Teaching Arabic as a Third Language with Higher Education 5.0 Technologies

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ABSTRACT

Within Malaysian higher education institutions, Arabic holds particular appeal as a tertiary language option, attracting students from the Malay-Muslim demographic. Their motivation stems largely from religious foundations, as familiarity with the Islamic Holy Book the Qur'an provides both linguistic exposure and spiritual connection. Many students view Arabic proficiency as a pathway to deeper Islamic understanding and enhanced religious devotion. However, pedagogical approaches in Arabic instruction appear markedly conservative when compared with English and other foreign language courses, continuing to emphasise conventional teacher-centred methodologies supplemented by rote vocabulary acquisition and memorisation techniques. This pedagogical conservatism raises significant concerns given the characteristics of contemporary learners: Generation Z (born 1995-2015) and the emerging Generation Alpha (born 2011-2025) have developed as digital natives, demonstrating both comfort with and preference for technology-enhanced learning environments. Through analysis of data gathered via an extensive online survey encompassing 250 respondents, this investigation examines these pedagogical considerations. The instrument incorporated both closed Likert-scale statements and open-ended questions designed to capture participants' perspectives and expectations regarding Arabic language instruction within the Higher Education 5.0 paradigm, specifically examining their receptiveness to innovative educational technology and digital applications.

Keywords: language instruction, third language, educational technologies, Education 5.0, Malaysia

INTRODUCTION

As a Semitic language with global significance, Arabic possesses considerable cultural and literary richness worthy of scholarly attention. Historical linguistics distinguishes two principal branches: Southern Arabic and Northern Arabic. Whilst southern Arabian societies demonstrated advanced civilisation through established writing systems and legal frameworks, northern communities developed their own juridical traditions. Crucially, the northern dialect achieved elevated status as the language of divine revelation, forming the linguistic foundation of the Qur'an. Following the Ma'rib empire's decline, southern merchants migrated northward across the Arabian Peninsula. Subsequently, Mecca's emergence as Islam's spiritual epicentre precipitated the gradual diminishment of southern linguistic variants, establishing Northern Arabic's predominance through the Qur'an's revelations and Islam's expansion (Omar, Ali, Salleh & Abdullah, 2017).

Ryding (2005) proposes a five-stage evolutionary framework for Arabic development. The initial Proto-Arabic phase (starting at around the 7th century BC) remains sparsely documented. The subsequent Early Arabic period witnessed significant linguistic transformation from the third century AD onwards, evolving towards Classical Arabic by the fourth century. The Classical period (6th century AD onwards) represents Arabic's most significant developmental phase, characterised by rich poetic traditions and tribal recitation customs. Islam's seventh-century emergence proved pivotal, as the Qur'an's revelation established the language's liturgical centrality. The Middle Arabic period coincided with the Islamic empire's declining influence during the thirteenth century amidst foreign incursions. The final Modern Arabic phase late in the eighteenth century, marked a renaissance with literary output diverging substantially from Classical forms. This period witnessed Arabic's recognition as a pluricentric language by achieving official status across Arab nations during World War II (Aboelezz, 2015).

LITERATURE REVIEW

Contemporary estimates position Arabic amongst the world's five most widely spoken languages, with over 400 million speakers globally (UNESCO, 2017). Multiple factors drive its expanding usage, including economic considerations, tourism development, educational opportunities, and sociopolitical influences (Mat Teh, Firdaus & Nasir, 2019). Since 1973, Arabic has maintained official status within the United Nations, with December 18th commemorated annually as the World Arabic Language Day (UNESCO, 2017).

Global perspectives on Arabic language pedagogy

Arabic is experiencing a contemporary renaissance, with growing international recognition of its educational value. Within the Arab world, the United Arab Emirates exemplifies sustained commitment to Arabic language development since 2012, implementing comprehensive programmes across educational institutions. These initiatives pursue dual objectives: linguistic preservation and pedagogical modernisation through demonstrable outcomes. Key programmes include the Arabic Language Charter, Arabic for Life Report, Arabic Reading Challenge, Reading Law, and Arabic Strategy for Literacy (Thomure, 2019). Additionally, the Ministry of Education there has undertaken reforms encompassing leadership reorganisation, enhanced teacher supervision, school leadership development, infrastructure modernisation, and technology integration within Arabic-medium education (Alhumaid, 2014). The United States demonstrates how non-Arab nations have expanded language instruction since 2000, incorporating Chinese, Hindi, Korean, Persian, Russian, Turkish, and Arabic into university curricula (Al Alili & Hassan, 2017). The 11 September 2001 attacks catalysed significant American interest in Arabic studies. Between 1998 and 2009, Arabic enrolment in American universities outpaced all third languages, including Spanish. American educators recognise Arabic proficiency as crucial for students' career advancement across sectors (Edwards, Ander & Herda, 2015).

Malaysia is another foreign nation where Arabic maintains educational prominence due to the predominantly Muslim population. Arabic's intimate connection with Islamic theology stems from its necessity for Qur'anic comprehension and Islamic scholarship. Arabic instruction in Malaysia commenced with Islam''s thirteenth-century arrival (Omar, Ali, Salleh & Abdullah, 2017). Numerous archaeological evidence documents the religion's Malay Peninsula presence, notably the '*Batu Bersurat Hulu Terengganu*' or inscribed stone testimony to Islam's earlier arrival than previously documented (Mat Teh, Firdaus & Nasir, 2019). Historical records indicate Islam's propagation through intermarriage and commercial relationships with Middle Eastern Islamic scholars. Initial Arabic instruction occurred through informal settings like mosques and teachers' residences. Subsequently, 'pondok' institutions emerged, providing structured education. The nineteenth century saw these institutions turning into formal learning establishments accommodating pupils from diverse backgrounds. Male (Ustaz) and female (Ustazah) teachers delivered Arabic language and Islamic studies instruction (Omar, Ali, Salleh & Abdullah, 2017), and Arabic has since maintained continuous growth in Malaysia (Yahaya, 2016).

Arabic language instruction in Malaysian tertiary education

Research by Mat and Wan Abas (2016) examining adults students reveals Arabic's continued relevance as a third language, particularly in and for Islamic Studies programmes. Lotfie and Ghalib's (2013) investigation into student perceptions demonstrates that Arabic courses within Islamic university curricula develop essential linguistic competencies for engaging with Islamic texts. Consequently, students integrate Islamic perspectives with their primary disciplines; students pursue Arabic to enhance Qur'anic understanding, whilst strengthening reading comprehension sub-skills and Arabic vocabulary retention strategies. In another study, Arifin, Riddzwan, Abdul Latiff, and Abdul Halim (2014) surveyed distance learning students' attitudes towards Arabic language development. They found that students consider Arabic essential given its global prevalence, enabling communication and integration particularly for those contemplating studies in Arab nations. Yusri, Rahimi, Shah, and Wan Haslina (2011) also found that university students held positive feelings towards Arabic, perceiving it as aesthetically pleasing and expressing genuine enthusiasm when practising basic Arabic expressions. Positive language perceptions connect strongly with Malaysia's Asian-Islamic identity. Ultimately, students with prior Arabic exposure demonstrated confidence regarding the language subject's complexity than novice learners (Mohd Adnan, 2017a, 2017b).

