# Development Of Pedagogical Design Elements For The My *Arabiy* Game-X Model To Enhance Arabic Language Learning In Religious Primary Schools

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**Abstract**
The use of teaching aids in Arabic language instruction has shown positive effects on students' vocabulary acquisition. However, many teachers still do not fully utilize technology and teaching materials in the teaching and learning process. Therefore, this study developed the My Arabiy Game-X model as a guide for creating interactive and user-friendly mobile applications to support Arabic language teaching in religious primary schools. The study focused on three of the seven primary constructs related to pedagogical design: teacher needs, learning objectives, and assessment of learning outcomes. The Fuzzy Delphi Method (FDM) was used in a structured way to ensure the accuracy and validity of the data. A total of 22 experts were selected through purposive sampling, including those with expertise in curriculum, teaching, educational technology, multimedia, information technology, and assessment. The research instrument was a questionnaire developed from a literature review and expert interviews. Data were analyzed using a Microsoft Excel template. Findings showed that all elements within the three constructs reached consensus among the experts. The pedagogical design of the model has strong potential as a helpful guide for developing more holistic, relevant, and effective Arabic language learning apps, in line with 21st-century educational digitalization initiatives.
**Keywords:** My Arabiy Game-X Model; Pedagogical Design; Mobile Application; Fuzzy Delphi Method

## INTRODUCTION

Digital game-based learning (DGBL) has emerged as a prominent pedagogical approach in Arabic language acquisition, receiving increasing scholarly attention both within Malaysia and globally. Empirical studies have consistently demonstrated that gamification and game-based strategies significantly enhance learners' motivation, engagement, and vocabulary retention (Jaffar et al., 2024; Ghani et al., 2019). In the Malaysian educational context, digital platforms such as Kahoot!, Quizizz, Duolingo, and

Wordwall have shown positive outcomes in improving students' Arabic vocabulary and oral proficiency (Salleh Kenali et al., 2019). The integration of digital and conventional game-based techniques presents a balanced instructional model aligned with current educational trends and technological advancements (Zainuddin et al., 2021). These findings are corroborated by international research, which affirms the efficacy of DGBL in fostering motivation, conceptual understanding, and communicative competence among non-native Arabic learners (Salleh Kenali et al., 2019; Abd Hamid et al., 2024).

In the context of 21st-century education, the incorporation of educational technology is increasingly regarded as a pedagogical necessity rather than an optional supplement. The diversity of contemporary teaching methodologies necessitates that educators adopt more dynamic, interactive, and innovative instructional approaches—particularly in the teaching of Arabic as a second language, which is widely offered at both primary and secondary levels in Malaysia. The use of digital tools, including mobile applications, has been shown to positively influence vocabulary acquisition and learner motivation (Li, 2023; Almekhlafi & Almeqdadi, 2010; Aziz & Ismail, 2018). Nonetheless, several challenges persist, notably the underutilization of technological resources by some educators in the context of Arabic language instruction at the primary school level (Husni Abdullah et al., 2018).

Studies also show that despite the availability of technology, Arabic language teachers often face obstacles such as inadequate training, lack of interactive digital content, and limited infrastructure, which hinder their full utilization of technological tools in teaching, especially at the primary school level (Benaidja, 2024). Reviews by Al Musawi and others (2016) reveal that Arabic language educators frequently underuse digital resources due to lack of training and suitable content. Additionally, research involving primary school teachers indicates that while technology is recognized as a useful instructional method, its integration remains limited due to these challenges (Wan Daud et. al, 2025).

In response to these challenges, a mobile application development model called My *Arabiy* Game-X was created. This model is based on a strong and user-friendly pedagogical design, focusing on three key constructs: teacher needs, learning objectives, and assessment of learning outcomes. These constructs were selected to ensure that the application meets the criteria for effective pedagogy in Arabic language teaching and learning. This initiative also aligns with the Malaysia Education Blueprint (2013–2025) and the Digital Education Policy (2021), both of which emphasize the integration of technology in the classroom and the urgent need to support nationwide digital education efforts.

