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Application of the Fuzzy Delphi Technique in Designing an Augmented Reality-Based Module for Learning Arabic Poetry

Shamsul Aiman Mua'mar Shamsul Bahrin[1], Mohd Fauzi Abdul Hamid*[1], Mohammad Azizie Aziz[1], Hamadallah Mohammad Salleh[2]

[1]Universiti Sultan Zainal Abidin, [2]Universiti Sains Islam Malaysia

Email: *[1]mohdfauzi@unisza.edu.my

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Abstract

Arabic poetry represents a significant literary heritage that has shaped the development of the Arabic language and culture from the pre-Islamic (Jahiliyyah) era to the modern age. Nevertheless, the teaching of Arabic poetry to non-native learners, particularly Malay students, often faces considerable challenges in terms of linguistic comprehension, the complexity of poetic structures, and the limited interest in traditional literary materials. Accordingly, this study seeks to establish expert consensus on the principal components and their constituent elements as the foundation for developing an interactive learning module for Arabic poetry through augmented reality technology. The design phase, aimed at achieving expert agreement, employed the Fuzzy Delphi Method (FDM) using a seven-point Likert scale. A total of ten experts from diverse academic and professional backgrounds participated as respondents. The collected data were analyzed using Triangular Fuzzy Numbering, while the ranking of items was determined via the Defuzzification process. The findings reveal that consensus was achieved, with a threshold value below 0.2 ($d<0.2$), a consensus level exceeding 75 per cent, and a fuzzy score (A) greater than 0.5. In sum, the expert-validated components and elements related to the interactive module for teaching Arabic poetry with augmented reality can yield an innovative and engaging learning tool, fully aligned with the pedagogical imperatives of 21st-century education, by integrating interactivity and immersive technological features.

Keywords: Arabic Poetry, Interactive Module, Augmented Reality, Fuzzy Delphi Method, Technology

Introduction

Arabic poetry has evolved from the Jahiliya period to the modern era, playing an important role in both Arab and global societies. During the Jahiliya era, poetry functioned as a medium

for recording tribal history, glorifying the bravery of warriors, and preserving the identity of Arab tribes. For non-native communities such as Malay students, Arabic poetry carries significant importance in fostering a deeper understanding of the Arabic language and culture. Studies have shown that exposure to Arabic poetry can enhance language comprehension, as poetry often contains more profound syntactic structures, richer vocabulary, and unique linguistic styles (Reynaert, 2024). In the context of education, Arabic poetry has increasingly gained attention as an effective pedagogical tool and teaching and learning (T&L) material. Furthermore, the integration of technology in poetry learning, such as augmented reality (AR), has opened new opportunities for more interactive, engaging, and effective methods in modern education (Chen, 2025).

In the rapidly expanding digital era, the use of technology in teaching and learning Arabic has become a vital necessity. In addition to augmented reality (AR), various other technologies such as artificial intelligence (AI), virtual reality (VR), mobile learning (M-Learning), game-based learning (gamification), and linguistic chatbots have also been employed to enhance the effectiveness of T&L. A study by Zhang (2024) found that mobile applications utilizing AI have helped students learn Arabic more interactively through pronunciation correction systems and automated grammatical analysis. Augmented reality (AR) is one of the most promising technologies in the field of education due to its ability to merge virtual elements with the real world, thus transforming learning tools into more interactive experiences. In the context of Arabic language teaching and learning, AR can be applied in various forms, including marker-based AR, marker-less AR, projection-based AR, and superimposition-based AR (Akhiryani, 2025). With the advancement of AR technology, it has the potential to increase students' inclination and motivation to appreciate Arabic poetry in its authentic meaning.

