-ended responses of the learners regarding their use of digital tools to learn Arabic. The first observations were made, especially when it came to the way the learners explained their usage of the online Arabic materials, communication devices, and tools of creating digital materials.

2. Generating Initial Codes

Data, at this level, is meaningfully divided into significant parts, and labelled using codes that describe the key aspects of the data. The responses of this study were coded to recognize the patterns that occur frequently, which included the use of online dictionaries, independent learning based on video, technical challenges, enhanced pronunciation by using audio tools, and trust in online communication. These codes reflected certain elements of digital literacy that affect learning Arabic language.

3. Searching for Themes

Then codes were reviewed and sorted into more general categories or themes that indicated noteworthy patterns in responses of the participants. Similar codes were grouped in this research as the potential themes of Digital tools as facilitators of language exposure, Digital literacy enhancing learner autonomy, technical barriers to effective learning and Digital communication supporting language practice.

4. Reviewing Themes

This stage will be that of refining and validating the themes to make sure that they are an accurate representation of the data and are internally consistent and clear of each other. All the data extracts of the reviews conducted by the researcher under each theme were reviewed to ensure consistency and applicability to the research objective. The overlap themes were combined, whereas unclear or unsubstantiated ones were edited or given up.

5. Defining and Naming Themes

At this phase, every theme was well established, and the extent and purpose of each theme was identified. The researcher determined the deep sense of the meaning of every theme and how it connected to the importance of digital literacy in AFL learning. As an illustration, such themes as Digital literacy as a catalyst of language skills development and Technological competence as a precondition of efficient digital learning were well-worded and designated to show their conceptual importance.

6. Producing the Report

The last phase is the presentation of the themes in an organized and coherent storyline with the help of appropriate facts extracts. The themes have been incorporated into the findings and discussion parts of this study to elaborate how digital literacy competencies have facilitated the learning of the Arabic language. The qualitative results, in turn, were used to supplement the quantitative data, as they gave the further insight into what, in terms of using digital technologies to learn Arabic, learners went through, what challenges they faced, and what strategies they employed.

All these six phases combined to guarantee a strict and methodical qualitative study, which enabled the study to uncover significant trends within the experiences of learners in the field of digital literacy and their effects on the Arabic language proficiency.

3. RESULTS AND DISCUSSION

Digital Literacy Profiles

The total literacy was between moderate and high (M = 3.62, SD =.54 on a 5-point scale). Communication skills were the highest with learners scoring most in this area and content creation and safety were the lowest areas.

Correlational Findings

There were also considerable positive associations between digital literacy and proficiency outcomes.

Table 3 presents the Pearson correlation matrix examining the relationships between the five digital literacy domains and the five Arabic language proficiency skills, to determine the strength and direction of association between learners' digital literacy competencies and their Arabic as a Foreign Language performance.

Table 3. Correlation between digital literacy and arabic proficiency

Digital Literacy Domain	Reading	Writing	Listening	Speaking	Vocabulary
Information & Data Literacy	.52**	.49**	.45**	.38*	.41*
Communication	.44*	.47**	.42*	.53**	.36*
Content Creation	.39*	.55**	.34*	.48**	.40*
Safety	.21	.19	.15	.18	.23
Problem-Solving	.48**	.45**	.46**	.41*	.39*

Note. $*p < .01$, $p < .05$

Regression analysis identified Information Literacy and Content Creation as strongest predictors of total proficiency ($R^2 = .41$).

Qualitative Themes

1. Enhanced Autonomy: Learners reported independent practice via apps, YouTube lessons, and online reading resources.
2. Multimodal Input Benefits: Video subtitles improved decoding and listening comprehension.
3. Over-Reliance on Machine Translation: Reduced writing development.
4. Access Inequality: Students lacking personal devices fell behind.
5. Pedagogical Gaps: Limited instructor training hindered effective tool integration.

Digital Literacy Profiles of Learners

The results show that the digital literacy profile of non-native Arabic learners differs due to diverse spheres. The competency of the information literacy turned out to be especially powerful, and students could find, critically assessing, and choosing credible Arabic online sources. This expertise would help the learners to have access to the original literature, audio-visual footage, and internet-mediated communicative arena, exposing them to various registers, dialects, and cultural allusions. These trends are consistent with the sociocultural perspective where learning can be mediated and enhanced with the help of social tools and communication; here, digital technologies are considered effective mediational instruments that widen the cognitive and communicative possibilities of learners. The most common among the learners were communication, content creation, and problem-solving skills, whereas, the

safety literacy level was lower, which shows that ethical and privacy skills are less prominent in the short-term language performance but remain significant in the long-term digital interaction.