Technological innovations in Arabic language pedagogy

Abu Samak (2006) positions educational technology as a global concern instrumental in developing nations' advancement. Furthermore, technology integration proves essential by enabling students to construct relevant content and establish connections through autonomous information discovery during learning processes (Adnan & Kusmawan, 2024; Akil & Adnan, 2022; May, Adnan & Rosly, 2023). Mills (1999) demonstrated technology's capacity to substantially enhance learner engagement and interest in language acquisition. Indeed, Malaysian Arabic language education has experienced multiple transformations responding to technological progress. Novel methodologies and approaches have rendered Arabic teaching and learning increasingly dynamic and resource-rich (Lawal, 2017). However, adapting contemporary technologies to Arabic instruction presents considerable challenges (Ditters, 2006), as English's dominance pervades both software and hardware developments in language teaching technology (Karim, Adnan, Salim, Kamarudin & Zaidi, 2020; Karim, Adnan, Tahir, Adam, Idris & Ismail, 2020).

Computer-Assisted Language Learning or CALL is an archetype of Higher Education 5.0 technology use within language classrooms (Shah, Adnan, M. S. Salim & M. N. Salim, 2025). Scholars acknowledge CALL's nascent status in Arabic language teaching contexts, particularly across Malaysia and the United Arab Emirates (Sahrir, Yahaya & Nasir, 2013). This situation reflects insufficient partnership between Arabic education creators and instructional technology specialists. Zawawi (2008) observes CALL's peculiar position in Arabic classrooms, attributing this to Arabic teachers' preference for conventional pedagogical methods over technological approaches. Additionally, limited computer proficiency, especially amongst experienced language educators, impedes CALL implementation in Malaysian Arabic education. Blended Learning or BL, another Higher Education 5.0 related concept, also enjoys widespread adoption in Malaysian tertiary Arabic language instruction, representing positive progress. Banditvilai (2016) characterises BL as an educational framework merging online educational resources and interactive opportunities with conventional classroom instruction. Within Arabic language classroom contexts, Alasraj and Alharbi (2014) observed that blended learning integration has diminished learner dependence on teachers. Students gain opportunities to explore instructional materials independently, eliminating obligatory teacher reliance for lesson completion.

Research rationale and objectives

The Fourth Industrial Revolution exerts profound global influence (Adnan, Karim, Tahir, Mustafa Kamal & Yusof, 2019). The convergence of Artificial Intelligence or AI, big data analytics, and Internet of Things or IoT technologies is reshaping educational, learning, and professional paradigms. Educational institutions have initiated modifications to actualise Education 5.0 principles (Adnan, 2020). In general, the terms 'Higher Education 5.0 technologies' describe how digital tools like AI, IoT, and mixed realities (MR/XR) are being incorporated into the classroom to produce a more efficient, human-centred, and customised learning environment that better equips students for the needs of Society 5.0. In order to produce graduates that are prepared to face the uncertain future, this entails utilising data analytics for individualised learning, VR/AR for immersive experiences, encouraging digital literacy and abilities, and cultivating flexibility. The endgame is a comprehensive change that combines humanism and technology innovations to address difficult problems and guarantee that students acquire both hard and soft skills prior to graduation.

Contemporary implementations also include students employing collaborative digital applications for group assignments and projects, subsequently uploading outputs online (Adnan, Ahmad, Yusof, Mohd Kamal & Mustafa Kamal, 2019; Mustafa Kamal, Adnan, Yusof, Ahmad, & Mohd Kamal, 2019). Teaching-learning environments have also began transitioning towards completely paperless operations, eliminating traditional chalk-and-talk methodologies through open platforms such as Google Classroom. Within the next five years, conventional university classrooms will undergo dramatic transformation; physical configurations will change as virtual and augmented reality technologies penetrate mainstream educational settings. Flexible assignments will accommodate individualised learning preferences, whilst Internet-based learning opportunities will impact education across all levels (Dunwill, 2016). At the same time, Shahroom and Hussin (2018) highlight increasing complexity. Contemporary youths (Millennials or 'Gen Z') demonstrate advanced digital literacy, developing distinctive personalities alongside unique modes of understanding, expression, and communication that diverge from previous generations. Rather than conventional learning approaches, these groups favour intelligent

learning incorporating imagery, audio, video, gaming, recreation, and AI. Consequently, educators must embrace online platforms and devise innovative instructional approaches satisfying the younger generations' requirements and preferences (Mohd Kamal, Adnan, Mustafa Kamal, Ahmad & Yusof, 2019; Ahmad, Adnan, Yusof, Mohd Kamal & Mustafa Kamal, 2019). Based on the above, a first-hand investigation was undertaken to accomplish two research objectives (RO):

RO1: What preferences do students at university hold regarding Arabic language learning through technological tools and applications?

RO2: How should lecturers at university modify their Arabic language instruction using high-tech tools and applications for students' benefits?

METHODOLOGY

Research design

The collection of data occurred in the months prior to, during and after the time of the global pandemic of SARS-CoV-2. An online survey with Likert-scale items alongside opinion-based questions captured respondents' feelings, opinions and perspectives on the research issues.

Survey respondents

Overall, 250 respondents completed the survey; all were first degree students from a public university in Peninsular Malaysia. Female respondents make up nearly two thirds (64%) compared to males. The majority were aged 21 years (63.2%), with 19 and 20-year-olds each representing equal proportions (11.2%). Remaining respondents included 22-year-olds (8.4%), and students aged 23+ (6%). The respondents hailed from the Faculty of Built Environment and the Faculty of Creative Arts with nearly equal numbers from both.

Survey instrument

The 18-item survey was constructed to assess constructs within both research objectives. Items utilised a 6-point scale starting with 'strongly disagree' and ending with 'strongly agree', and deliberately excluding neutral options. To verify whether items reliably measured similar latent variables (enabling Likert-type scale development), Cronbach's Alpha testing was conducted on twenty comparable respondents. Following removal of three items, the final reliability coefficient achieved .879 (reliable survey instrument).

The online survey comprised three sections. The first gathered demographic data including gender, age, study programme, current semester, and Arabic learning experience. The second section explored respondents' perceptions regarding technology implementation in Arabic instruction and its efficiency in enhancing the learning process. The last section contained open questions enabling participants to elaborate their opinions. In total, the questionnaire includes 7 demographic questions, 15 items for Arabic instruction, and three more 'open' questions. The data collected were analysed to be presented in the next section.

Data analysis

IBM SPSS Statistics (version 29.0) was employed for comprehensive quantitative analysis of the survey data. Cronbach's Alpha was calculated to assess internal consistency reliability, yielding a coefficient of $\alpha = .879$ following removal of three items based on pilot testing with 20 respondents. This exceeds the conventional threshold of .70 and demonstrates excellent internal consistency (Nunnally & Bernstein, 1994).