This study used the Fuzzy Delphi Method (FDM), adapted from the work of Mohd Ridhuan (2024), to gather expert consensus in designing the model. A total of 22 experts in curriculum, pedagogy, educational technology, multimedia, information technology, and assessment were selected through purposive sampling. The research instrument, a questionnaire developed from a literature review and expert interviews, was analyzed using Microsoft Excel. Findings showed that all elements within the three constructs achieved a high level of agreement among the experts. This indicates that the pedagogical design of the My *Arabiy* Game-X model has strong potential to serve as a guide for developing more holistic, relevant, and effective Arabic language learning applications for religious primary schools.

## METHOD

### Research Design

This study used the Fuzzy Delphi Method (FDM), a modified version of the traditional Delphi method. FDM is an innovative research methodology that combines the traditional Delphi technique with Fuzzy number systems. This combination is considered more effective because it allows for more detailed expert input, especially in situations that are unclear or uncertain. According to Mohd Ridhuan and Nurulrabihah (2020), this method was first introduced by Murray, Pipino, and Gigch in 1985. In this study, FDM was used as an effective approach to gain expert consensus on complex and ambiguous issues. Experts with relevant knowledge and experience were involved to evaluate and agree on the elements within each construct, helping to shape and develop the My *Arabiy* Game-X model, which is suitable for students in religious primary schools.

The instrument used in this study was a questionnaire developed based on the elements identified within each construct of the study. These elements were selected and mapped through a review of the literature and supported by expert interviews. Key references for constructing the elements were drawn from the study of Salleh and Md Salleh (2021), which served as guidelines to ensure the relevance and validity of the questionnaire content.

A 7-point Likert scale was used in the questionnaire to gather expert agreement on the relevance and suitability of the proposed elements for the My *Arabiy* Game-X model, designed for primary religious school students. Based on recommendations from Mohd Ridhuan and Nurulrabihah (2020) and the study by Chang, Hsu, and Chang (2011), the 7-point Likert scale was chosen because it helps reduce ambiguity in the experts' responses.

The use of a 7-point scale, rather than fewer points, provides greater granularity and allows experts to express their level of agreement with more nuance, thereby reducing ambiguity and improving the accuracy and reliability of consensus measurement. Studies have shown that this method achieves high levels of expert agreement, with threshold values (d) below 0.2 and consensus percentages exceeding 75%, indicating its effectiveness in refining and validating items based on expert feedback (Mastam & Zaharudin, 2024; Yin & Hanif, 2024; Ismail, et. al, 2023; Hasim, Mohamed & Hamzah, 2019). The Likert scale used in this study is as follows:

1 – Strongly Disagree
2 – Very Disagree
3 – Disagree
4 – Somewhat Agree
5 – Agree
6 – Strongly Agree
7 – Completely Agree

### Sampling and Participants

This study employed purposive sampling, a method that involves the deliberate selection of individuals based on specific criteria relevant to the research objectives. This approach was chosen to obtain in-depth insights from experts who could provide meaningful and relevant feedback for the development of the My *Arabiy* Game-X model (Malek et al., 2023; Had et al., 2023). A total of 22 experts were selected as participants. According to Adler and Ziglio (1996) and Burn (1998), a panel of 10 to 15 experts is sufficient for Delphi-based research, thus the sample size in this study exceeds the minimum recommendation and enhances the credibility of the findings (Mohd Ridhuan & Nurulrabihah, 2020). All participants were invited via an online questionnaire, which included items related to the main constructs of the model: teacher needs, learning objectives, and assessment. The expert panel represented a diverse range of qualifications and professional backgrounds: 10 experts held a Doctor of Philosophy (PhD), 10 held a Bachelor's degree, 1 held a Master's degree, 1 held a Diploma. Their areas of expertise included curriculum and instruction, multimedia, educational technology, information technology, and educational assessment. Participants had between 5 and 30 years of experience, which ensured that the data collected reflected a high level of professional competence and relevance to the study. Their input played a critical role in validating the constructs of the model and ensuring its suitability for use in religious primary schools.

**Data Collection and Analysis**

The data collection and analysis process in this study followed a structured set of steps to ensure its status as an empirical study (Mohd Ridhuan & Nurulrabihah, 2020). The procedure was guided by a five-step approach summarized by Che Hat et al. (2024), which was selected for its clarity and suitability to the context of this research.

