

Towards Designing a Framework for Adaptive Gamification Learning Analytics in Quranic Memorisation

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ABSTRACT

The difficulty of sustaining and preserving the quality of Quranic memorisation is still an unsolved problem. Motivation and engagement are the most desired experiential qualities to memorise the Quran. This paper presents a framework for introducing adaptive gamification technology (integrated into the student learning experiences) by providing appropriate personalised formative memorising activities. A methodology that follows the three stages, which are analysis, design, and evaluation, was implemented in this study. A validation process by experts was conducted to get the relevant criticisms and recommendations for further improvement of the proposed framework. The results demonstrated that all components are compatible and usable for developing a prototype application specifically for self-learning Quranic memorisation. With proper integration of gamification in learning and assessment activities, a positive impact on the memorisation process can be achieved, such as higher satisfaction, motivation and greater achievement of students through appropriate learning analysis. Therefore, the proposed conceptual

framework known as Gamification Learning for Al-Quran Memorisation (GLAM-Q) is expected to contribute significantly and be a reference model in developing a Quranic memorisation application.

Keywords: Adaptive gamification, game aesthetics, game dynamics, game mechanics, learning analytics, Quranic memorisation, self-regulated learning

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INTRODUCTION

Memorising the Quran may be a great challenge to non-Arabic speakers because they lack mastery of Arabic vocabulary and grammar (Dzulkifli et al., 2014; Salehuddin et al., 2019). Nevertheless, Muslims worldwide have engaged in a concerted effort to understand and preserve the Quran by memorising it (Zakariah et al., 2017). In recent years, studies in the Quranic field in Malaysia, such as by Yusoff et al. (2018), are getting more encouraging responses from communities. This situation can be seen with the increasing number of Tahfiz schools established by the government and private sector (Ibrahim et al., 2018).

However, due to face-to-face learning constraints during this pandemic, online class becomes preferable to adapt to the new normal. Nevertheless, the learning time session between students and a qualified Quran teacher is insufficient and ineffective in sustaining and preserving memorisation quality for an extended time. It is because memorising the Quran to achieve a certain target number of Surah within some period requires much motivation (Aziz et al., 2019; Mustafa & Basri, 2014a; Mustafa & Basri, 2014b) and a good and strong memory to abide by the specific rules (Ariffin et al., 2013; Aziz et al., 2019; Rosmansyah & Rosyid, 2017). Hence, it has been admitted that the process is not easy, and the duration of memorisation depends on the memory retention ability of the students (Aziz et al., 2019). For example, Hashim (2015) reported that in the retention strategy of the Tahfiz learning style, students did not complete memorisation of the Quran revision (Khatam) according to schedule and were less steadfast in following the revision memorisation schedule. Ambo and Mokhsein (2019) reported that many students could not memorize all 30 constituencies within 3 years. In a previous study, Ismail et al. (2017) mentioned that 60% of students could not complete Quran memorisation according to the prescribed schedule of 30 constituencies within 6 semesters. Besides, other statistics showed that the percentage of students who did not manage to recite the Quran according to the prescribed constituencies is high (Yusuf et al., 2019); only 63% of students in National Religious Secondary Schools (SMKA) and Fully Residential Schools (SBP) managed to complete their memorisation phased over 5 years.

In addressing the above issues, Industrial Revolution 4.0 (IR4.0) has introduced gamification technology that could be applied in Tahfiz Higher Religious Institutions (HRIs) to respond to Gen Z students' learning preferences by giving them appropriate assessments to monitor their progress. Therefore, the objective of this study is to propose a new conceptual framework for self-regulated Quranic memorisation using specific learning strategies and some gamification elements. The rest of this paper is organised as follows. At first, this research provides a quick overview of the related works in literature. Afterwards, it presents a research methodology that follows three activities: analysis, design, and evaluation. The next section explains the details of the conceptual framework that consists of learning theories, learning techniques used in memorisation strategy, and

three gamification elements (game mechanics, game dynamics and game aesthetics) with learning analytics used in assessment modules. The last section discusses the analysis result from the expert reviews based on the proposed framework.

Quran Memorisation Techniques

Quran memorisation refers to memorising every verse of the Quran, which should be accompanied by the pure intention of preserving the Quran verses from any alterations, either in the form of elimination or manipulation of the verses (Shukri et al., 2020). The method is essential for students to learn and practice memorising the Quran. However, it is not easy to memorise blindly because it is ineffective, boring, and prone to fail (students forget what they had previously memorised). Saleem (2018) revealed that before starting the actual memorisation, memorisers are taught Arabic letters and their sounds. At this stage, they are only concerned with how to pronounce or read out the 'words,' whereby learners internalize the phonotactics of classical Arabic without reference to meaning.

Once the memorisers have completed their 'reading' of the text, they embark on memorisation proper. The practice of Quran memorisation is in line with 'guided repetition', which involves modelling by an expert, imitation by a novice, and rehearsal and performance by the novice. Nafi et al. (2019) mentioned that there are two main ways to memorise the Quran easily for beginners, which are memorised per page by reading one page 3 to 10 times (or more, which depends on the memoriser's capability) in Tartil before proceeding to the next page when the reading is smooth and memorise per verse by reciting one verse 3 to 10 times (or more, which depends on the memoriser's capability) in Tartil before moving to the next verse in the same way. This technique is known as Murajaah, a traditional method that directs students to memorise gradually by dividing chapters and increasing repeatability (Purbohadi et al., 2019).