Comprehensive descriptive analyses included means, medians, modes, standard deviations, and frequency distributions across the six-point Likert scale. Agreement and disagreement percentages were calculated by combining positive and negative response categories respectively. Standard errors ($SE = SD / \sqrt{n}$) assessed the precision of mean estimates, while 95% confidence intervals were constructed for both means ($M \pm 1.96 \times SE$) and proportions to establish population parameter ranges. Cohen's d effect sizes were calculated using $d = (M - 3.5) / SD$ to quantify practical significance of deviations from the neutral midpoint, interpreted following Cohen's

(1988) conventions: small (d = 0.20), medium (d = 0.50), and large (d = 0.80). Skewness coefficients assessed response distribution symmetry. Item Q10 was reverse-coded (7 - raw score) due to negative wording. Cross-item comparisons examined patterns across technological interventions and relationships between technology awareness, normative beliefs, and current practice, with implementation gaps calculated as percentage point differences between expectations and reported reality.

Ethics and limitations

The study ensured participant confidentiality, voluntary participation, informed consent, and secure data storage following institutional ethical protocols. Online data collection presents several advantages. For example, enhanced return rates together with minimal costs. The simplicity of the online survey generated high response rates (n=250). Additionally, the respondents answered open questions.

Simultaneously, online data collection presents disadvantages regarding unscientific sampling, potentially compromising the reliability and validity of collected datasets. Regarding sampling, despite current normalisation, not everyone maintains constant Internet access. University students may lack consistent Internet access due to mobile Internet costs. Furthermore, online survey data collection's most significant detriment involves the fraud potential. If online survey questionnaires prove excessively lengthy or complex, fraudulent responses may proliferate. Reduced online accountability increases likelihood of respondents arbitrarily selecting responses to complete questionnaires quickly.

FINDINGS

Demographic data

The majority of respondents (90%) had studied Arabic as a third language before enrolling in their respective university courses, whilst only 10% of participants lacked any prior Arabic language classroom experience. Although other third language elective courses exist, it can be presumed that most respondents chose Arabic due to existing familiarity with the language. With the majority possessing prior Arabic learning experience, they had encountered different teaching styles and classroom teaching aids.

Figure 1 illustrates the exposure to Arabic that the respondents have received. For those who studied Arabic previously, approximately 70.8% started during primary school, whilst 37.2% started at secondary level. Others learned this third language from alternative sources or locations. Regarding proficiency, the majority reported having basic Arabic proficiency (87.2%), followed by intermediate (12.4%), with only 2% having advanced fluency and overall proficiency. Although nearly all of them indicated previous Arabic language study, language mastery levels remain predominantly at the basic level. This data suggest that university lecturers might employ different instructional approaches accommodating lower Arabic proficiency levels, including incorporating classroom-based technology.

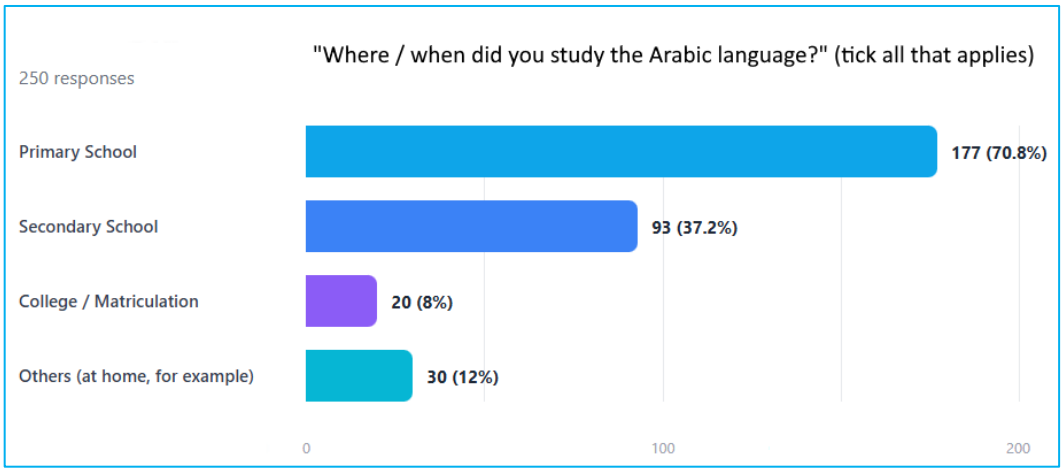

Figure 1. The learning of Arabic as a third language prior to Malaysian university entry

University students' preferences for learning Arabic using technologies (RO1)

Due to the limits of space, only selected survey items are presented and analysed in this subsection. For the item focusing on whether the usage of social media can help students learn Arabic better (see Figure 2), the results reveal a divided yet predominantly positive perspective. The distribution shows 95 participants (38%) agree, 67 participants (26.8%) slightly agree, and 25 participants (10%) strongly agree, yielding a total agreement rate of 74.8% (n=187, 95% CI: [69.3%, 80.3%]). Conversely, 36 participants (14.4%) slightly disagree, 24 participants (9.6%) disagree, and 3 participants (1.2%) strongly disagree, comprising 25.2% (n=63, 95% CI: [19.7%, 30.7%]) in total disagreement.

While the results skew more heavily toward agreement, the substantial minority expressing disagreement (approximately 1 in 4 students) warrants careful consideration. The standard deviation of 1.32 indicates moderate variability in responses, reflecting genuine diversity of opinion rather than uniform consensus. This statistical evidence demonstrates that although the majority (74.8%) is open to the utilization of social media as part of the teaching aid, a notable 25.2% of participants do not believe that using social media will be constructive in learning the Arabic language. The narrow confidence intervals for both agreement [69.3%, 80.3%] and disagreement [19.7%, 30.7%] percentages, combined with the small standard error (SE=0.083), provide strong evidence that these findings are statistically robust with the sample size of 250 participants. The distribution's slight negative skew (-0.52) confirms the tendency toward agreement, though not overwhelmingly so.