Although a seven-step procedure is outlined in the work of Mohd Ridhuan and Nurulrabihah (2020), the approach by Che Hat et al. (2024) consolidates the final three requirements into a single step, making the process more concise. In contrast, the original seven-step model separates these three components into distinct stages, resulting in a longer process. Despite the difference in the number of steps, both frameworks share the same core procedures and objectives. Therefore, this study adopted the five-step approach by Che Hat et al. (2024), while still incorporating the key principles and standards emphasized by Mohd Ridhuan and Nurulrabihah (2020) to ensure the accuracy and validity of the Fuzzy Delphi Method (FDM) implementation.

**Step 1: Development of Fuzzy Delphi Questionnaire Items**

The first step in the process involved the development of items for the Fuzzy Delphi questionnaire. These items were constructed based on an extensive literature review and further refined through expert interviews. While the process of designing a Fuzzy Delphi questionnaire is similar to conventional questionnaire development, it is carried out in a more structured manner, supported by citations from relevant literature and expert input. A seven-point Likert scale was used for each item to reduce ambiguity and ensure clearer responses from the expert panel. This scale helps in capturing precise expert agreement on the importance and relevance of each element proposed in the model.

**Step 2: Selection and Involvement of Expert Panel**

In the second step, a group of 22 experts (denoted as K) were purposefully selected and invited to evaluate the importance of each construct and element using linguistic variables. These experts were chosen based on their qualifications and experience in relevant fields such as curriculum and instruction, multimedia, educational technology, information technology, and assessment. All experts had a minimum of five years of professional experience, and their selection aligned with the objectives of the My *Arabiy* Game-X model. The questionnaire was administered online to facilitate accessibility and efficiency.

**Step 3: Conversion to Triangular Fuzzy Numbers**

The third step involved converting the linguistic variables into triangular fuzzy numbers (TFNs) (Mohd Ridhuan & Nurulrabihah, 2020). Although the linguistic scale used mirrors the traditional Likert scale, it is enhanced through the application of fuzzy logic, specifically triangular fuzzy numbers, to allow for a more nuanced and accurate interpretation of expert responses (Che Hat et al., 2024). The use of a seven-point Likert scale, as discussed earlier, further strengthens the precision of the data collected. Table 1 presents the levels of agreement for each linguistic variable alongside their corresponding fuzzy scale values.

**Table 1. Level of Agreement and Fuzzy's Seven Points Scale**

| Likert's Scale | Linguistics Variable | Skala Fuzzy |
|---|---|---|
| 1 | Strongly Disagree | (0.0, 0.0, 0.1) |
| 2 | Very Disagree | (0.0, 0.1, 0.3) |
| 3 | Disagree | (0.1, 0.3, 0.5) |
| 4 | Somewhat Agree | (0.3, 0.5, 0.7) |
| 5 | Agree | (0.5, 0.7, 0.9) |
| 6 | Strongly Agree | (0.7, 0.9, 1.0) |
| 7 | Completely Agree | (0.9, 1.0, 1.0) |

**Step 4: Data Entry and Threshold Value Calculation**

The fourth step involved entering all expert response data into Microsoft Excel, using a specialized template developed by Mohd Ridhuan et al. (2024) specifically for analyzing data using the Fuzzy Delphi Method (FDM). Once all responses were entered, the threshold value (d) for each item was calculated using the appropriate formula. This threshold value is a key indicator used to determine the level of agreement among experts. Items with a threshold value (d) ≤ 0.2 are typically considered to have achieved expert consensus and are retained in the final model.

The formula for calculating the threshold value (d) is as follows:

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

**Step 5**

The fifth step in this process is the final stage in determining whether the developed elements have reached expert consensus. This process involves three key conditions for data analysis using the Fuzzy Delphi Method (FDM), based on the principles of triangular fuzzy numbers and the defuzzification process.

1. Triangular Fuzzy Number Conditions:
   The threshold value (d) for each item (constructs and elements) must be equal to or less than 0.2 (Chen, 2000; Cheng & Lin, 2002).
   The percentage of expert agreement must be 75% or higher (Chu & Hwang, 2008; Murry & Hammons, 1995).
2. Defuzzification Condition:
   The fuzzy score (A) must be equal to or greater than the α-cut value of 0.5 (Tang & Wu, 2010; Bodjanova, 2006).