In the Malaysian context, several studies have emphasized the importance of integrating technology into Arabic language pedagogy. Zaini and Nasir (2020) highlighted that the use of technology has expanded pedagogical approaches in Arabic language education in Malaysia, despite challenges related to infrastructure and teachers' competencies. Similarly, Ashari et al. (2024) underscored the integration of 21st-century skills such as communication, collaboration, and critical thinking in Arabic language teaching at the secondary school level, which aligns with student-centered learning (SCL). Meanwhile, Jaafar et al. (2022) discussed the challenges of technology-based learning in Malaysian higher education, including learners' acceptance and educators' readiness in adapting to digital instruction. In addition, Aziz and Hamzah (2021) examined gamification as a strategy to enhance motivation, whereas Abdullah (2017) emphasized the didik-hibur (edutainment) approach in Arabic teaching at the primary school level. Collectively, these findings reinforce the necessity of developing an augmented reality-based interactive module that is consistent with the principles of student-centered learning, namely active engagement, collaboration, and learner autonomy in Arabic language education.

Many students face difficulties in understanding the structure and language of Arabic poetry, which often differs from the prose form they are more accustomed to. This leads them to feel incapable and less interested in appreciating poetry in depth (Almelhes, 2024). Moreover, poetry is often perceived as something archaic or unrelated to contemporary issues, which causes students to neglect its importance in understanding cultural and literary content (Younes & Altoma, 2023). In recent years, the teaching of Arabic has embraced various forms

of digital transformation. Yet, one area that remains noticeably overlooked is the teaching of Arabic poetry, especially for non-native learners. While numerous studies have examined the role of digital tools in improving grammar, vocabulary, or speaking proficiency, only a handful have attempted to link technology with the literary and aesthetic aspects of Arabic. This imbalance has created a clear gap between linguistic competence and cultural appreciation.

Arabic poetry is not merely a linguistic exercise, but it represents a world of rhythm, meaning and emotion that helps learners connect with the essence of the Arabic language. However, traditional classroom approaches often fail to engage students at this deeper level. Many learners perceive poetry as abstract, outdated or too complex to relate to. This issue is particularly evident among Malay learners who may struggle to visualise poetic imagery and structure through conventional instruction. At the same time, educational discussions today revolve around how technology can humanise learning, not by replacing teachers, but by creating meaningful and interactive experiences. Augmented reality (AR), which merges the real and digital worlds offers that possibility. Several recent studies have demonstrated how AR and digital modules can increase learners' motivation and comprehension in various disciplines (Chen, 2025). Yet, these studies have rarely touched the area of Arabic poetry or explored how expert consensus could guide the design of such modules.

Therefore, this study responds to a specific and timely research gap. It brings together the heritage of Arabic poetry and the possibilities of immersive technology. By applying the Fuzzy Delphi Method, this research seeks to identify expert consensus on the components that should shape an AR-based module for Arabic poetry learning. The findings are not only relevant to language educators but also to the broader conversation on how culture, technology, and pedagogy can coexist meaningfully in 21st-century education.

Interactive learning modules have emerged as effective tools in the teaching and learning process, particularly in higher education and language education contexts. According to a study by Guaña-Moya (2024), the use of artificial intelligence in interactive learning modules has significantly improved the effectiveness of language learning at the university level. Through these digital platforms, students can receive immediate feedback and customize their learning according to their individual needs. In addition, Mutawa et al. (2024) emphasized that the use of H5P technology in interactive modules has brought substantial changes to teaching methods in higher education institutions. The integration of interactive elements such as quizzes, simulations, and visuals has enhanced knowledge retention among students. This demonstrates that interactive learning technology is not only relevant but also capable of enriching language learning experiences in the ever-expanding digital world. Overall, teaching and learning through interactive modules provide an innovative and effective approach to enhancing educational experiences. By leveraging technology and fostering active learning, students can acquire the knowledge and skills required to face future challenges.

Research Objectives

To acquire the necessary data for the development of an interactive module for learning Arabic poetry, the objectives of this study are as follows:

i) To design an Arabic poetry learning module utilizing augmented reality technology.

This section addresses the following research questions:

i) What is the design of an Arabic poetry learning module using augmented reality technology based on literature studies?
ii) What are the main components in the design of an Arabic poetry learning module using augmented reality technology based on expert consensus?
iii) What are the elements within the main components in the design of an Arabic poetry learning module using augmented reality technology based on expert consensus?

