



EXPLORING TECHNOLOGY INTEGRATION IN ARABIC EDUCATION

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Abstract

This review examines technology integration in Arabic language education research within a variety of contexts—such as traditional in-person classes, face-to-face classes, hybrid courses (synchronous and asynchronous engagements), and finally, fully online CALL environments. Specific characteristics from theoretical frameworks of CALL, second language acquisition, and education are explored within the context of the Arabic classroom that uses technology. It is shown that in the research, six themes emerge in the teaching and learning of Arabic and there is a need for more studies to emphasize the importance of technology integration within course development to benefit both instructors and learners of Arabic. This synthesis of current research will be helpful to Arabic educators and researchers in determining best collaborative and comprehensive strategies for designing effective Arabic language learning environments to propel the field into the future.

Keywords: Arabic education; Online; Technology

INTRODUCTION

Arabic teaching and learning is experiencing significant changes throughout the world. Within the United States, Arabic language education in grades K–12, universities, and government language programs (military, CIA, etc.) are expanding (Coombe et al., 2019; El Essawi, 2018; Rahman, 2014). Recent growth in language and culture programs may be attributable to political and social events in the last few decades. Arabic language education was significantly impacted by the tragic events of 9/11 when national and security interests increased in areas of the world that are dominated by Arabic speakers (Abu-Melhim, 2014; Al-Batal, 2007; Brecht, 2007). For example, although there was a, “92% increase between 1998 and 2002 in the number of students studying Arabic at U.S. universities and colleges” (Al-Batal, 2007), the U.S. government was still struggling by 2003 to fill key Arabic-speaking positions. Intelligence organizations within the U.S. Army, the Central Intelligence Agency and other government intelligence groups were in recruitment mode as there were only, “about 1300 active-duty soldiers” who could speak or read some Arabic causing a “critical challenge” for diplomatic and intelligence operations in the Middle East (“Lack of Arabic,” p. 1).

In 2006, then President G.W. Bush, introduced the ‘National Security Language Initiative’ aimed at increasing the number of Americans/students learning foreign languages, particularly what the initiative refers to as ‘critical-need’ languages in which Arabic is included (Brecht, 2007; Taha, 2007). As a result, Arabic language programs in K–12 institutions, universities, and military training sites exploded in numbers of learners, opportunities, funding, and research (Abu-Melhim, 2014; Al-Batal, 2007; Allen, 2007; Blake & Kramersch, 2007; Brecht, 2007; Magnon, 2007). Despite national initiatives and efforts to promote Arabic language learning in the United States, schools, colleges, and universities bore the ultimate responsibility for improved language education, and significant reform was needed to meet national goals (Brecht, 2007).

Along with its growth in the U.S., Arabic is also experiencing a renaissance around the world, perhaps due to economic and political factors surrounding the Middle East and North Africa (MENA) region. Arabic is among the six official/working languages of the United Nations (U.N.) and among the top five languages in the world (Taha, 2007; World Population Review, 2021). There are 25 independent states and territories that list Arabic as their native language and it is estimated that there are more than 313 million Arabic speakers in the whole world (World Population Review, 2021). Religious, economic, and strategic factors surrounding areas of the world that speak Arabic contribute to its growth. Access to studies especially in Arab culture, history, geography, and the Arabic language, will challenge students and will require changes in practice within Arabic education (Ryding, 2013; Weber & Hamlaoui, 2018).

The global pandemic of COVID-19 in the latter part of 2019 and into 2021 proved the need for changes within Arabic education by emphasizing the need for non-traditional Arabic educational offerings. Educators realized the challenges of meeting Arabic language goals in their classes and have learned the importance of offering classes fully online, or in computer-assisted language learning (CALL) environments. Given the strategic and cultural importance of Arabic language learning, coupled with the economic and technological advancements in offering education in non-traditional settings, the ability to offer Arabic, integrating computer mediated and technological tools, is more essential than ever before.

There is a multitude of research that has been conducted on the effects of technology on language learning in a variety of learning settings, from elementary to university-level classes (Chen et al., 2016; Levy & Stockwell, 2006). This research represents a variety of educational contexts—such as traditional in-person classes, face-to-face classes, hybrid courses (synchronous and asynchronous engagements), and finally, fully online CALL environments. Arabic, however, is not represented well in the literature. More research is needed that explores how technology is integrated in Arabic teaching and learning environments. Given that Arabic is a global language and continues to grow in numbers of programs and in speakers, it is imperative that researchers focus efforts on how technology is integrated in the Arabic classroom and its effectiveness. Additionally, it is important to understand the perceptions of learners and educators on the use of technology in Arabic educational environments.

These important topics are explored in this article by providing a comprehensive look at research into technology integration in Arabic education in a variety of settings and contexts. First, the theoretical frameworks found in Arabic education research are discussed, especially as it applies to technological integration in Arabic language teaching and learning. Next, the process used to identify relevant studies and key characteristics of the research will be highlighted. Six themes that emerged in the findings that relate to technology integration in the teaching and learning of Arabic are enumerated and finally, there is a discussion on what the research revealed with regard to implications for practice and future research.

THEORETICAL FRAMEWORKS IN ONLINE ARABIC EDUCATION RESEARCH

Some prominent frameworks for research on CALL and technology integration in Arabic education are social-constructivist approaches that take into account, “affective, cognitive, and interactionist perspectives” (Levy & Stockwell, 2006, p. 110). These theories are drawn from second language acquisition (Atkinson, 2011; Krashen, 2017; Ortega, 2013) and education theories (Levy & Stockwell, 2006; Richards & Rodgers, 2014; Ryding, 2013). Three prominent theoretical frameworks found in Arabic education research are discussed, especially as they apply to technology integration in Arabic language teaching and learning.