Correlation Between Digital Literacy and Arabic Proficiency

Quantitative analysis of results showed strong positive correlations between majority of digital literacy domains and Arabic language proficiency especially in reading, writing, speaking, listening as well as vocabulary acquisition. The best match with the increased performance was information literacy and content creation, which means that students who actively use real digital materials and create Arabic content are better receptive and productive in language skills. These results ensure the perception that digital literacy is a facilitating skill: not only does it help to access information, but it also provides meaningful interaction, practice, and self-directed learning in an AFL situation where exposure is not natural.

Predictors of Arabic Proficiency.

The stepwise regression analysis helped to identify information literacy and content creation as the strongest predictors of overall Arabic proficiency which confirmed that these competencies play the biggest role in the development of language. The findings indicate that using digital resources to search, assess and produce content stimulates learner agency, facilitates learning based on output and reinforces linguistic awareness. Active content production (e.g. blogging, collaborative writing, audiovisual activity) encourages the use of Arabic in the purposeful, creative manner, and is consistent with the language acquisition theory, which advocates output as the foundation of generating knowledge and skill development awareness.

Barriers to Effective Digital Engagement.

Although this is advantageous, several challenges were established. Overreliance on digital technology, including translation software or the predictive text, can lead to less cognitive effort and hinder more profound linguistic processing. Moreover, one can also mention disparities in access to devices, internet connectivity, and previous experience of working with the digital world, the digital divide, which form unequal learning opportunities, especially in the context of AFL, where learners have different socio-economic backgrounds. These results have shown the importance of institutional backing, inclusion, and specific digital literacy education to achieve equal access and successful involvement.

Instructional Opportunities to Promote AFL Learning

The paper underlines the idea that integrating digital tools in pedagogical models that are based on interactions can make the most out of them. Online AFL instructional practice as proposed by Nasirudeen and Lawal (2025) is feasible provided that communicative interaction, instructor presence and culturally rich materials are strategically matched to the level of learner proficiency. Technical, informational and creative literacies make integration into the design of instructional activities improve both receptive and productive literacies whereas ethical and safety literacy offers the basis of responsible and sustainable interaction. Integrative strategies to the implementation of the AFL programs will make sure that learners have a chance to fully capitalize on the pedagogical value of technology, combine active and scaffolded language use with active and meaningful and ethically conscious learning experiences in the digital environment.

4. CONCLUSION

The concept of digital literacy proves to be another important and relevant measure of the successful mastering of the Arabic language. Students that are competent in accessing, assessing and managing digital content and in producing and sharing information on the online platforms are more likely to show greater levels of receptive skills, including reading comprehension and listening, and productive skills,

including writing and speaking. This correlation indicates how language competence and the competency to use and navigate digital tools are interconnected, and that language learning of the 21 st century cannot be separated with technological competence.

The inclusion of direct acquisition of digital literacy in Arabic as a Foreign Language (AFL) program is a comparatively untapped but potentially great opportunity in improving the performance of learners. Through the explicit instruction of how to critically interact with digital materials, how to work in virtual space and create multimodal texts, teachers can equip students with the skills they would need to achieve success in more technology-mediated communicative practices. Moreover, incorporating digital literacy into the AFL curriculum would be able to support learner autonomy, promote self-directed learning, and facilitate the acquisition of practical competencies that are not limited to the classroom.

Finally, the emphasis on digital literacy as a learning goal and a measure of achievement during AFL programs is relevant to the modern educational requirements and prepares students with cognitive and technical means to survive and prosper in digitally enriched language teaching. However, further investigation to the new approaches to the implementation of digital literacy in Arabic language teaching and learning should be an ongoing process of further research to enhance as much learner engagement, proficiency, and lifelong learning opportunities.

The pedagogical implications of the research are 1) Digital Literacy Instruction: Integrate systematic training alongside Arabic curriculum, 2) Teacher Development: Focus on multimedia task design and supervised AI use, 3) Task-Based Content Creation: Student-produced videos, blogs, and podcasts enhance communicative output, and 4) Scaffolded Technology Use: Shift learners from passive consumers to active creators.

The limitations of this study are a) Institutional generalizability was impaired by sample size, b) The cross-sectional design does not allow detecting the causal effects in the long term, and c) Perceived literacy may be inflated on self-report data. Recommendations for future research include longitudinal designs of literacy development and performance, comparative experiment on matters to do with literacy and traditional models of instruction, and AI-powered individual tutoring research.

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