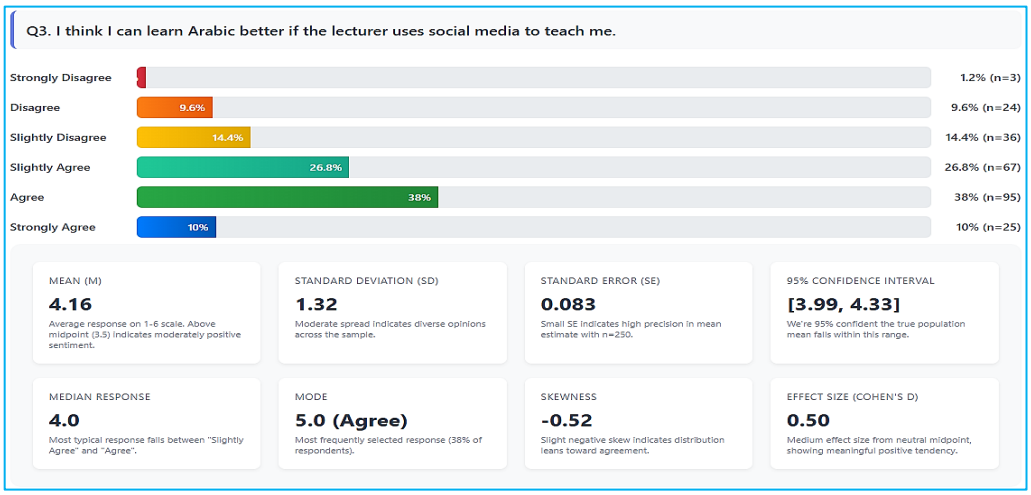

Figure 2. Social media use for the learning of Arabic as a third language

Regarding virtual reality (VR) implementation in Arabic language instruction (Figure 3), an overwhelming 84% of respondents (n=210, 95% CI: [79.3%, 88.7%]) perceive VR as beneficial for facilitating language acquisition. Agreement levels comprised 45.2% (n=113) agreeing, 24% (n=60) slightly agreeing, and 14.8% (n=37) strongly agreeing. Conversely, merely 16% (n=40, 95% CI: [11.3%, 20.7%]) expressed reservations, with 8% each slightly disagreeing or disagreeing, whilst none strongly disagreed. Statistical analysis demonstrates robust endorsement, with a mean score of M=4.49 (SD=1.16) exceeding the neutral threshold of 3.5. The 95% confidence interval [4.35, 4.63] confirms reliability, whilst the standard deviation suggests greater consensus than observed for social media integration (SD=1.32). Cohen's d of 0.85 indicates substantial practical significance, with negative skewness (-0.78) highlighting pronounced positive sentiment. These findings reflect considerable student interest in emerging technologies for Arabic language learning.

Augmented reality (AR) yielded comparable results, with 85.6% (n=214, 95% CI: [81.1%, 90.1%]) endorsing its efficacy for accelerated language acquisition, compared to 14.4% (n=36) expressing disagreement. Agreement comprised 46.4% (n=116), 28.4% (n=71) slight agreement, and 10.8% (n=27) strong agreement. The parallel acceptance patterns between VR (M=4.49, SD=1.16) and AR (M=4.51, SD=1.14) suggest students conceptualise immersive technologies as unified pedagogical interventions rather than discrete tools. This statistical congruence, reflected in comparable agreement rates, standard deviations, and effect sizes, provides compelling empirical justification for integrating extended reality technologies within Arabic language curricula, demonstrating both widespread student receptivity and pedagogical viability.

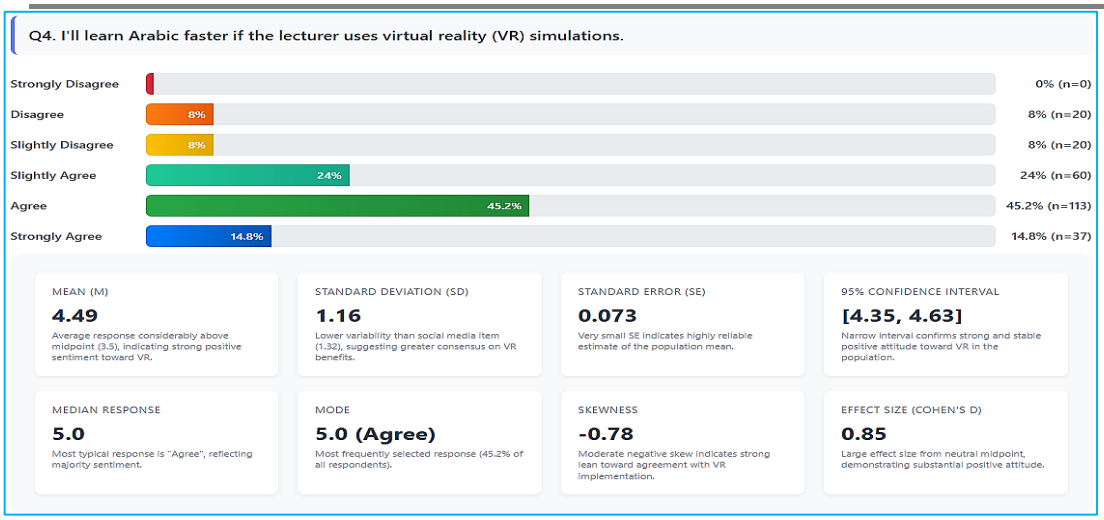

Figure 3. AR and VR use for the learning of Arabic as a third language

Game applications demonstrated the strongest support among all technological interventions (Figure 4), with 86.8% of participants (n=217, 95% CI: [82.6%, 91.0%]) endorsing their implementation, whilst only 13.2% (n=33, 95% CI: [9.0%, 17.4%]) expressed disagreement. Agreement comprised 47.2% (n=118), 20.8% (n=52) strong agreement, and 18.8% (n=47) slight agreement. Disagreement remained minimal, with 7.6% (n=19) slightly disagreeing, 4% (n=10) disagreeing, and merely 1.6% (n=4) strongly disagreeing. Statistical analysis revealed game applications as the clear frontrunner, achieving the highest mean score (M=4.59, SD=1.19, SE=0.075) across all technological tools examined. The 95% confidence interval [4.44, 4.74] confirms robust support, whilst Cohen's d of 0.92 represents the strongest effect size observed, demonstrating substantial pedagogical relevance. The distribution's pronounced negative skewness (-0.89) reflects considerable consensus regarding game-based learning benefits.

Notably, game applications garnered significantly higher strong agreement (20.8%) compared to VR (14.8%) and AR (10.8%), suggesting deeper conviction rather than mere acceptance. Comparative analysis underscores this superiority: whilst VR (M=4.49, 84% agreement) and AR (M=4.51, 85.6% agreement) demonstrated strong support, game applications exceeded both by 0.08-0.10 points. Furthermore, game applications maintained a substantial 12-point advantage over social media (M=4.16, 74.8% agreement). The narrow confidence intervals and small standard error provide strong statistical assurance of reliability. The convergence of highest agreement rates, largest effect size, and lowest disagreement collectively establishes game applications as the most pedagogically promising student-endorsed technological tool surveyed.