Interaction Perspective

The interaction perspective originated from a theoretical model developed by Krashen (1985) and included five hypotheses for second language acquisition. One of these, the Comprehensible Input Hypothesis, is most concerned with learners being exposed to linguistic data that is just above the level of current comprehension (Levy & Stockwell, 2006; Ortega, 2013). Similar to how a speaker acquires their first language, a second language, the L2, is acquired in much the same way as a small child exposed to the language of the environment. In this way, the learner is continually processing data for meaning, either through oral or written messages, and grammar rules occur in a naturalistic way (Ortega, 2013). The more compelling the input, the more efficient the learning, thus eliminating the need for motivation towards improvement. If the input is compelling enough, the learner will acquire the L2 and forget that it is in another language (Krashen, 2017). The interaction model was controversial, yet did emphasize input, interaction, and output, which is, “the major school of mainstream SLA studies” (Atkinson, 2011, p. 13; Ortega, 2013).

Through further research on this concept, the Interaction Hypothesis, as introduced by Michael Long in the early 1980s, posits that another person is involved in the comprehensible input of the learner—an interlocutor—to provide interaction with the language learner, thus increasing comprehension (Atkinson, 2011; Levy & Stockwell, 2006; Ortega, 2013; Ryding, 2013). This process of natural language interaction between the learner and the interlocutor was a goal of CALL in early applications that had the challenge of providing a system of CALL interactions for individual learners at their individual level of language needs (Caws & Hamel, 2016). Computer Mediated Communication (CMC) between instructor and learner, through applications such as email and chat, has been researched as beneficial to learners through interactions that enhance students’ self-confidence and learner autonomy (Levy & Stockwell, 2006).

The interaction perspective emphasizes face-to-face communication in L2 development (Levy & Stockwell, 2006). In Arabic language classrooms that use technology, or in online environments, interactions may take place via video conferencing or may be negotiated with facial and/or nonverbal cues through email and chat features. Using these tools and features, two or more people interact through text, emojis, and other online communicative tasks by repeating, confirming, reformulating, and clarifying through computer mediated conversations (Levy & Stockwell, 2006; Long, 1996; Richards & Rodgers, 2014; Ryding, 2013).

Several CALL studies have also examined the interaction perspective through research where the computer serves not only as the vehicle for communication, but as the presenter of language materials to engage students in conversation (Gonzales-Lloret, 2003; Levy & Stockwell, 2006). Gaming software, such as those that target vocabulary retention are an example of this. Other original language learning software have the goal of improving speech output. These programs, enhanced with speech recognition programs and intuitive responses to learner input, are important tools where communication and negotiation occur to facilitate the comprehension process (Gonzales-Lloret, 2003). The interaction perspective views learning as an individual process, and given the tools of CALL, is a strong theoretical cornerstone for research in second language acquisition.

Sociocultural Perspective

A sociocultural perspective in CALL is concerned with the social dimensions of language learning development (Atkinson, 2011; Levy & Stockwell, 2006; Ortega, 2009; Swain et al., 2015; Warschauer, 2005). The teacher is a critical component in this theoretical perspective, acting as supporter and communicative partner, enabling students to operate independently in the language. In CALL, this process is supported with the use of computer applications and other tools intertwined in the teaching and learning process. Language development, therefore, is mediated using these tools, to change behavior and to transform “innate behaviors” in the language (Warschauer, 2005; Zuengler & Miller, 2019, p. 39).

According to Vygotsky (1975), a central tenet of sociocultural theory for the learner is mediation. Mediation is the use of “symbolic artifacts” to self-regulate through interaction with others and with content and the, “ability to plan, monitor, check, and evaluate self-performance” (Atkinson, 2011, p. 25). In CALL, technological tools act as, “systems that function to augment human psychological processing” (Haas, 1997, p. 17). Therefore, through mediation in a CALL environment, the individual regulates problem solving to achieve goals according to their motivations and exercising the means to reach them (Atkinson, 2011; Fernyhough, 2008; Ortega, 2013; Rieber, 1997; Swain et al., 2015).

Another tenet of the theory, as described by Vygotsky, is the Zone of Proximal Development (ZPD) (Vygotsky, 1975). ZPD refers to what a language learner can accomplish alone versus with another through interaction. ZPD is concerned with the distance between these two extremes and the process of getting from one to another (Atkinson, 2011; Ortega, 2013; Swain et al., 2015). In CALL, establishing social groups and communities is created through interactions and using collaborative learning teaching and learning strategies to help learners through the ZPD. It is the interaction that a student has with the language content, with peers, and with the instructor that can affect student success in a CALL environment (Atkinson, 2011; Fernyhough, 2008; Levy & Stockwell, 2006).

Mediation in CALL environments can be observed through the interactions between students and instructors and/or peers and is often seen taking place over several iterations of interaction in chat, email, or discussion forums. In language classrooms using technology integrated within, or in online classes, the interactions are limited and may or may not be synchronous (Atkinson, 2011; Ortega, 2013). Scaffolding is often conducted via discussion forums, messaging, chat, or email to aid in mediation. Instructors use these means to interact and gradually intervene, providing modeling and more explicit examples to help students reach a higher level of mastery in a concept (Dobberfuhr-Quinlan, 2018).

Constructivist Perspective

In the constructivism lens, researchers posit that learners construct meaning internally through an active process of learning according to their own personal reality (Ally, 2008; Richards & Rodgers, 2014). Learners interact with others to pose questions, explore meaning, construct knowledge, and solve problems, while the teacher acts as facilitator and guide (Levy and Stockwell, 2006; Richards & Rodgers, 2014). In CALL environments, whether fully online or with technology integrated into traditional settings, constructivism emphasizes student-focused teaching and language strategies.

In CALL, the processes of constructivism remain the same as in traditional language learning environments; however, the educational context may or may not take place online. The centrality of the experience is with the learner, and technology assists in task completion. One way that technology plays a part is with tools such as simulations and microworlds, to, “encourage active explorations within a virtual environment” (Levy & Stockwell, 2006, p. 123). Instruction can also take place directly through the use of software such as virtual tutors to teach vocabulary, or to encourage speaking toward a particular purpose. Finally, computer-supported collaborative learning tools can be used to encourage social interactions with peers and the instructor toward the knowledge construction process (Levy & Stockwell, 2006). In studies on constructivism’s influence on CALL, researchers drew varying views on the theory, yet, “most emphasized the centrality of the learner actively constructing knowledge, sometimes alone, but frequently through collaborative tasks, using the technology to assist task completion” (Levy & Stockwell, 2006, p. 123).