The fuzzy score is further analyzed using Microsoft Excel (Mohd Ridhuan et al., 2024) based on the following formula:

$$\mathrm{A} = \frac{1}{3}\,(m_1 + m_2 + m_3)$$

## RESULTS AND DISCUSSION

This study presents a detailed discussion of three of the seven primary constructs validated by experts in the development of the My *Arabiy* Game-X model. The focus is specifically directed toward elements within these constructs that are directly associated with pedagogical design. The constructs selected for discussion are teacher requirements, learning objectives, and the assessment of learning outcomes. The first construct, Teacher Requirements, emphasizes the essential qualifications, skills, and instructional strategies that educators must possess to effectively implement the My *Arabiy* Game-X model in classroom settings. Expert consensus was achieved on the necessary competencies, ensuring that teachers can facilitate an engaging and educational gaming experience.

The second construct, Learning Objectives, highlights the critical goals that the game aims to achieve in terms of student knowledge, skills, and attitudes. These objectives were refined and validated through expert input, ensuring alignment with the pedagogical goals of the educational game. Finally, the third construct, Assessment of Learning Outcomes, focuses on the methods and criteria for evaluating student performance within the My *Arabiy* Game-X model. This construct was developed to ensure that the game not only delivers educational content but also effectively measures student understanding and skill acquisition. The findings related to these constructs are analyzed in alignment with expert feedback and are supported by a robust data analysis process using the Fuzzy Delphi Method (FDM). This approach ensures that the constructs are both theoretically sound and practically applicable within educational contexts.

### Expert Consensus On Elements Within The Teacher Requirements Construct For The My *Arabiy* Game-X Model

Table 2 presents the elements within the construct of teacher requirements for the My *Arabiy* Game-X model, which were submitted to expert panels for validation and consensus. The development of these elements was informed by a comprehensive review of the literature and in-depth interviews with subject-matter experts. The construct of teacher requirements refers to the essential competencies and needs that must be addressed prior to the implementation of the application by teachers

**Table 2. Expert Consensus, and Element Ranking for the Teacher Requirements Construct**

| Num. of Element | Element | *Threshold Value*, d | Expert Group Agreement Percentage, % | Average Fuzzy Score *(A)* | Expert Consensus | *Ranking* |
|---|---|---|---|---|---|---|
| 7 | Structured learning guidance | 0.074 | 100.00% | 0.926 | Accepted | 1 |
| 2 | User manual | 0.076 | 100.0% | 0.921 | Accepted | 2 |
| 1 | Internet accessibility | 0.096 | 90.9% | 0.920 | Accepted | 3 |
| 5 | Clear user interface display | 0.102 | 95.45% | 0.914 | Accepted | 4 |
| 6 | Interactive notes | 0.088 | 95.45% | 0.914 | Accepted | 4 |
| 4 | Easily understood icons | 0.100 | 90.91% | 0.911 | Accepted | 6 |
| 3 | Simple navigation | 0.088 | 95.5% | 0.909 | Accepted | 7 |
| 9 | Portfolio of work samples as reference | 0.108 | 100.00% | 0.889 | Accepted | 8 |
| 8 | Interactive space between users and application developers | 0.104 | 100.00% | 0.885 | Accepted | 9 |

Table 2 displays the values of the threshold 'd', the percentage of expert agreement, the average fuzzy score (A), expert consensus status, and the ranking of elements within the teacher requirement construct for the My *Arabiy* Game-X model, as assessed by the expert panel. A total of nine elements were proposed for this construct, all of which were accepted by the experts.