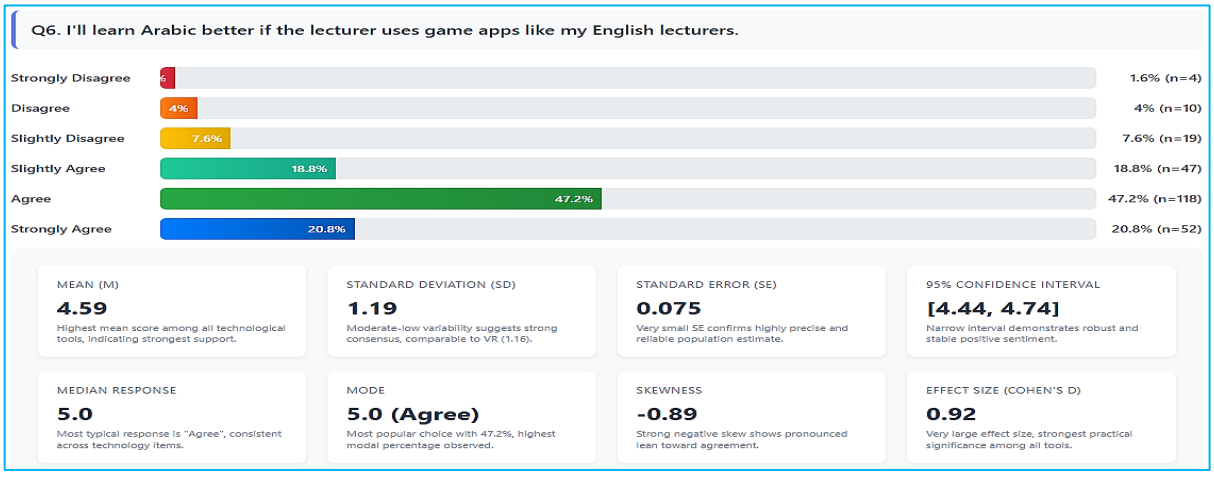

Figure 4. Game applications use for the learning of Arabic as a third language

Regarding current technology integration (this is a negatively worded survey item, see Figure 5), over half of the participants (66.4%, n=166, 95% CI: [60.5%, 72.3%]) disagreed that their Arabic lecturers eschew

technological tools, whilst 33.6% (n=84, 95% CI: [27.7%, 39.5%]) perceived otherwise. Disagreement comprised 32.4% (n=81), 23.2% (n=58) slight disagreement, and 10.8% (n=27) strong disagreement. Conversely, 15.6% (n=39) slightly agreed, 15.2% (n=38) agreed, and merely 2.8% (n=7) strongly agreed. Statistical analysis reveals moderate technology adoption. The raw mean (M=2.88, SD=1.53, SE=0.097) falls below the neutral threshold of 3.5. However, reverse coding yields an adjusted mean of M=4.12 (95% CI: [3.93, 4.31]), positioning current adoption moderately above neutral and comparable to social media integration (M=4.16). Notably, the standard deviation of 1.53 represents the highest variability observed, indicating considerably diverse experiences and suggesting inconsistent adoption practices across lecturers. The moderate positive skewness (+0.58) confirms that whilst most students experience technological integration, a meaningful minority encounters minimal implementation.

These findings reveal mixed experiences skewed towards technology usage, with the modal response being "Disagree" (32.4%). Statistical evidence indicates that whilst approximately two-thirds report technology integration, one-third (95% CI: [27.7%, 39.5%]) experience conventional instruction. This represents a significant implementation gap, particularly noteworthy given students' strong enthusiasm for game applications (86.8%), VR (84%), and AR (85.6%). The wide confidence intervals and elevated standard deviation underscore variable practices, suggesting technology adoption remains lecturer-dependent rather than systematically integrated, thereby highlighting opportunities for addressing this underserved population predisposed towards technological enhancement.

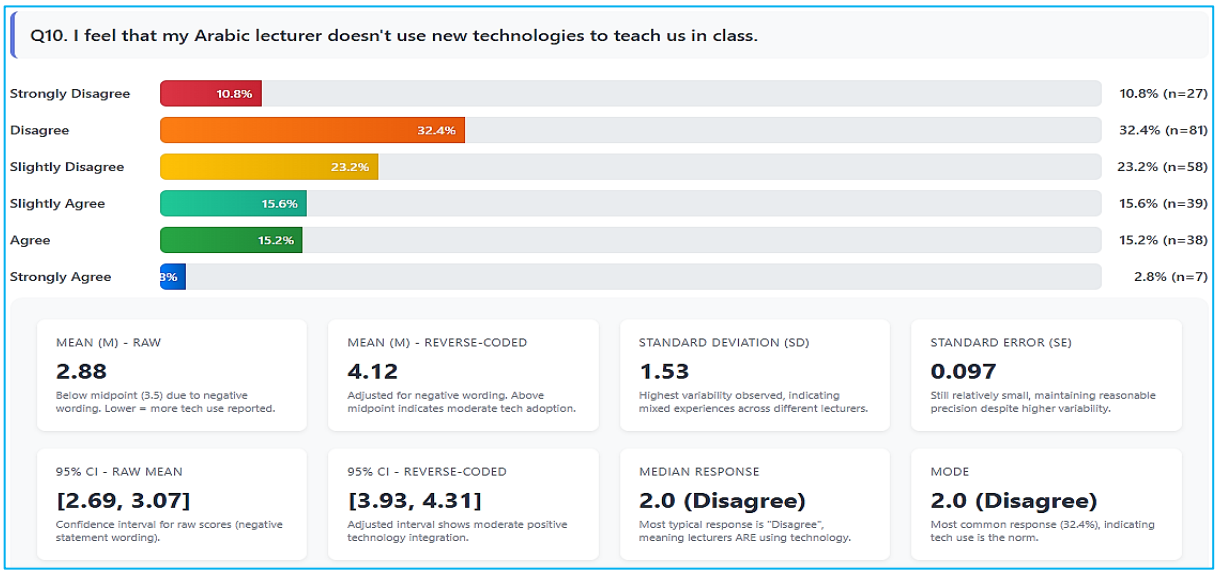

Figure 5. Technology integration in the teaching of Arabic as a third language (negatively worded)

A substantial majority of participants (86.8%, n=217, 95% CI: [82.6%, 91.0%]) endorsed the normative statement that Arabic lecturers should employ technological tools (Figure 6), with 47.6% (n=119) agreeing, 25.2% (n=63) slightly agreeing, and 14% (n=35) strongly agreeing. Conversely, only 13.2% (n=33, 95% CI: [9.0%, 17.4%]) disagreed, comprising 8% (n=20) slight disagreement, 3.2% (n=8) disagreement, and 2% (n=5) strong disagreement. Statistical analysis reveals remarkably strong normative expectations. The mean score (M=4.59, SD=1.17, SE=0.074) with 95% confidence interval [4.44, 4.74] demonstrates robust consensus favouring technology integration. Cohen's d of 0.93 represents very large practical significance, whilst the low standard deviation reflects considerable agreement. Strong negative skewness (-0.85) confirms pronounced agreement tendencies.

Notably, this normative belief (M=4.59, 86.8%) perfectly aligns with game application acceptance (M=4.59, 86.8%), suggesting students' prescriptive expectations directly correspond to technological willingness. This concordance extends to AR simulations (85.6%, 1.2% gap) and VR simulations (84%, 2.8% gap), demonstrating concrete openness rather than abstract ideals. However, a critical implementation gap emerges, whilst 86.8% believe technology should be utilised, only 66.4% report current implementation, representing a 20.4 percentage point deficit affecting approximately 51 students. This gap constitutes 30.7% of ideal implementation levels,

signifying substantial missed pedagogical opportunities. The statistical robustness remains unambiguous. Narrow confidence intervals, small standard error, and consistent modal response (47.6%) provide compelling evidence of stable, replicable normative beliefs. The convergence of elevated mean scores, agreement rates, very large effect size, and low variability establishes technology integration as central normative expectation, one that current practices inadequately fulfil for about one-fifth of students.