Methodology

The design phase in the Design and Development Research (DDR) approach (Richey & Klein, 2007) for this study focuses on designing an Arabic poetry learning module using augmented reality technology. Data were collected through the Fuzzy Delphi Method (FDM) as the research technique for designing and developing the module. This method was employed to obtain expert consensus in determining the elements that should be included during the design and development process of the module. The selection of this technique is consistent with the objectives of the design phase, which emphasize detailed and in-depth evaluation of the module to be developed.

The Fuzzy Delphi Method, first introduced by Murray et al. (1985) and further developed by Kaufmann and Gupta (1988), is a systematic approach that integrates fuzzy logic into the traditional Delphi technique to enhance the precision and reliability of expert findings. This method functions as a measurement instrument that optimizes the process of obtaining consensus among experts, particularly in situations involving uncertainty and ambiguity of information. Compared to the conventional Delphi approach, the fuzzy version allows for a more realistic representation of the degree of certainty in expert opinions, thereby providing advantages in ensuring the content validity of a research instrument (Blasco-Blasco et al., 2025). Such improvements render the Fuzzy Delphi Method a more effective tool for addressing complex issues requiring subjective interpretation, while simultaneously increasing the accuracy of analysis across various fields of research such as education, engineering, and risk management (Heidary et al., 2025; Bozkus & Kaya, 2025).

Research Sample

The study sample consisted of ten expert panel members: three experts in learning module development, four experts in educational technology, and three experts in the field of Arabic poetry. A purposive sampling technique was employed in the selection of experts. This technique was chosen to obtain an in-depth understanding of the knowledge and experience of the experts in the area under investigation.

According to Jones and Twiss (1978), the number of experts required for a Delphi study ranges between 10 and 50. This statement was further supported and reinforced by Adler and Ziglio (1996), who stated that the number of experts should range from 10 to 15 to achieve a high level of consensus. Therefore, ten experts were selected in this study as they fall within the permissible range of 10 to 50 experts.

Research Instrument

The research instrument used in this study was an expert assessment questionnaire developed based on a review of the literature. The purpose of constructing this instrument was to collect quantitative data related to the Arabic poetry learning module using

augmented reality. The use of questionnaires met the criteria and requirements of the Fuzzy Delphi Method, which involves the application of mathematical formulas to obtain expert consensus. According to Skulmoski et al. (2007), the development of instruments can be based on literature reviews, pilot studies, and practical experience.

Data Analysis

Prior to distributing the questionnaire to the ten participating experts, content validity was first conducted by involving three experts to evaluate the suitability of the proposed elements in the Fuzzy Delphi questionnaire. Feedback and suggestions provided by the experts were recorded and incorporated for improvements in the questionnaire.

The data were analyzed using the Fuzzy Delphi Method. Likert scale ratings were converted into fuzzy scales based on the responses obtained. The data were subsequently analyzed using Microsoft Excel software.

Steps in the Study

The Fuzzy Delphi Method was employed to analyze the data obtained from the set of questionnaires. To achieve this objective, several steps and procedures were followed. Adhering to these procedures ensured empirical validity of the results. The sequence of steps undertaken in this study was as follows:

Step 1:

Design the questions for the Fuzzy Delphi questionnaire using the following methods:

i) Literature review
ii) Existing questionnaires (adaptation)

The process of constructing the Fuzzy Delphi questionnaire script is similar to that of a standard questionnaire. The Likert scale was applied in the questionnaire based on the requirements of the research questions, measuring aspects such as the degree of agreement, level of importance, and extent of scale.

Step 2:

It was assumed that experts K were invited to determine the importance of the evaluation criteria for the variables to be measured using linguistic variables. The researcher could employ their own initiative in the process or method of obtaining information and data. In this study, the researcher opted to distribute the questionnaire in person, and any inquiries related to the questionnaire were addressed directly.