This acceptance is attributed to the fact that all proposed elements fulfilled the three required criteria: the threshold value 'd' must be less than or equal to 0.2, the expert agreement percentage must be equal to or greater than 75%, and the average fuzzy score (A) must be equal to or exceed the α-cut value of 0.5. Based on the ranking, the element that should be given the highest priority within the teacher requirement construct is Element 7—guided instructional delivery—while the lowest ranked is Element 8—interaction space between users and application developers

Teachers' requirements in the integration of technology for learning encompass several critical elements that warrant careful consideration. Based on expert recommendations, one of the primary needs is the provision of guided instructional materials to ensure a smooth and systematic teaching process. In line with this, it is also recommended that teachers be provided with a comprehensive and user-friendly manual to enable effective mastery of the application's functionalities. Furthermore, stable internet connectivity is a crucial prerequisite. A minimum speed of 10 Mbps is recommended for downloading learning materials, supported by a Wi-Fi network accessible within the classroom. In the absence of Wi-Fi infrastructure, alternative connections such as mobile hotspots may be utilized; however, it must be noted that such alternatives may compromise the application's performance, particularly in rural schools where internet access remains limited.

The provision of a clear and user-friendly interface plays a vital role in enabling teachers to navigate the application with ease. In addition, interactive content such as visually appealing and concise infographics can enhance teachers' understanding both visually and practically. To further facilitate usability, intuitive icons and straightforward navigation must be prioritized to prevent confusion during instructional use. Moreover, the inclusion of sample outputs or exemplary student work as reference materials can serve as practical guides for teachers in planning and implementing learning activities. The integration of an interactive space between users and developers is also highly encouraged, as it offers teachers opportunities to provide feedback, raise inquiries, and receive real-time support. Additionally, expert panels have recommended the provision of appropriate support infrastructure, such as smart TVs, to ensure the application functions optimally within school environments.

## Expert Consensus On The Elements Within The Learning Objectives Construct Of The My *Arabiy* Game-X Model

Table 3 presents the elements within the learning objectives construct of the My *Arabiy* Game-X model, which were submitted to a panel of experts for consensus validation. The development of these elements was informed by a review of relevant literature and expert interviews. In this study, the elements of the learning objectives construct refer to the components necessary to articulate the expected learning outcomes for the topics being taught.

**Table 3. Threshold Value 'd', Expert Group Agreement Percentage, Average Fuzzy Score (A), Expert Consensus, and Element Ranking for the Learning Objectives Construct in the My *Arabiy* Game-X Model**

| Num. of Element | Element | *Threshold Value*, d | Expert Group Agreement % | Average Fuzzy Score | Expert Consensus | *Ranking* |
|---|---|---|---|---|---|---|
| 3 | Achievable Objectives | 0.076 | 100.0% | 0.921 | Accepted | 1 |
| 1 | Measurable Objectives | 0.076 | 100.0% | 0.917 | Accepted | 2 |
| 4 | Relevant Objectives | 0.088 | 95.45% | 0.909 | Accepted | 3 |
| 2 | Specific Objectives | 0.086 | 95.5% | 0.905 | Accepted | 4 |
| 5 | Time-bound Objectives | 0.097 | 100.00% | 0.897 | Accepted | 5 |

Table 3 displays the threshold values ('d'), expert agreement percentages, average fuzzy scores (A), expert consensus status, and the ranking of elements within the learning objectives construct of the My *Arabiy* Game-X model, as evaluated by the expert panel. A total of five elements were proposed for this construct, all of which were accepted by the experts. This acceptance is due to the fact that all proposed elements met the three required criteria: the threshold 'd' value must be less than or equal to 0.2, the percentage of expert agreement must be at least 75%, and the average fuzzy score (A) must be equal to or greater than the α-cut value of 0.5. Based on the ranking, the element that should be prioritized within the learning objectives construct is Element 3—attainable objectives—while the lowest-ranked element is Element 5—time-bound objectives.

Based on expert recommendations, learning objectives must be clear, specific, and measurable to ensure the effectiveness of evaluating learning outcomes. Clarity in learning objectives is crucial as it facilitates the assessment of student achievement and ensures that the intended outcomes are successfully attained. Moreover, the formulated objectives should be relevant to teaching and learning needs, and time-bound to ensure that instructional goals are achieved within the designated timeframe. Overall, the proposed learning objective elements were deemed appropriate. With clearly defined, outcome-oriented objectives, applications such as the My *Arabiy* Game-X model have the potential to positively impact Arabic language acquisition and the integration of Islamic values among primary school students in religious schools. Additionally, the application of the SMART principles (Specific, Measurable, Achievable, Relevant, Time-bound) in designing learning objectives is essential to ensure that learning is effective, focused, and measurable. These principles support teachers in formulating objectives that are not only realistic but also aligned with the curriculum and learners' needs.