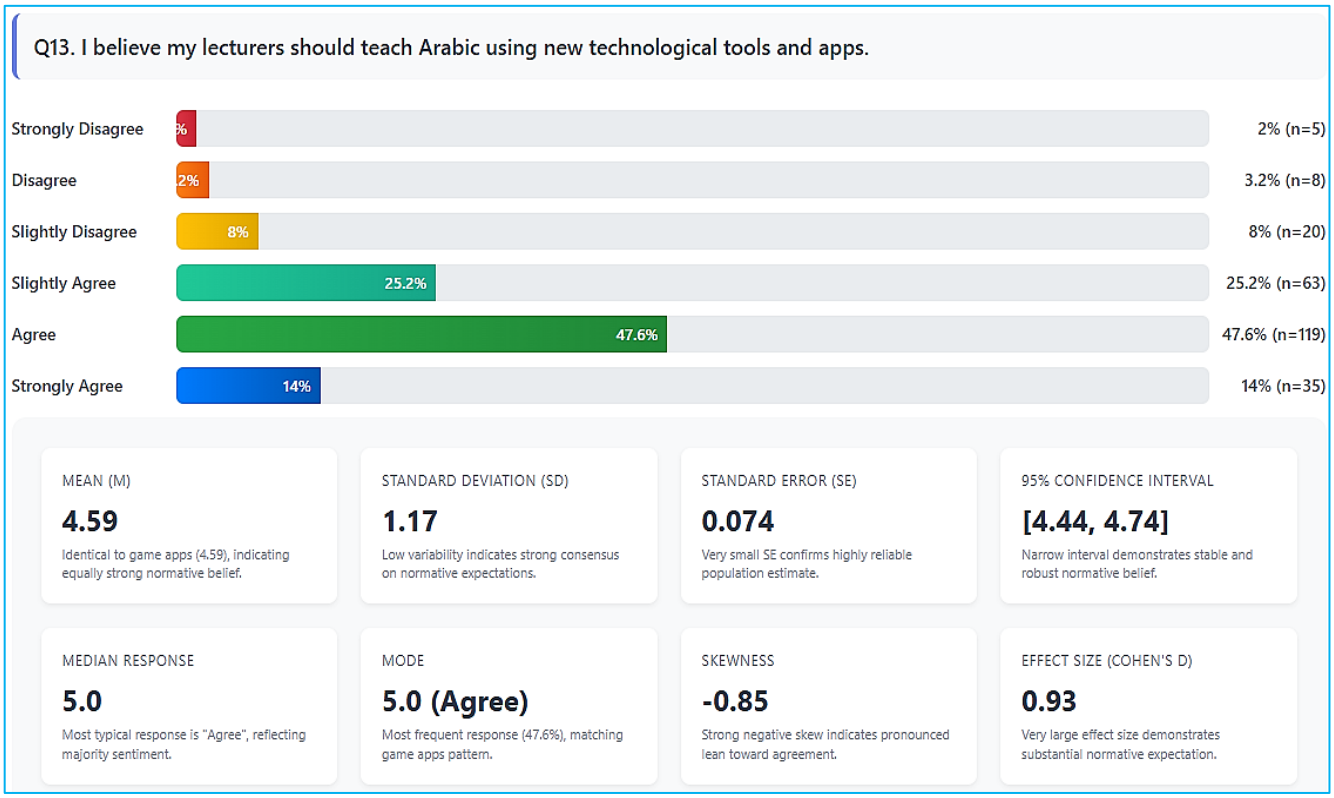

Figure 6. Desire for technology integration in the learning of Arabic

For this last survey item (Figure 7), an overwhelming majority of participants (92.8%, n=232, 95% CI: [89.6%, 96.0%]) acknowledged abundant applications and technologies available for Arabic language learning, whilst merely 7.2% (n=18, 95% CI: [4.0%, 10.4%]) disagreed. Agreement comprised 46.8% (n=117), 29.6% (n=74) strong agreement, and 16.4% (n=41) slight agreement. Disagreement remained negligible, with 4.4% (n=11) slightly disagreeing, 1.6% (n=4) strongly disagreeing, and 1.2% (n=3) disagreeing. This item achieved unparalleled statistical supremacy across all measures. The mean score (M=4.84, SD=1.06, SE=0.067) represents the highest value observed, with the narrowest confidence interval [4.71, 4.97] demonstrating exceptional precision. Cohen's d of 1.26 constitutes the largest effect size recorded, indicating profound practical importance exceeding conventional thresholds. The standard deviation of 1.06 reflects the strongest consensus, whilst extreme negative skewness (-1.24) confirms heavy concentration towards agreement.

Remarkably, this awareness (92.8%) surpasses normative expectations (86.8%) by 6 percentage points, suggesting students recognise that suitable tools already exist. The combined "Agree" and "Strongly Agree" percentage (76.4%) substantially exceeds game applications (68%) and normative beliefs (61.6%). However, a critical awareness-implementation gap emerges. Whilst 92.8% acknowledge available technologies, only 66.4% report current implementation, representing a 26.4 percentage point deficit affecting approximately 66 students. This constitutes the study's largest disconnect, highlighting significant missed opportunities despite existing infrastructure, near-universal awareness, strong normative support (86.8%), and high technology acceptance (74.8-86.8%). A systematic attenuation pattern emerges, awareness (92.8%), normative beliefs (86.8%), specific technology acceptance (74.8-86.8%), and reported implementation (66.4%). The convergence of near-universal awareness, strong prescriptive beliefs, and concrete acceptance creates robust empirical foundations for expanded integration. The 26.4-point gap represents the study's most actionable finding: infrastructure and student readiness exist, yet pedagogical practice inadequately meets student expectations or technological availability.