Step 3:

This step involved converting all linguistic variables into triangular fuzzy numbers. The linguistic scale resembles the Likert scale used in other studies, but it is enhanced with fuzzy numbering based on triangular fuzzy numbering. Three values were applied as illustrated in Figure 1:

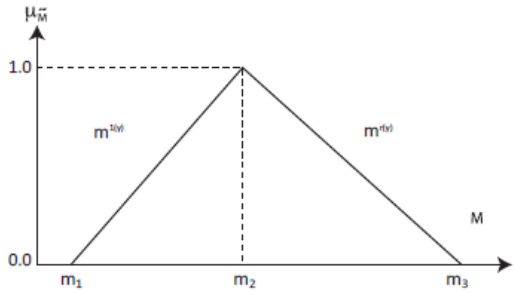

Figure 1. Triangular Fuzzy Number

(m1 = minimum value; m2= moderate value; m3= maximum value)

The linguistic h-scale was employed to convert linguistic variable scales into fuzzy numbers.

Table 1
Example of Linguistic Variable Scale

Seven-Point *Fuzzy* Scale	*Fuzzy* Number		
	m_1	m_2	m_3
Strongly Agree	0.9	1.0	1.0
Agree	0.7	0.9	1.0
Somewhat Agree	0.5	0.7	0.9
Neither Agree nor Disagree	0.3	0.5	0.7
Somewhat disagree	0.1	0.3	0.5
Disagree	0.0	0.1	0.3
Strongly Disagree	0.0	0.0	0.1

Step 4:
Once all data and information had been collected from the experts, the Likert scales were converted into fuzzy scales. All data and information were analyzed using Microsoft Excel software. For each expert, the vertex method was applied to calculate the distance between the average rij (Chen, 2000). The distance between two fuzzy numbers m = (m1, m2, m3) and n = (n1, n2, n3) was calculated using the following formula:

$$d(m,n) = \sqrt{\frac{1}{3}[\,(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}$$

Step 5:
If the distance between the average and the expert's rating data is less than the threshold value of 0.2, all experts are considered to have reached consensus (Cheng & Lin, 2002). In addition, if the percentage of group consensus among m × n experts exceed 75% (Chu & Hwang, 2008; Murry Jr & Hammons, 1995), then the process continues to Step 6. Otherwise, a second round of the Fuzzy Delphi Method must be conducted, or the item is discarded.

Step 6:
The next phase is the defuzzification process. There are three formulas that can be applied to obtain the average Fuzzy score (Amax), namely (Nor Aidillina & Marinah, 2020):

i) $A_{max} = 1/3 * (m_1 + m_2 + m_3)$, or;

ii) $A_{max} = 1/4 * (m_1 + m_2 + m_3)$, or;

iii) $A_{max} = 1/6 * (m_1 + m_2 + m_3)$.

If the researcher employs Average Fuzzy Numbers or the average response, the resulting score is a numerical value within the range of 0 to 1.

Findings

There were three steps followed by the researcher in the process of determining the main components and the elements within the design of the module. Table 2 presents the steps employed in the findings of the module design.

Table 2
Steps in Module Design

Steps	Activities
1	Development of the main module components based on existing models.
2	Development of elements for each module component based on data from needs analysis and literature review.
3	Verification of module components and elements based on expert consensus using the *Fuzzy Delphi* Method.

Module Objectives

Table 3 presents the final findings for the module objectives component, which have undergone consensus and suggestions from the expert panel. The results indicate the threshold value for each item, the percentage of expert consensus, the average Fuzzy score, the expert consensus decision, and the ranking of each item.

Table 3
Analysis of Module Objectives

	Item / Element	*Threshold* Value	Percentage of Expert Group Consensus	*Fuzzy* Score *(A)*	Expert Consensus	Ranking
1.	To explain clearly the development and content of the Arabic poetry studied in terms of form, theme, and concept.	0.122	83%	0.897	ACCEPTED	4
2.	To report effectively the content of the Arabic poetry studied.	0.186	83%	0.856	ACCEPTED	5
3.	To examine the values contained in the Arabic poetry studied.	0.098	92%	0.911	ACCEPTED	1
4.	To apply augmented reality technology in enhancing students' understanding of Arabic poetry learning.	0.098	92%	0.911	ACCEPTED	1
5.	To explain the methods of recitation and construction of Arabic poetry according to the correct rules of *ʿArūḍ* and *Qāfiyah*.	0.122	83%	0.906	ACCEPTED	3

Table 3 details the results of the Fuzzy Delphi analysis for the module objectives component, demonstrating a very strong and convincing level of expert consensus. All five evaluated elements recorded threshold values (*d*) ranging from as low as 0.098 to 0.186, all of which are below the acceptance level of 0.2 established in the Fuzzy Delphi Method, thereby fulfilling the first criterion related to data stability. Furthermore, the percentage of consensus among the experts was high, ranging from 83% to 92%, thus meeting the second criterion that requires at least 75% agreement.