In CALL, the theoretical perspectives of interaction, sociocultural, and constructivism are represented in approaches that involve activities of cooperative or collaborative learning in purposeful activities and in

communities and social groups—all with technology. These theoretical perspectives are prevalent in CALL research and in use by practitioners, cementing its presence in the future of Arabic language-learning education.

METHOD OF REVIEW

The purpose of this review was to understand the role that technology plays in Arabic language education and was guided by the following two questions:

- 1) What are the key findings and emerging themes across the empirical research on technology integration in Arabic language education?
- 2) What are the characteristics of the research conducted on technology integration in Arabic language education?

Study Inclusion Criteria

In this review, Arabic language learning research includes in-person, hybrid, and fully online Arabic language classes integrating technology in the administration, instruction, and/or assessment of language content. In order to get a better understanding of the true Arabic educational experience using technology, the educational context included studies focused on instructors of Arabic and students of Arabic in grade school levels K–12, university beginning and intermediate language classes, and beginning and intermediate language classes for U.S. military personnel. The studies presented in this review offer a wide scope of the Arabic language landscape as it currently attempts to integrate more and more technology into the teaching and learning of Arabic.

Literature Search Process and Analysis

The studies for this review were located using three search strategies. First, electronic searches were conducted in the following databases: ERIC, ProQuest, and JSTOR. Keywords used in the initial database and journal searches included general terms (e.g., “online education,” “language learning,” “language teaching,” “e-learning,” “virtual learning”) as well as more specific terminologies (e.g., “Arabic,” “technology,” “CALL,” “blended learning,” “Arabic as a second language,” “Arabic as a foreign language”).

These searches produced many informative articles, however, specific studies in online Arabic language learning were lacking. The relatively low numbers of studies looking at fully online Arabic educational context is due, perhaps, to the challenging nature of learning Arabic or in the slow evolution of technology integration to facilitate teaching Arabic. As a result, articles that specifically included integrating technology in Arabic language classes as well as E-learning in the Middle East and North Africa (MENA) were included.

Second, peer-reviewed journals on language learning, language teaching, and integration of technology in language education were manually reviewed (e.g., *Modern Language Journal*, *Studies in Second Language Acquisition*, *Language Teaching Research*, *Language Learning and Technology*, *Computer Assisted Language Learning*, *CALICO Journal*, *Studies in Second Language Learning and Teaching*, *Language and Education*, *International Journal of Bilingual Education and Bilingualism*, *International Journal of Applied Linguistics*, *Journal of Language Education*, *L2 Journal*, *Foreign Language Annals* and *Journal of Education*).

The third strategy included a review of the reference lists of several collected studies on Arabic education for other compatible studies, especially those that emphasized CALL or technology integration in the Arabic language classroom. In total, close to 50 eligible studies were evaluated in which 25 met the criteria for inclusion in this review. Although the literature search was open to all years, the earliest study was published in 1999 and the most recent in 2020.

The focus of this review was to use the literature to answer the research question—*What are the key finding and emerging themes across the empirical research on technology integration in Arabic language education?* The first phase of this analytic process included open coding (Strauss & Corbin, 1998) for the main research findings of the research question. The next phase included axial coding by generating connections between the codes to form categories of themes across the corpus of studies. The codes were condensed to form broad categories of themes. Finally, during the selective coding stage, broad categories were refined into six core themes that identified recurring topics in the Arabic education literature. The six themes were distinct and supported with illustrative examples.

FINDINGS

Characteristics of Research on Technology Integration in Arabic Education

This review explored the landscape of research on the use of technology integrated into Arabic language education. A total of 25 empirical studies were included in this review with a time span of 1999 to 2020. A majority of the studies (84%) were published in the last decade, from 2011 – 2015 (40%) and 2016 – 2020 (44%). The research

studies on Arabic education were presented equally as qualitative studies (48%) and quantitative studies (48%) and only 4% were presented as mixed methods (Table 1).

Most of the studies reviewed (60%) targeted beginning and intermediate levels of Arabic instruction to adults at university programs. A total of 32% of the studies were in the United States, 28% were in Middle East North Africa (MENA), 12% were in Malaysia, and 12% were in other online/worldwide locations such as Indonesia and Palestine. Military and government personnel were also represented in 12% of the studies at the Arabic Basic and Intermediate Course Program at the Defense Language Institute Foreign Language Center (DLIFLC) in Monterey, CA, and Department of Defense language school for Fifth Special Forces Operations Group at Fort Campbell, KY.

Younger learners of Arabic in grade school were also represented in the empirical studies with grades 1–4 representing 20% and grades 5–7 representing 4% of studies. Some of the studies reviewed (8%), were in non-specific, worldwide Arabic language settings. One study reviewed Arabic massive open online courses (MOOCs) in the Middle East, one study took place at an Arabic teaching professional workshop, and a third study targeted language learners in a cultural and religious tutoring program available to learners from potentially around the world.

Characteristics	n	%
Publication Year		
1996 – 2000	2	8
2001 – 2005	2	8
2006 – 2010	0	0
2011 – 2015	10	40
2016 – 2020	11	44
Design		
Qualitative	12	48
Quantitative	12	48
Mixed Methods	1	4
Content Area		
Modern Standard Arabic	20	80
Not specified	3	12
MSA and Dialect	2	8
Participants (students and teachers)		
University Beginning and Intermediate	13	52
Grades 1–4	5	20
Defense Language Institute/Military	3	12
Not specified	3	12
Grades 5–7	1	4
Context of Instruction		
In person	16	64
Online	8	32
Hybrid	1	4
Source		
Journal Article	23	92
Dissertation	2	8

In the following, 25 empirical studies on integrating technology in Arabic education are synthesized and discussed. The most pervasive findings are described first and then the final theme discusses a common recommendation from instructors and learners of Arabic for the future of Arabic education.