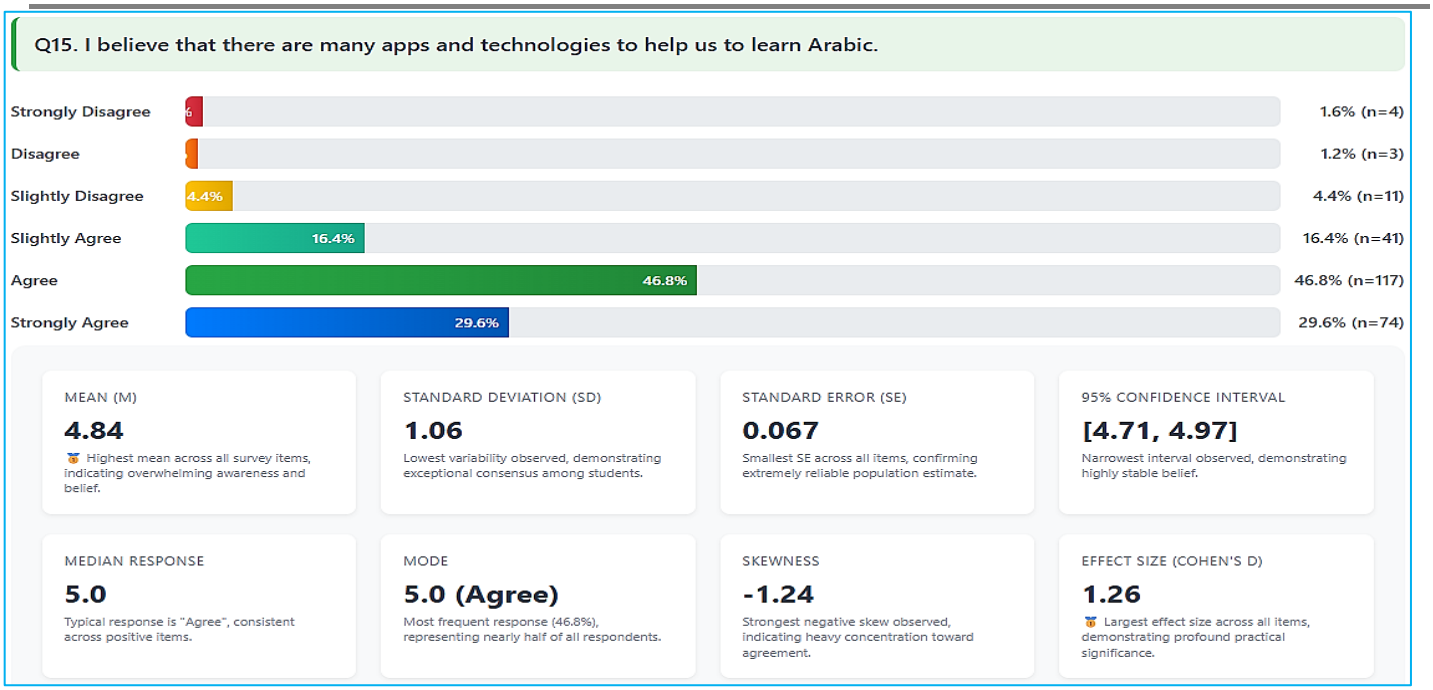

Figure 7. Perceptions regarding apps and technology tools in the learning of Arabic

University lecturers adapting to teaching Arabic using apps and other technologies (RO2)

Q16. “Do you feel your Arabic lecturer should use more technology to teach this language?”

Approximately 72.8% of respondents responded in a positive manner that their Arabic lecturers should incorporate more technology into instruction within classroom settings. For those providing affirmative responses, several recurring themes emerged as justifications for their positions: To introduce diversity into their educational experience; Students actively utilise technology in daily life, for instance through smartphone usage; and Conventional approaches such as collaborative group activities, concept mapping exercises and oral presentations occasionally prove monotonous.

Conversely, 24.4% of participants provided negative responses instead. For those answering negatively, several recurring themes emerged as rationales for their positions: Conventional approaches prove sufficient, for instance, employing textbooks and whiteboards; Without appropriate implementation strategies, technology remains equally ineffective; The existing instructional methodology proves adequately effective. An additional 2.8% of participants provided neither affirmative nor negative responses, believing technology usage for Arabic instruction should be situational. One participant mentioned achieving equilibrium between conventional methodology and technological instruments.

Q17. “Will the use of technology help you and your friends to learn Arabic better?”

Approximately 85.6% of the respondents concurred that technology utilisation will help them in achieving superior level Arabic language acquisition. For those providing affirmative responses, several recurring themes emerged as justifications for their positions: Physical classroom instruction proves inadequate; Enhanced accessibility to exemplars such as instructional videos and translation resources; and improved retention of Arabic vocabulary items.

Meanwhile, only 8% of participants indicated that technology would not facilitate improved Arabic language acquisition. Three recurring rationales were identified from those providing negative responses: the financial burden of utilising technologies, conventional methodology proves adequately effective, and technology usage complicates their language comprehension processes. Approximately 6.4% of participants expressed uncertainty, with one recurring rationale discerned from this percentile being that individual learner characteristics determine whether technology facilitates easier Arabic language acquisition.

Q18. "Compare between learning technologies for Arabic with learning technologies for English. What can you observe between both?"

Several comparative themes emerged between Arabic and English language educational technologies. Participants noted that English instruction benefits from more extensive technological resources and accessibility, with technology appearing more naturally suited to English language pedagogy. Conversely, Arabic language instruction underutilises technology's full potential, often limiting implementation to video materials exclusively. This disparity stems partly from Arabic's smaller user base compared to English, resulting in fewer available technological tools and applications designed specifically for Arabic learning. Technical challenges further compound these limitations, particularly regarding Arabic script, which necessitates specialised keyboards with integrated Arabic characters, creating additional barriers absent in English instruction.

Despite these constraints, participants recognised that both languages could achieve comparable engagement levels when technology is effectively employed, suggesting that the observed disparities reflect resource availability and implementation rather than fundamental pedagogical incompatibility. These findings highlight significant opportunities for expanding Arabic language technology integration whilst acknowledging the practical challenges requiring address.

FINDINGS

From the data, two different but quite related patterns emerge. The first is regarding Malaysian university students' preferences for specific technology tools, and the second is the awareness, beliefs and gaps in actual educational technology practices in the teaching and learning of Arabic as a third language in Malaysia.

Students' preferences regarding specific technology tools

The survey respondents largely show acceptance across four technological interventions for Arabic language learning: game applications, augmented reality simulations, virtual reality simulations, and social media integration (see Figure 8). VR and AR demonstrate remarkably parallel acceptance patterns, with differences of merely a few percentage points separating them. Their nearly identical mean scores, comparable standard deviations, and large effect sizes suggest students conceptualise these technologies as unified immersive learning tools rather than discrete interventions. This statistical congruence indicates that immersive technologies are perceived collectively as promising pedagogical approaches, reflecting a broader understanding that both virtual and augmented reality offer similar affordances for language acquisition. The parallel enthusiasm suggests that students recognise the shared benefits of spatial learning, interactive environments, and experiential engagement that characterise immersive technologies generally.

That being said, game applications emerged as the clear frontrunner amongst all technological interventions examined. Notably, game applications garnered substantially higher strong agreement compared to augmented reality, nearly doubling the proportion of students expressing the highest level of enthusiasm. The convergence of elevated mean scores, largest effect sizes, and minimal disagreement establishes game-based learning as the most pedagogically promising intervention. This elevated enthusiasm likely reflects students' positive experiential familiarity with game applications in English language instruction, translating into robust confidence regarding Arabic implementation. Students' prior success with gamified learning appears to generate authentic conviction rather than mere abstract acceptance, suggesting that experiential knowledge powerfully shapes technological expectations.