## Expert Consensus On Elements Within The Learning Outcomes Assessment Construct for the My *Arabiy* Game-X Model

Table 4 presents the elements within the construct of learning outcome assessment for the My *Arabiy* Game-X model, which were submitted to a panel of experts for consensus validation. The development of these elements was guided by a review of relevant literature and expert interviews. This construct focuses on the essential elements required to evaluate student achievement in the learning process.

**Table 4: Threshold value 'd', percentage of expert consensus %, average fuzzy score (A), expert agreement, and element ranking for the construct of learning outcome assessment in the My *Arabiy* Game-X model.**

| Num. of Element | Element | *Threshold Value*, d | Expert Group Agreement % | Average Fuzzy Score | Expert Consensus | *Ranking* |
|---|---|---|---|---|---|---|
| 4 | Provides immediate feedback | 0.076 | 95.45% | 0.932 | Accepted | 1 |
| 3 | Displays individual achievement scores | 0.085 | 95.5% | 0.923 | Accepted | 2 |
| 2 | Question content aligns with the application`s final assesment. | 0.108 | 86.4% | 0.917 | Accepted | 3 |
| 5 | Motivational prompts for each question within the application | 0.126 | 81.82% | 0.905 | Accepted | 4 |
| 1 | Appropriate time allocation for each task | 0.163 | 95.5% | 0.868 | Accepted | 5 |
| 6 | Allows repeated attempts for answering questions | 0.266 | 86.36% | 0.811 | Accepted | 6 |

Table 4 displays the threshold values (‘d’), expert agreement percentages, average fuzzy scores (A), consensus status, and the ranking of elements within the learning outcome assessment construct of the My *Arabiy* Game-X model, as evaluated by the expert panel. A total of six elements were proposed under this construct, all of which were accepted by the experts. This acceptance is attributed to the fact that all proposed elements met the three essential criteria: the threshold ‘d’ value was less than or equal to 0.2, the expert agreement percentage was equal to or greater than 75%, and the average fuzzy score (A) met or exceeded the α-cut value of 0.5. Based on the ranking, the element prioritized most highly within this construct was Element 4—providing immediate feedback—while the lowest-ranked was Element 6—the ability to attempt questions multiple times.

The assessment of learning outcomes requires clear and well-structured planning. Based on expert consensus and recommendations, this gamified application should include achievement scores for each user, accompanied by immediate feedback. Immediate feedback is viewed as highly engaging and offers a significant advantage to applications such as My *Arabiy* Game-X. This feature enhances the application’s appeal and encourages students to participate more actively in the learning process. In addition, the content of the questions must be aligned with the final assessment within the application to ensure a comprehensive evaluation of learning effectiveness. Motivational elements should also be embedded in each question, such as allowing students to attempt the questions multiple times in order to improve their performance. Furthermore, elements of Digital Game-Based Learning (DGBL) can be incorporated, including scoreboards, challenges, and rewards. These rewards may take the form of stars, certificates, or verbal praise when students reach certain milestones, with the aim of encouraging them to retry if they do not succeed initially. Such features provide additional motivation and help to foster a greater interest in learning.

Furthermore, the time allocated for each assessment task should be clearly specified to ensure its appropriateness with the students’ proficiency levels. As a reinforcement strategy, the questions within the application should be designed with varying levels of difficulty to accommodate learners with diverse capabilities. Such differentiation can assist students in better mastering Arabic language techniques and methods. A well-designed assessment framework not only measures student achievement but also provides an engaging and motivating learning experience.

## CONCLUSION

The implications of these findings suggest that the pedagogical design of the My *Arabiy* Game-X model holds significant potential as a guideline for the development of holistic, relevant, and user-friendly Arabic language learning applications. By integrating teacher requirements, clearly defined learning objectives, and interactive and motivating outcome assessments, this model is capable of supporting more effective teaching and learning processes in religious primary schools. Furthermore, the model is expected to strengthen the role of teachers as key implementers of technology and contribute to the digitalisation of the curriculum by institutions such as the Selangor Islamic Religious Department (JAIS), in alignment with 21st-century educational demands.

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