Theme One: Technology Integration in the Arabic Classroom Encouraged Students' Engagement with Language Content

The strongest theme throughout the research on technology integration in the Arabic classroom was that technology encouraged students' engagement with language content. In 44% of the studies reviewed, engagement with Arabic content was enhanced through the use of technology (Ahmed, 2015; Al-Busaidi et al., 2016; Arrabtah & Nusour, 2012; Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999; Omari, 2015; Osman & Hamzah, 2017; Sahrir & Yusri, 2012; Samy, 2006; Sulaiman, 2015). To set the context for engagement in these particular studies, some characteristics are worth noting. Most of the studies were conducted post-secondary, in universities or directed at military personnel at DLIFLC and USMA (Ahmed, 2015; Holland et al., 1999) or on station (Harless et al., 1999). A single study (Al-Busaidi et al., 2016) was conducted on teacher participants from Muscat Basic Education schools in Oman who reported on their students' progress in the language. As for the context of the learning environment, 72% of these studies were conducted in classrooms where the primary method of classroom instruction was in person (Ahmed, 2015; Al-Busaidi et al., 2016; Arrabtah & Nusour, 2012; Holland et al., 1999; Omari, 2015; Sahrir & Yusri, 2012; Samy, 2006; Sulaiman, 2015).

Learners enjoyed interacting with language content that was presented using technology and expressed their satisfaction with their language learning experience (Al-Busaidi et al., 2016; Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999; Omari, 2015; Osman & Hamzah, 2017; Sahrir & Yusri, 2012). In the studies mentioning learner engagement and satisfaction, 71% were conducted within the context of in person classes (Al-Busaidi et al., 2016; Harless et al., 1999; Holland et al., 1999; Omari, 2015; Sahrir & Yusri, 2012) and two were hybrid or online (Blake & Shiri, 2012; Osman & Hamzah, 2017). Technology can help facilitate real-life interactions in genuine situations and in these studies, a variety of technology was used for this purpose. These included media for presenting video and audio (Blake & Shiri, 2012; Osman, 2017), Internet applications such as Facebook, YouTube, Skype, Wimba, WebSwami (Blake & Shiri, 2012; Omari, 2015) and original language learning software that was developed for specific language learning experiences (Al-Busaidi et al., 2016; Harless et al., 1999; Holland et al., 1999; Sahrir & Yusri, 2012). In a study of an asynchronous online university Arabic classroom dubbed Arabic Without Walls (AWW), Blake and Shiri (2012) illustrated that, "students can learn a new language in an online format and achieve satisfaction in this process" (p. 241). With regard to original software programs, Harless et al. (1999) declared that, "subjects expressed their enjoyment" of using virtual training software to practice speaking Arabic for a specific purpose in the military (p. 322). Military and university students equally enjoyed virtual microworld software in the Holland et al. (1999) study that stated, "Like the university students, the soldiers in our sample uniformly liked the microworld lesson..." (p. 350).

Not only do Arabic learners express enjoyment learning Arabic using technology, but some studies showed that they actually preferred language content that was presented in both audio and video means over more traditional language teaching methods such as lecture or text only (Ahmed, 2015; Holland et al., 1999; Omari, 2015, p. 624; Samy 2006; Sulaiman, 2015). Several students in Ahmed's (2015) research at DLIFLC expressed their preference for completing listening work via the use of iPads or tablets, iPods or MP3/4/5 players, or with iPhones or other mobile devices due to the flexibility it provided in autonomous learning. This was illustrated through end of course comments such as, "It allows me to listen at my own pace" and "Having access to portable technology is useful because each student takes responsibility for their own listening comprehension" contrasting "it is difficult having a listening activity done by a teacher speaking quickly and slurring words together" (p. 68). Several teachers in the Al-Busaidi et al. (2016) study noted that integrating original software in the classroom added to the enthusiasm students felt about the class. One teacher stated, "[t]he direct presentation of the sound and the pictures as well as the linguistic games via the software has made the presentation of Arabic lessons to be more comprehensive and enjoyable" while another added, "[i]f it involves quizzes, word matching, sentence completions, and fun games; all these make students enthusiastic for Arabic classes" (p. 146). In similar fashion, the Samy (2006) study noted that, "learners, in general, appear to be more motivated to do 'work' using computers than to do work with a more traditional medium such as text" as it provides opportunities for repetition and ease of performance (p. 270).

Some studies emphasized how the integration of technology in the Arabic classroom, especially through access to original Internet content, was an effective means to allow students to engage in authentic Arabic content and knowledge of culture (Ahmed, 2015; Al-Busaidi et al., 2016; Arrabtah & Nusour, 2012; Harless et al., 1999; Omari, 2015; Sahrir & Yusri, 2012; Sulaiman, 2015). Authentic content allowed learners to be exposed to more, "dynamic social contexts and events that enable learners to construct rich, realistic mental models of such situations (Samy, 2006, p. 265). Ahmed (2015) illustrated the importance of authentic content through exit interviews with students at DLIFLC. One student indicated, "listening to authentic news has been the most helpful" to learning Arabic, "because it has native speed" while another student enjoyed the, "range of topics and news items to see grammar features used in concert with social and cultural articles like sports" (p. 66).

Theme Two: Technology Integration in the Arabic Classroom Supported Language Learning

Technology integration in the Arabic classroom supported language learning in 40% of the studies reviewed (Al Busaidi et al, 2016; Arrabtah & Nusour, 2012; Attia, 2011; Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999; Mahmoud et al, 2013; Mosa & Kakehi, 2015; Omari, 2015; Sahrir & Yusri, 2012). To better understand how language learning is supported with technology, some characteristics of these studies are worth mentioning. In 36% of the studies, research was conducted for learners of Arabic at the post-secondary, university level and 8% (Harless et al., 1999; Holland et al., 1999) focused on military learners of Arabic at DLIFLC, USMA, or on station. Al-Busaidi et al. (2016) was the lone research conducted in Basic Education in Oman. Researchers in these studies looked at how technology played a role in supporting language learning, specifically reading skills (Al-Busaid, 2016; Mosa & Kakehi, 2015), listening skills (Al-Busaid, 2016; Attia, 2011), speaking skills (Attia, 2011; Mosa & Kakehi, 2015), grammatical constructions (Arrabtah & Nusour, 2012; Attia, 2011) and vocabulary exposure (Al-Busaidi, 2016; Sahrir & Yusri, 2012). The majority of these studies were conducted for in-person language contexts, while 8% (Blake & Shiri, 2012 and Harless et al., 1999) were for online.