The defuzzification scores further indicate uniformity in the acceptance of the elements, with values ranging between 0.856 and 0.911, exceeding the acceptance level of 0.5 and reflecting a very high level of consensus. Therefore, all items within the module objectives component were fully accepted by the expert panel. This outcome reinforces the justification that the objectives of the developed module are valid in terms of content and aligned with the requirements and perspectives of most experts in the relevant field.

Module Content

Table 4 presents the final findings for the module content component, which have undergone consensus and suggestions from the expert panel. The results indicate the threshold value for each item, the percentage of expert consensus, the average Fuzzy score, the expert consensus decision, and the ranking of each item.

Table 4.
Analysis of Module Content

Item / Element	*Threshold* Value	Percentage of Expert Group Consensus	*Fuzzy* Score *(A)*	Expert Consensus	Ranking
1. Introduction to the History of Arabic Literature	0.097	92%	0.903	ACCEPTED	10
2. Imri' Al-Qays	0.098	92%	0.911	ACCEPTED	2
3. Al-Nabighah Al-Dhubyani	0.098	92%	0.911	ACCEPTED	2
4. Zuhayr bin Abi Sulma	0.098	92%	0.911	ACCEPTED	2
5. Ka'b bin Zuhayr	0.098	92%	0.911	ACCEPTED	2
6. Hassan bin Thabit	0.098	92%	0.911	ACCEPTED	2
7. Abu Dhu'ayb Al-Hudhali	0.098	92%	0.911	ACCEPTED	2
8. Malik bin Al-Rayb	0.098	92%	0.911	ACCEPTED	2
9. Al-Farazdaq	0.098	92%	0.911	ACCEPTED	2
10. Al-Iltizam Al-Islami in Poetry	0.068	100%	0.933	ACCEPTED	1

Table 4 illustrates the Fuzzy Delphi analysis for the elements of the module content which demonstrates strong consensus among the experts. All ten evaluated elements recorded threshold values (*d*) below 0.1 significantly lower than the maximum value of 0.2 established in the Fuzzy Delphi Method. This confirms compliance with the first criterion of the method. The percentage of expert consensus ranged from 92% to 100% thereby exceeding the minimum threshold of 75% as stipulated. Meanwhile, the fuzzy scores (*A*) for all items exceeded 0.90 with the highest score recorded at 0.933. These findings indicate that all elements of the module content were accepted with a high level of agreement thus validating the content's reliability and applicability in the context of teaching and learning.

Module Design

Table 5 presents the final findings for the module design component which have undergone consensus and suggestions from the expert panel. The results indicate the threshold value for each item, the percentage of expert consensus, the average Fuzzy score, the expert consensus decision and the ranking of each item.

Table 5
Module Design Analysis

Item / Element	*Threshold* Value	Percentage of Expert Group Consensus	*Fuzzy* Score *(A)*	Expert Consensus	Ranking
1. The selection of colors and font sizes in the module is appropriate.	0.154	92%	0.881	ACCEPTED	24
2. The module contains suitable diagrams and illustrations.	0.098	100%	0.911	ACCEPTED	21
3. The layout of the module is well-organized.	0.068	100%	0.933	ACCEPTED	2
4. The module uses attractive and relevant graphics.	0.068	100%	0.933	ACCEPTED	2
5. The module includes icons that facilitate understanding.	0.057	100%	0.933	ACCEPTED	2
6. The module maintains consistent page formatting.	0.074	92%	0.942	ACCEPTED	1
7. The front cover design of the module is appealing.	0.068	100%	0.925	ACCEPTED	14
8. The selection of font type and size facilitates readability.	0.068	100%	0.911	ACCEPTED	21
9. The module contains interactive elements.	0.068	100%	0.933	ACCEPTED	2
10. The page design of the module facilitates navigation.	0.068	100%	0.933	ACCEPTED	2
11. The module is user-friendly.	0.068	100%	0.933	ACCEPTED	2
12. The design of the module is appropriate for the target group.	0.068	100%	0.933	ACCEPTED	2
13. The content arrangement supports comprehension.	0.068	100%	0.894	ACCEPTED	23
14. The module applies a consistent color theme.	0.068	100%	0.917	ACCEPTED	19
15. The text size is appropriate and easy to read.	0.068	100%	0.925	ACCEPTED	14
16. The design of the module adheres to instructional	0.074	92%	0.933	ACCEPTED	2