TECHNOLOGY	AGREEMENT %	N	MEAN (M)	SD	SE	95% CI	COHEN'S D	STAGR %
Game Applications	**86.8%**	217	**4.59**	1.19	0.075	[4.44, 4.74]	**0.92**	**20.8%**
AR Simulations	85.6%	214	4.51	1.14	0.072	[4.37, 4.65]	0.89	10.8%
VR Simulations	84.0%	210	4.49	1.16	0.073	[4.35, 4.63]	0.85	14.8%
Social Media	74.8%	187	4.16	1.32	0.083	[3.99, 4.33]	0.50	10.0%

Figure 8. The preferences of students' regarding specific technology tools

Conversely, social media integration lagged substantially behind alternative technologies. Notably higher variability and medium rather than large effect sizes characterise social media acceptance, indicating considerably less consensus amongst respondents. The disagreement rate proved approximately double that of alternative technologies, suggesting considerably more polarised opinions. This polarisation potentially reflects legitimate concerns regarding distraction, pedagogical appropriateness, or the blurring of academic and personal digital spaces. Students may perceive social media as less conducive to focused language learning compared to purpose-built educational technologies.

Interestingly, an inverse relationship emerges between acceptance rates and response variability. Technologies generating higher agreement demonstrated stronger consensus, whilst lower-ranked interventions exhibited greater opinion dispersion. This pattern indicates that compelling technologies generate not only broader acceptance but also greater unanimity, whereas contested technologies produce more divided responses reflecting genuine uncertainty about their pedagogical value. Despite varying enthusiasm levels, all interventions achieve statistical robustness; even the lowest-ranked technology secures support, suggesting openness towards diverse technological approaches despite clear hierarchical preferences favouring immersive technologies and game-based learning for Arabic language instruction.

Implementation gap: Awareness, beliefs and actual practice

The data also reveals a compelling narrative of unrealised potential, examining the disconnect between student awareness of available technologies, normative beliefs regarding technology integration, and the reality of current classroom practice (Figure 9). Near-universal awareness establishes a robust foundation for expanded implementation. The overwhelming majority of students recognise that abundant technological resources exist for Arabic language learning, representing the strongest conviction observed across all survey dimensions. This awareness demonstrates profound rather than tentative understanding, characterised by minimal variability and exceptional effect sizes. Students possess genuine knowledge about available tools and are actively anticipating their systematic integration into instruction. This awareness is neither abstract nor speculative but reflects understanding of the technological landscape surrounding Arabic language education.

CONSTRUCT	QUESTION	AGREEMENT %	N	MEAN (M)	SD	EFFECT SIZE (D)	95% CI
Awareness	Q15: Many apps available	**92.8%**	232	**4.84**	**1.06**	**1.26**	[4.71, 4.97]
Normative	Q13: Should use tech	86.8%	217	4.59	1.17	0.93	[4.44, 4.74]
Practice	Q10: Lecturers use tech	**66.4%**	166	4.12*	**1.53**	—	[3.93, 4.31]

**Note: Q10 mean is reverse-coded from raw score of 2.88 due to negative statement wording. Original question: "I feel that my Arabic lecturer doesn't use new technologies."*

Figure 9. Between student's awareness, beliefs and actual classroom practice

Strong normative alignment emerges between awareness and prescriptive expectations, with minimal attenuation between recognising that technologies exist and believing they should be implemented. This direct translation from awareness to normative conviction creates a powerful mandate for pedagogical innovation firmly grounded in student expectations. Students are not merely passively aware of technological possibilities but actively advocate for their incorporation, reflecting genuine investment in technology-enhanced learning experiences. However, current practice captures only approximately three-quarters of both student awareness levels and normative expectations. This implementation deficit represents the single largest opportunity identified throughout the study. A substantial cohort of students simultaneously aware of technological possibilities and supportive of integration nevertheless experience conventional instruction without technological enhancement. This gap signifies considerable untapped potential for improved learning outcomes, representing students whose educational experiences fall short of their expectations.

Most significantly, current practice exhibits the highest variability amongst all examined dimensions, substantially exceeding the dispersion observed in either awareness or normative beliefs. This elevated

inconsistency indicates highly uneven implementation patterns, with some students experiencing technology-rich instruction whilst others receive entirely traditional approaches. This variability suggests the deficit stems not from universal resistance or systematic barriers but rather from uneven adoption across individual lecturers, specific courses, or different institutions. The gap therefore reflects implementation inconsistency rather than fundamental pedagogical obstacles.

The convergence of near-universal awareness, robust normative support, high acceptance of specific technological interventions, and demonstrated implementation feasibility creates optimal conditions for systematic expansion. Infrastructure exists, awareness is comprehensive, and student support proves substantial. The primary challenge appears to involve scaling existing practices systematically rather than overcoming fundamental resistance or establishing initial proof-of-concept. The readiness exists; what remains is translating sporadic adoption into consistent, institution-wide integration that meets student expectations and leverages available technological resources effectively.

CONCLUSION

This empirical investigation of 250 university students in Malaysia, reveals compelling insights into contemporary Arabic language pedagogy within Malaysian higher education. The findings demonstrate a clear generational divide between student expectations and current pedagogical practices. Whilst an overwhelming majority (86.8%) advocate for increased technological integration in Arabic instruction, and 92.8% acknowledge the availability of diverse educational technologies, the data simultaneously exposes persistent attachment to traditional methodologies amongst certain student cohorts. The research unveils a paradoxical landscape: 72.8% of students desire enhanced technological adoption, yet from the survey 52.4% of them simultaneously endorse whiteboard-based instruction, and 55.2% support memorisation-drilling techniques. This dichotomy suggests students envision technology as supplementary rather than transformative, enhancing rather than replacing conventional approaches. Particularly noteworthy is the enthusiastic reception towards immersive technologies: 84% endorsed virtual reality simulations and 85.6% supported augmented reality applications, indicating strong receptivity towards innovative pedagogical instruments that transcend traditional boundaries.

The comparative analysis between English and Arabic language instruction proves particularly illuminating. Students perceive English language pedagogy as more technologically sophisticated, attributing this disparity to Arabic's limited global user base and the technical challenges posed by Arabic script keyboards. This perception, whether accurate or not, influences student expectations and potentially undermines Arabic language education's perceived modernity and relevance. Most significantly, the data reveals that 66.4% of students observe their Arabic lecturers *already* employing technological tools, contradicting assumptions of widespread technological resistance. However, the gap between current implementation and student aspirations remains substantial.

The challenge facing Arabic language educators extends beyond mere technology adoption; it requires strategic integration that respects traditional methodologies' proven efficacy whilst embracing digital-native learners' expectations. To end, future investigations would benefit from incorporating mixed methods approaches combining classroom observations with lecturer perspectives on technology implementation. Comparative studies across diverse institutional contexts, including private universities and Islamic higher learning institutions, would also broaden contextual understanding. Last but not least, experimental research examining specific technological interventions' measurable impact on Arabic language education would also be a valuable next step for the field.

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