Integrating technology in the classroom enhanced the language learning process for students (Al-Busaidi, 2016; Arrabtah & Nusour, 2012; Attia, 2011; Mosa & Kakehi, 2015; Omari, 2015; Sahrir & Yusri, 2012). Researchers in 12% of the studies, reviewed the effects that integrating original language learning software had on Arabic students' language learning (Al-Busaidi et al., 2016; Mosa & Kakehi, 2015; Sahrir & Yusri, 2012). In highlighting a few of these studies, Al-Busaidi et al. (2016) interviewed Arabic teachers in Muscat, Oman on the effectiveness of an original language learning software program and perceptions on their students' learning. In a similar study, Mosa and Kakehi (2015) conducted two studies on a combined 97 learners on their preferences using an e-learning software program for Arabic script recognition in a Tokyo university. In a third mixed methods study, researchers Sahrir and Yusri (2012) evaluated a prototype Arabic vocabulary video game in a university in Malaysia. In the preceding three studies on original language learning software, researchers reported that instructors and students alike indicated that the software that was integrated into an existing class was helpful for improving Arabic skills, especially in reading and vocabulary. Teacher K in the Al-Busaidi et al (2016) study stated that presenting, "new words frequently and repeatedly" helps the learners, "to get more familiar with the vocabulary and they are more likely to remember what they have learnt" (p. 146). Mosa and Kakehi (2015) stated that the software was effective in identifying and reading Arabic letters (p. 7), and Sahrir and Yusri (2012) stated definitively that software has the ability to, "improve and enhance" vocabulary acquisition in learning Arabic (p. 973). Among the six studies that listed specific enhanced language skills, improvement in listening was mentioned by Al-Busaidi et al. (2016), Omari (2015), and Attia (2011). A teacher participant in Attia's (2011) study, "having taught listening and speaking, in particular, for many years, recognizes the remarkable role of technology in enriching Arabic language teaching" (p. 141). Finally, 50% of these studies revealed how the use of technology in the classroom helped to improve grammar (Arrabtah & Nusour, 2012; Attia, 2011; Omari, 2015).

Students in several studies viewed the integration of technology in the Arabic classroom to be a positive experience toward their individual language learning (Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999; Omari, 2015). In Blake and Shiri's (2012) study, a graduate participant in the asynchronous online Arabic without Walls (AWW) program communicated that, "the course in general lead to a greater inter-personal relationship between students and the instructor that created a space for language acquisition that surpasses what is found in most traditional language courses (p. 240). Harless et al. (1999) and Holland et al. (1999) both reported that, "all" participants in the virtual dialogue and microworld research of those studies expressed their enjoyment using the technology as a "good idea" for language learning (p. 322; p. 348). In Omari's (2015) study of multimedia programs, social media applications, and online language tools in the teaching of Arabic in U.S. universities, learners at the University of Michigan provided a "positive perception" of the use of Arabic for Communication, "expressing satisfaction" and "finding them extremely valuable" (p. 625).

Technology integration in the Arabic classroom also showed evidence of increased language proficiency and achievement in learners (Arrabtah & Nusour, 2012; Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999; Mahmoud et al., 2013). In 60% of the studies, participants provided their own assessment of the increase in their language proficiency and achievement in interviews with researchers (Blake & Shiri, 2012; Harless et al., 1999; Holland et al., 1999). In Blake and Shiri's (2012) study, several students who participated in the online program AWW, continued their Arabic studies at another university in a more traditional learning environment with success. Learning proficiency and achievement was also measured through pre- and post-test assessments in reading, listening, and speaking in the Harless et al. (1999) research using original Virtual Conversations speech recognition software at DLIFLC. Twenty participants from beginning and intermediate Arabic language classes participated in this virtual immersion experience and results showed that a, "statistically significant increase occurred in speaking and reading and a convincing increase in listening" for participants (p. 329). Additionally, seven of nine learners who participated in pre- and post-test Oral Proficiency Interview Assessments (OPIs), "improved dramatically during their five-day experience with the Virtual Conversations characters" (p. 329).

Theme Three: Original Language Learning Software Increased Autonomous Learning Opportunities in the Arabic Classroom

Original language learning software, when integrated in the Arabic classroom, increased autonomous learning opportunities for learners in a total of 36% of the studies (Al Busaidi et al., 2016; Bush & Browne, 2004; Hammad, 2019; Harless et al., 1999; Holland et al., 1999; Mahmoud et al., 2013, p. 128; Mosa & Kakehi, 2015, p. 6; Sahrir, 2012; Shaalan, 2005). Of the studies here, 8% focused on software to address speaking for military personnel (Harless et al., 1999; Holland et al., 1999), one study compared reading using technology versus a traditional reading curriculum for university learners (Hammad, 2019) and a final study reported on numerous software used at Brigham Young University (BYU) (Bush & Brown, 2004).

Original language learning software enabled individualism and autonomy for Arabic language students. Software programs designed for military speakers, such as in Harless et al. (1999), addressed the issue of skill erosion by allowing independent practice in a virtual multimedia environment (p. 315). In a similar study, Holland et al. (1999) discovered that when presented with opportunities to practice independently, repeated independent practice produced intrinsic motivation within students to “overlearn” – that is training beyond mastery. Students who participated in independent study of language concepts in a software program reported increased motivation and confidence (Harless et al., 1999). Additionally, Al-Busaidi et al. (2016) mentioned that autonomous learning opportunities, as presented with original software, “help students to take ownership of their learning” (p. 141). Game prototype software, as presented in Sahrir and Yusri (2012), was described by learners as an, “easily accessible learning tool,” and Shaalan (2005) described ICALL as a system that, “guides learner to recognize by themselves the erroneous or inappropriate functions for their misused expressions” (p. 83).

Theme 4: Technology Integration in the Arabic Classroom Allowed for a More Flexible Language Learning Experience than Traditional Arabic Language Teaching Methods

Technology integration in the Arabic classroom allowed for a more flexible language learning experience over more traditional language teaching methods in 32% of the studies reviewed (Ahmed, 2015, Al-Busaidi et al., 2016; Attia, 2011; Blake & Shiri, 2012; Harless et al., 1999; Mahmoud et al., 2013; Mosa & Kakehi, 2015; Omari, 2015).