design principles.					
17. The module captures students' interest.	0.068	100%	0.925	ACCEPTED	14
18. The design enables active student engagement.	0.068	100%	0.917	ACCEPTED	20
19. The module is designed professionally.	0.068	100%	0.925	ACCEPTED	14
20. The module contains bookmarks or a table of contents.	0.068	100%	0.933	ACCEPTED	2
21. The quality of images and illustrations in the module is high.	0.068	100%	0.933	ACCEPTED	2
22. The module uses white space effectively.	0.068	100%	0.925	ACCEPTED	14
23. The module complies with module design standards.	0.068	100%	0.933	ACCEPTED	2
24. The design of the module supports the achievement of learning objectives.	0.068	100%	0.933	ACCEPTED	2

Table 5 details the findings of the Fuzzy Delphi analysis for the module design elements, which overall demonstrate a highly encouraging level of expert consensus. All 24 evaluated items satisfied the first criterion of the Fuzzy Delphi method, as the threshold (d) values for each item were below the 0.2 benchmark, with the highest recorded value being only 0.154. Furthermore, the percentage of expert consensus across all items was high, ranging from 92% to 100%, thereby surpassing the minimum threshold of 75% required to indicate agreement. In addition, the fuzzy scores (A) for all items exceeded 0.88, with the maximum value reaching 0.942, reflecting consistent and robust expert acceptance of the evaluated design elements. Based on full compliance with these three criteria, it can be concluded that the module design has been well received and validated in terms of content validity by the experts.

Learning Activities of the Module

Table 6 presents the final findings for the module's learning activity component, which have undergone consensus and refinement based on expert panel feedback. The results indicate the threshold values for each item, the percentage of expert agreement, the mean Fuzzy scores, the level of consensus among experts, and the ranking of each item.

Table 6
Learning Activities of the Module Analysis

Item / Element	*Threshold* Value	Percentage of Expert Group Consensus	*Fuzzy* Score *(A)*	Expert Consensus	Ranking
1. Interactive quizzes using applications such as *Quizizz*.	0.076	100%	0.917	ACCEPTED	1
2. Interactive virtual discussions using applications such as *Discourse*.	0.129	92%	0.894	ACCEPTED	4
3. Group role-play activities producing Arabic poetry theatre through *YouTube*.	0.098	92%	0.911	ACCEPTED	2
4. Group activities producing creative re-enactment videos of Arabic poetry using *TikTok*.	0.098	92%	0.911	ACCEPTED	2
5. Group-based language games in the form of an *escape room*.	0.186	83%	0.856	ACCEPTED	5

Table 6 presents the findings of the analysis for the learning activity elements within the module, which demonstrate a strong level of expert agreement. All five activities assessed recorded threshold (d) values below 0.2, indicating consistency of opinion among the experts and fulfilling the first criterion of the Fuzzy Delphi Method. In terms of agreement percentage, all activities exceeded the minimum threshold of 75%, ranging between 83% and 100%, thereby satisfying the second criterion. Furthermore, the fuzzy scores for all activities were notably high, exceeding 0.85, with the highest score recorded at 0.917. Taken together, these three indicators confirm that all the proposed learning activities within the module were fully accepted by the experts and deemed suitable for instructional implementation.