Of the eight studies that included language learning and teaching methods, 37% reported on learning Arabic (Ahmed, 2015; Blake & Shiri, 2012; Harless et al., 1999; Mahmoud et al., 2013; Mosa & Kakehi, 2015) and 37% on teaching Arabic (Al-Busaidi et al., 2016; Attia, 2011; Omari, 2015). Several studies (Ahmed, 2015; Al-Busaidi et al., 2016) alluded to the importance of using technology in the teaching and learning of Arabic in order to advance more nontraditional opportunities for Arabic study.

In Attia’s (2011) dissertation research, interviews with three Arabic instructors at the Arabic Language Institute (ALI) at American University of Cairo (AUC) argued that integrating technology into their teaching methods improved their students’ use of time and resources. One of the participants, Dalal, revealed that technology by itself did not necessarily advance teaching, but the manner in which it was used was important. “A smart teacher is one who harnesses technology and uses it in the best way to the service of the learners” (p. 119). Especially in meeting the needs of visual learners, technology that was integrated into lessons, “facilitates things for the teacher and for the students, especially if it involves colors.... highlights, and the like. This makes a huge visual difference” (p. 122). Arabic instructors also declared how technology supported the learner and encouraged instructors to use different methods of instruction to help students who would benefit the most. She stated the importance for teachers to recognize when technology is working for particular teaching methods and with certain students. “When teachers see how [their teaching] can be done differently, they will definitely want to change and learn” ...and “I try to see what method suits them best and employ it” (p. 130–1). Students also experienced the flexibility of learning Arabic when using original software. In the Mahmoud et al. (2013) study findings of a Virtual Tutor online, technology tools allowed for, “equal opportunities” among various levels of language learners, where teachers could accommodate students to have the, “opportunity to learn well either in the classroom or at home” (p. 128). And in Omari’s (2015) discussion of the findings on multimedia program research, learners, “provided positive feedback concerning the structural flexibility of the program, which gave them the opportunity to skip around multiple sections and activities as they choose” (p. 628).

Theme 5: Computer Mediated Communication and Conferencing Tools were Effective Feedback Tools for Language Teachers and Collaborative Tools for Learners

In 20% of studies reviewed, computer mediated communication tools and conferencing tools were effective feedback and collaborative tools for teachers and learners (Ahmed, 2015; Blake & Shiri, 2012; Mahmoud et al., 2013; Mosa & Kakehi, 2015; Omari, 2015). In these studies, 37% (Ahmed, 2015; Mahmoud et al., 2013; Mosa & Kakehi, 2015), showed that original language learning software was used within the Arabic classroom as an additional teaching tool.

Original language learning software that was incorporated into Arabic curriculum benefited the teacher and student alike in providing a means for feedback and collaboration in a nontraditional setting. In Mahmoud et al. (2013), the researchers reported that speaking practice for learners was suitable for technology to address as a

teaching aid and feedback tool in the classroom. In the software program Virtual Tutor, established for non-native speakers of Arabic, there was a textual and phonological database of vocabulary and “manners of pronunciation” to infer probable and highly expected errors from those learning Arabic as a foreign language. The Arabic Text to Speech Mechanism (TTS) within the program responded to male and female student voices, “recognizing the phonetic properties of the new learner (speaker adaptation)” and worked, “with the different and diverse Arabic dialects” (p. 126). These innovations within the software provided feedback that was an, “instant response to the learner in discovering his mistakes in reading and clarifying the mistake in detail” (p. 126). In a similar example of using original software programming, Mosa and Kekehi (2015) reported on an e-learning program for non-Arabic speakers to recognize and identify Arabic letters and word spacing using colored script. A Support-on-Demand feature was provided in the software on, “user demand” and was automatic and unconditional, meaning it was present and active only while the user was demanding the action. Researchers found that the support provided, “feedback from the instructor to guide him/her in improving his/her skills” and the student, “can press a button for online and/or offline contact” with the instructor (p. 6). Mosa and Kekehi, (2015), concluded that, “the multimedia system is effective and significantly supportive” to students in the study (p. 7).

In examining a fully online, asynchronous classroom environment in a U.S. university, Blake and Shiri (2012) reported on the regular use of email/SMS/and chat functions within the classroom for oral and written feedback from the instructors to the students. “The messaging/email function in Moodle was frequently used not only for submitting written assignment and getting instructor feedback but also for giving overall course feedback and for answering queries regarding certain aspects of the course” (p. 234). Both oral and written feedback was left for students in the chat function and email was used for scanned feedback and correction on handwritten assignments (p. 234). The asynchronous voice work submitted by students required feedback as well, which was provided by the instructor, individually, via the application, *Wimba* (p. 235). One graduate student who participated in the AWW learning environment commented that the feedback he and other students received was highly conducive to learning. “The fact that the commentary or corrections are written often [in the chat box] seemed less intimidating, or less stern, and therefore, more approachable to integrate the comment into the student’s oral production” (p. 240).

In Omari’s (2015) study, the researcher looked at how Arabic instructors implemented technology into their curriculum across universities in the U.S. and their beliefs about the importance of integrating technology to enhance Arabic learners’ foreign language skills. In looking specifically into how feedback was provided using technology, Omari (2015) found that, “participants shared that CALL provides visual feedback to students and offers them activities that the course textbooks cannot” (p. 622–3). A survey of learners indicated that students, “responded positively to the recording capabilities that allow them to speak their responses into a microphone then to listen to their responses” so that they could compare it to a native speaker of the target language for an instant comparison (p. 624). This instantaneous response was crucial for keeping students motivated and engaged in the classroom.