Module Evaluation

Table 7 presents the final findings for the module evaluation component, which have undergone both expert consensus and refinement through expert recommendations. The results of this study indicate the threshold (d) values for each item, the percentage of expert agreement, the mean fuzzy scores, the degree of expert consensus, and the ranking of each item.

Table 7
Module Evaluation Analysis

Item / Element	*Threshold d* Value	Percentage of Expert Group Consensus	*Fuzzy* Score *(A)*	Expert Consensus	Ranking
1. Online objective test.	0.161	92%	0.869	ACCEPTED	4
2. Oral test.	0.076	100%	0.917	ACCEPTED	2
3. Written assignment.	0.076	100%	0.917	ACCEPTED	2
4. Video-based assignment.	0.074	100%	0.925	ACCEPTED	1

Table 7 presents the findings of the analysis for the final component in the development of the module, namely the assessment aspect. All four evaluated items satisfied the first criterion of the Fuzzy Delphi method, with threshold (d) values below 0.2, thereby indicating an acceptable level of consistency. Furthermore, the percentage of expert consensus for all items ranged from 92% to 100%, surpassing the minimum requirement of 75% set as the second criterion. In addition, all items recorded fuzzy scores (A) exceeding 0.86, with the highest value reaching 0.925. These results reflect a high degree of acceptance and agreement among experts regarding the assessment elements of the module. Therefore, it can be concluded that all module assessment elements have been validated and fully endorsed in terms of content validity, based on expert consensus.

The overall findings indicate that the expert panel reached consensus on the elements identified as guidelines for the development of the module. These elements and components were systematically derived from an extensive review of the literature. Collectively, the results demonstrate a high level of agreement among experts on the key components of the developed module, namely objectives, content, design, learning activities, and assessment. This consensus was achieved through the application of the Fuzzy Delphi method, which provides empirical justification for the content validity of the module elements. Based on the analysis of fuzzy scores and calculated threshold values, it can be concluded that each selected component is not only content-valid but also aligned with the demands of contemporary pedagogy.

Discussion

In general, the experts agreed with the module's outlined objectives. These five objectives correspond directly to those specified in the course outline (Proforma) for the *Jahili* and Islamic Arabic Poetry course. The learning objectives formulated in this module yielded fuzzy scores exceeding 0.85, indicating that the targeted goals are clearly defined, relevant, and attainable. Emphasizing the mastery of values through poetry, coupled with the integration of technology such as augmented reality, demonstrates a pedagogical approach that synthesizes cognition and values within a unified framework. These results align with findings from Syahfutraa et al. (2024), who reported that the Fuzzy Delphi Method (FDM) effectively underpins the design of digital instructional modules in educational contexts. Furthermore, Hamzah, Omar, and Radzi (2024) highlight that expert consensus enhances the precision of instructional design and contributes to more effective learning outcomes.

In terms of the module content component, the findings indicate that a content structure organized both chronologically and thematically received full endorsement from the experts. The item related to Islamic values in poetry—particularly al-Iltizām al-Islāmī—obtained the highest fuzzy score, signifying its strong alignment with the philosophy of Islamic literature education. The sequence beginning with the biographical background of poets, followed by poetic features and embedded values, constructs a progressive and meaning-centered learning narrative. These findings align with Al-Mansour and Youssef (2023), who advocate for content modules designed in phased stages to enhance both conceptual understanding and retention among learners. Furthermore, Zainuddin, Amrullah, and Zuhriyah (2025) demonstrate that student-centered content grounded in Islamic educational contexts effectively stimulates learner interest and makes instruction more contextual and meaningful.

In terms of module design, it received exceedingly strong support, with all items achieving expert consensus levels exceeding 90%. Visual aspects such as the use of colors, icons, font sizes, and a consistent layout were recognised as critical factors in ensuring readability and clarity of message for learners. This demonstrates that design is not merely aesthetic but also functions as a cognitive tool that supports understanding. Indeed, recent research affirms this: cognitive load theory supports visual hierarchy and consistent design in reducing mental effort and enhancing usability (Ibraheem et al., 2025). Furthermore, the aesthetic–usability effect posits that more aesthetically pleasing interfaces are perceived as more intuitive by users, reinforcing both usability and cognitive fluency (Ali Darejeh et al., 2024; Fu, 2024). Thus, design features that enhance visual appeal and consistency contribute significantly to learner engagement and comprehension.