Theme 6: Technology Integration in the Arabic Classroom was not Institutionally Supported

This review revealed that technology integration in the Arabic classroom was not institutionally supported in 40% of the studies (Ahmed, 2015; Al Anshory & Salis, 2020; Al Busaidi et al., 2016; Arrabtah & Nusour, 2012; Attia, 2011; Fassetta, 2017; Osman & Hamzah, 2017; Omari, 2015; Sahrir & Yusri, 2012; Zulaini et al., 2020). Consistent challenges for programs situated outside of the United States were infrastructure issues with reliable Internet connectivity (Al Anshory & Salis, 2020; Osman & Hamzah, 2017; Sahrir & Yusri, 2012; Zulaini et al., 2020). Several studies made recommendations for improving technology integration into Arabic programs such as increased funding requirements to finance computer equipment (Al-Busaidi et al., 2016; Omari, 2015; Osman & Hamzah, 2017) laboratories (Al-Busaidi et al., 2016; Arrabtah & Nusour, 2012; Omari, 2015), and language program subscriptions (Omari, 2015; Osman & Hamzah, 2017) for use on existing computer hardware. Additionally, several studies mentioned the need to provide user training and technological support for both learners and instructors (Ahmed, 2015; Arrabtah & Nusour, 2012; Attia, 2011).

Reliable Internet connectivity is crucial for the integration of technology in the Arabic classroom and studies revealed that many intuitions failed to address infrastructure concerns to make this a reality for instructors and students (Al Anshory & Salis, 2020; Osman & Hamzah, 2017; Sahrir & Yusri, 2012; Zulaini et al., 2020). In the Osman and Hamzah (2017) study that reported on an assessment of student readiness for Arabic blended learning, more than 96% of students had their own laptop and almost 50% of students subscribed to a paid Internet connection at a Malaysian University (UniSZA). However, despite the prevalence of computers and the existence of Internet connectivity, many students did not show indicators that they were comfortable using the Internet for education. Participants responded in the study that for social and personal use, they had used the Internet (83.9%) and that they knew how to perform an Internet search (79.4%). However, only 44.4% claimed to have experience learning online and only 25.4% of students, “were satisfied with the speed of the connection available to them” at school (p. 86). These findings prompted the researchers to recommend UniSZA, “to upgrade its Internet service as

74.6% of students raised dissatisfaction about the service provided since access to the Internet is not available in all areas within the campus” (p. 87).

Speed of Internet connectivity is also important in software applications, such as the vocabulary game prototype introduced in Sahrir and Yusri (2012) for teaching and learning Arabic. This online game was introduced as a teaching and learning aid, also at a Malaysian university (CDSIUM). Despite positive feedback on student attitudes and motivation in using the application, “the most mentioned weakness of this prototype is the slow Internet connection” (p. 970). There were no technical problems observed with the software and the only recommended issue to address was the, “slow Internet connection” (p. 971).

Two recent studies, both conducted in Indonesia, showed similar difficulties in obtaining the required Internet connectivity needed to properly integrate technology into the teaching and learning of Arabic. In Zulaini et al. (2020), during the initial COVID-19 crisis, the necessity and reality of teaching Arabic using technology was hindered through poor Internet connections at home (p. 53). In a similar study, Al Anshory and Salis (2020) sought to determine the use of information-based Arabic learning media in the Arabic Language Center (PKPBA) at UIN Maulana Malik Ibrahim Malang University. The need for teaching and learning Arabic using technology was apparent.

“وهكذا فإن استخدام تكنولوجيا المعلومات في تعليم اللغة العربية حاجة ماسة لابد من اعتمادها في مدارسنا وجامعاتنا لتعليم اللغة العربية” (ص.43).

“Thus, the use of information technology in teaching Arabic is a need, a gem that must be adopted in our schools and universities to teach the Arabic language” (p. 44). In the findings of this study, students were asked the challenges faced when attempting to conduct their learning using technology, and,

“11,25% من أفراد العينة بإجابة أخرى كضعف شبكة الإنترنت المتاحة في الجامعة” (ص.55).

“11.25% of respondents answered on the weaknesses of the available Internet in the university” (p. 55). As the need and availability for technology integration in the teaching and learning of Arabic increases, there were challenges in Internet connectivity for participants in the studies.

In addition to Internet connectivity concerns, many studies reported financial challenges in language departments to upgrade existing technology, increasing opportunities for access to laboratories, and language program subscriptions (Al-Busaidi et al., 2016; Arrabtah & Nusour, 2012; Omari, 2015; Osman & Hamzah, 2017). Al-Busaidi et al. (2016) reported on research on teachers’ perceptions of the effectiveness of using Arabic language teaching software in Omani basic education. Teachers felt the software was effective in increasing language skills such as reading, vocabulary, listening, and pronunciation (p. 150), yet, challenges included access to the technology. Teachers recommended, “providing a language lab for ALT [Arabic language teaching] in each school and providing both teachers and students with sufficient computer and multimedia facilities were also highly suggested” (p. 152). Similarly, Omari (2015) in a study of technology use in Arabic programs across the U.S., found that there was a, “lack of sufficient funding for computer technology in Arabic language departments” among many of the Arabic instructors surveyed (p. 626).

Technology integration in the Arabic classroom was found to encourage engagement, support language learning, increase learning opportunities, provide for flexibility in learning, and provide effective communication for learners and teachers alike. Given the realities that exist in the importance of providing more opportunities for language learning, and the increasing technological influence on education, Arabic language programs must work to adapt to new teaching and learning strategies with the integration of more technology in the learning environment.

DISCUSSION

The goal of this review was to synthesize the key findings and emerging themes across the empirical research on technology integration in Arabic language education. Drawing on theoretical frameworks from SLA and education, this review highlighted six main themes within existing research to help understand the current landscape of technology use within Arabic education. The six themes emerged as guideposts for research on the importance technology plays in Arabic language education of the future.

Research on technology integration in Arabic education revealed that not only did technology encourage student engagement with language content, but it also supported the learning process with increased proficiency and achievement. There is a considerable volume of literature that recognizes and affirms the vital role technology plays in enhancing learners’ language skills, social interactions, and language exposure (Blake & Guillen, 2020; Richards & Rodgers, 2014). This review affirms the existing research as technology-based instruction helped students, “acquire meaningful learning” in the Arabic language (Arrabtah & Nusour, 2012).

Despite the evidence to support the benefits of technology in Arabic education, this review also revealed that institutions should do more to encourage and support its integration within the classroom. Having CALL

specific technologies available for teachers to access, as well as a strong support network, allows for integration to occur along different dimensions in the classroom environment. The administrative responsibilities in this include funding appropriate infrastructures so that Internet access is abundant and readily available to all within the language setting. Additionally, the research revealed that unhindered access to a language laboratory is needed so teachers can appropriately monitor student progress within classroom times. Language laboratories should be readily available to students and teachers alike and should include language learning software deemed appropriate to the institution or mission of the specific language educational environment.

The current state of research in online and hybrid Arabic education programs was also shown to be woefully inadequate. Many languages are represented in a full range of CALL research, yet Arabic studies are only beginning to explore the use of simple tools in the classroom. Much of the research focused on a single multimedia tool added to the teaching environment. Other studies looked at how integrating a software program improved one language skill or how it affected student motivation. What was lacking in the Arabic research was a study on using technology to teach all language skills using a comprehensive strategy of sound CALL pedagogy. As this may be an indication of teaching challenges, more must be done to understand these preferred methods or hinderances that teachers face in integrating more technologies in the classroom.

Finally, asynchronous opportunities for formal, academic Arabic study is an under-explored topic within the research. Given the current inadequate state of technology use in Arabic education, progress may be slow toward advancing offerings to fully online. However, as the global COVID-19 pandemic illuminated, Arabic educators and institutions must prepare for the unexpected. Technology should become fully integrated in more Arabic classrooms and more research should be conducted in a variety of instructional settings. As more research becomes available to practitioners, best practices can be adopted and more hybrid, fully online, and asynchronous classrooms can be offered to learners of Arabic.

Implications for Practice

This review highlighted several challenges to Arabic practitioners in integrating technology in the classroom. In addition to the need for administrative support for appropriate infrastructure, there is a real need to include strategies for integrating technology into teacher preparation courses and training. As there is a movement toward more learner-centered approaches to teaching languages, Arabic teachers must be taught to facilitate this transition in how technology is integrated into individual classrooms. Richards and Rodgers (2014) state, the learner's, "contribution to language learning should not be constrained by the practices of a particular teaching approach or method" (p. 341). Effective training must occur for those about to enter the language teaching profession, as well as those who have been in the profession for decades. As Attia (2011) describes, in-service professional development should occur on an individual basis so that each teacher performs a, "constant examination of their own practice within their specific context" (p. 212). More effective methods of teaching Arabic with technology will reach the modern student, accustomed to the use of technology in all facets of life. As Arabic language opportunities grow, the teaching profession must grow and mature in technology integration and strategies as well.

Once teacher preparation and training courses increase and improve, practitioners must be willing to establish Arabic language programs in more K–12 institutions, using technology to reach a larger audience of learners. In many larger metropolitan areas, heritage speakers of Arabic have established cultural and religious connections within the community, yet lack Standard Arabic skills in reading, listening, and writing (Kelleher, 2010). Appropriate programs to meet heritage learners' specific needs should be established using pedagogical approaches with technology, thus attracting more diverse student populations to continue their studies in the language (Hassan, 2018). Similarly, Arabic as a foreign language programs can introduce K–12 students to a non-traditional, yet important language with global implications. Innovative and technology-driven strategies at this level of instruction can attract a new generation of learners to feed existing university and government programs, thus producing more adept Arabic language learners overall.

Implication for Research

This review examined key findings on how technology is integrated in Arabic education and revealed some important considerations for researchers as well. Based on these studies, there are three recommendations for future research.

Research into online Arabic programs must increase to accurately determine the state of technology integration in Arabic education. As the majority of research in this review only considered one or two technology additions to a traditional classroom setting, it becomes important for future researchers to investigate the depth of existing fully online educational environments. Blake and Shiri (2012) noted that students show a high level of readiness in accepting language learning that is student centric and fully online. How this is implemented in future language environments will guide the research into a variety of directions; namely, how the language skills of speaking and writing are assessed.

Only a few studies definitively addressed improvements in speaking skills (Attia, 2011; Mosa & Kakehi, 2015), and fully online language environments present many challenges for student speaking opportunities and

engagements. More must be done to follow the progress of research in this area, considering a range of tools that can be integrated with varying degrees of success for speaking skills. Another challenge for future researchers is assessing best practices for teaching and assessing students' writing skills in online environments.

Another recommendation for future research is the need for more rigorous research using varying methods. There are well developed theories for foreign language acquisition, and considerable research in online learning strategies. Teaching Arabic with technology needs more studies to explore best strategies that incorporates both theories for teaching and learning foreign languages, as well as the best strategies for teaching it fully online. These studies should be explored using the full-range of applicable designs throughout qualitative, quantitative, and mixed-methods research. By incorporating more rigor in the research processes of learning Arabic with technology, more effective teaching strategies could be developed benefiting both instructor and student.

Finally, Arabic language researchers must explore more topics in CALL. One possible topic to explore is how advances in technology can support language teaching in all levels of Arabic instruction. As online Arabic course offerings grow, future research must elucidate on the relationship between cognition and practice among professionals. Future studies can examine the culture change among Arabic educators through ethnographic studies, cultural studies, or CALL for specific purposes/environments. As teachers become aware of the benefits of using technology in the teaching of Arabic, a question to consider is: Will there be a transformation of practice among practitioners?

Another possible topic of research to explore is how advances in technology can support Arabic language learning and achievement. The argument for including technology in the Arabic educational environment must rely on evidence of success for its students and all language skills must show benefits and improvements. Consistent with current studies on the importance of building communities, research should also continue on collaboration and engagement within an Arabic CALL environment. CALL research in Arabic must advance and be available so that the voices of Arabic learners and teachers can be added to the abundance of CALL research currently available.

By exploring and understanding the research on technology integration in Arabic education, the areas in need of further development and research become apparent. Recent research reveals that technology encourages engagement, supports language learning, increases student autonomy, allows for flexibility, and allows for collaboration. Future researchers should consider the issue of development and sustainability of specific technologies for Arabic acquisition as it relates to a specific language learning environment. With technologies changing and growing, the opportunities for advancing the Arabic language teaching and learning environments are increasing. However, there is still much to be explored in research and practice of the integration of technology in Arabic education.

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