In terms of learning activities, the integration of interactive quizzes, video assignments, online forums, and social platforms such as TikTok and YouTube received high approval. These activities align with a student-centered approach, tapping into the interests and learning styles of digital-native generations. Tools like Quizizz and Padlet not only foster learner engagement but also enhance conceptual understanding through real-time feedback and interaction. This finding aligns with research by Guana-Moya (2024), which demonstrates that interactive technologies yield significant increases in both student motivation (by 23%) and knowledge retention (by 31%). Creative expression through performance and video production assignments further supports the development of 21st century skills.

In terms of module evaluation, a diverse array of assessment methods including written assignments, video assignments, objective quizzes, and oral tests was designed. Video-based assessment received the highest scores from the expert panel, reflecting the current inclination toward authentic forms of assessment that encompass multiple dimensions of student competency. Such assessment approaches evaluate not only knowledge but also communication skills, creativity, and the application of learning in real-world contexts. This aligns with recent findings in the literature: a systematic review on authentic assessment underscores that real-world, context-based tasks enhance the development of critical 21st century skills (Vlachopoulos & Makri, 2024). Additionally, research on implementing student-generated videos as summative assessment in language learning highlights that such methods effectively foster learner motivation, engagement and a range of competencies including creativity, critical thinking and cultural awareness (Abdelhadi & Belaid, 2025).

Overall, the findings of this study not only attest to the validity of the developed module but also illustrate that an expert-based design approach, utilizing the Fuzzy Delphi Method can produce a highly effective, contextually relevant and student-aligned module. The integration of value-laden content, technological elements, visual strategies and diversified assessment approaches ensures a pedagogically sound and practically balanced module. Given the high level of expert consensus and empirical support obtained, this module shows strong potential for implementation across various contexts in Arabic poetry instruction, particularly in higher education and integrated madrasah settings.

These results are reinforced by contemporary studies demonstrating the efficacy of the Fuzzy Delphi Method in module development. For instance, Zeng (2025) applied FDM in designing a STEM teaching model, achieving comprehensive expert consensus that resulted in an impactful and operational framework. Syahfutraa et al. (2024) similarly illustrate how FDM enhances module design by managing uncertainty and facilitating consensus, particularly in digital media development. These studies substantiate the empirical robustness and practical applicability of expert-informed design methodologies in instructional module development.

Conclusion

In conclusion, the consensus reached among experts on all elements of the main components in designing the augmented reality–based Arabic poetry learning module serves as a foundation and guideline for its development. Expert agreement on the proposed elements is crucial to ensure that the module is designed in accordance with proper standards and remains suitable for use by learners. The components and elements outlined in the design phase of this study were informed by a needs analysis and supported by findings from the literature review. Once expert consensus was obtained, these components and elements became the basis for the development of the module, thereby strengthening its content validity and enhancing confidence in the final product. Moreover, the process incorporated relevant theories and models that underpinned the module's production, providing important theoretical implications for research in the field of instructional module development.

Nevertheless, this study remains at the design phase and has yet to evaluate the module's effectiveness in real classroom settings. Therefore, further research in the form of quasi-experiments or actual experimental studies is strongly recommended to assess the impact of the augmented reality (AR) module on improving Arabic communication skills among non-native learners. Such research could adopt a pre-test and post-test design, comparing a control group (traditional methods) with an experimental group (AR-based module). The need for such evaluation is further supported by previous studies conducted by the researcher, such as the effectiveness of the Hamoody app in improving Arabic communication skills among non-native speakers and Comparison between smartphone apps and flashcards in enhancing Arabic communication skills by Kenali (2019), which demonstrated that mobile applications and interactive technologies enhance learners' motivation and enjoyment in learning Arabic. Accordingly, future experimental validation will not only provide empirical evidence of the pedagogical effectiveness of AR modules but also strengthen the foundation for interactive Arabic language module development in the Malaysian context.

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