In memorising the Quran verses, there are three levels of allegiance, namely memorising the new verses (Hifz Jadid), the repeating stage of the last memorisation (Sabaq), and the level of maintaining the existing memorisation (Murajaah) (Abdullah et al., 2003; Abdullah & Muda, 2004). The failure of students to master these three major processes results in the students failing to memorise the Quran at a maximum level (Abdullah et al., 2003). Literature suggested that several prominent Quranic memorisation models highlighted memorising strategies used in memorising the Quran. Through the analysis of previous studies, such as by Dzulkifli and Solihu (2018), there are at least 12 basic methods and approaches to memorising the Quran that have practically been used by most Tahfiz schools in Malaysia and were brought in from Indonesia, Mecca, India (Deobandy method) and Pakistan (Panipati method).

Adaptive Gamification

Gamification is defined by Lavoué et al. (2019) in Deterding et al. (2011) as the use of game design elements (e.g. mechanics, dynamics and aesthetics) to motivate user behaviour in non-game contexts. It has recently attracted much discussion and research as a promising value in transforming student behaviour towards learning engagement, motivation and performance (Ofosu-Ampong, 2020).

Gamification was first introduced in the application of Islamic learning, *Al-Furqan*, by Bakri et al. (2014). It was a gameplay interactive learning that integrated graphics, sound, and text for children's learning; unfortunately, it was not specifically for memorising. Subsequently, more game mechanics have introduced for Quran memorisation in 2016 and 2017, such as points (Adhoni et al., 2013; Moulana, 2017; Rosmansyah & Rosyid, 2017; Senan et al., 2017; Shamsuddin et al., 2016), achievements (e.g. badges, trophic, rewards/gifts) (Rosmansyah & Rosyid, 2017; Shamsuddin et al., 2016), levels (Adhoni et al., 2013; Adhoni et al., 2014; Moulana, 2017; Rosmansyah & Rosyid, 2017; Senan et al., 2017; Shamsuddin et al., 2016), challenges (Moulana, 2017), progress bar (Rosmansyah & Rosyid, 2017), leaderboard (Rosmansyah & Rosyid, 2017), and so on. However, in 2018, comprehensive studies into gamification in memorising the Quran became less attractive to researchers. There are some reasons for this decline in interest, as concluded by Morschheuser et al. (2018), who posited that gamification is challenging to design because 1) Games are complex, multifaceted, and therefore, difficult to holistically transfer to other environments, 2) Gamification entails the understanding of motivational psychology, and 3) The purpose of gamification usually also influences the behaviour that adds another layer into the scope of the gamification design.

To our knowledge, there are no studies (in the memorisation of the Quran) that adapt the game's features to the students' profiles. Thus, even though gamification can help increase learning motivation, it is important to know the characteristics of each individual. Unfortunately, most game systems incorporate game elements under the standard 'one measure fits all' approach to the standard gamification concept without considering the user's individual preferences, styles, needs and abilities (Alomair & Hammami, 2020). Therefore, to improve the conventional gamification approach, we have proposed adaptive gamification, a more user-centred design to accommodate various characteristics of different users and contexts (Böckle et al., 2018). In personalised learning, the content displayed can be tailored to suit each individual's profile (such as age, gender and motivation), learning style (which is obtained from interaction learners with the system), behaviour and skill/knowledge (namely beginner, intermediate and advanced levels) so that each student is presented with learning activities based on what they know and what they need to know (Rozi et al., 2019).

Learning Analytics

Learning Analytics (LA) can be defined as measuring and collecting data on students and learning processes to improve the teaching and learning processes through visualisations and data processing (Rosmansyah et al., 2017). The data interpretation activity related to students is required during the educational activity to predict the performance of the overall learning system, support the decision-making process, and detect potential problems or recognise in advance the signs of failure that may arise in the future. It borrows from different related fields (e.g. academic analytics, personalised adaptive learning) to collect, analyse, and report data about learners in specific contexts to understand and optimise learning and the environments in which it occurs (Chatti et al., 2012). Unfortunately, LA in Quranic memorisation is not well addressed in the literature. It was found that most research in Quranic memorisation does not directly mention the implementation of learning analytics research in students' assessment, probably because such assessment requires longitudinal studies. The LA dashboard plays a performance indicator where different topics are visualised and can be adjusted by the learner. It can be used as a Quranic language-learning application that tracks the results of exercises to visualise learners' progress. This dashboard relies on time spent, score, and some assessment at the end of every game for immediate reflection and feedback on the learner's performance that is tracked from the learning environment (Verbert et al., 2013). The feedback provided through progression enables learners to get an insight into their goals and track their advancement in the course over time (Hassan et al., 2021).

LA can be integrated with gamification to acquire data in real-time such as time spent without achieving a goal (i.e., time viewing a tutorial), total time played, number of attempts before completing a task, or users' progression between the first session played and the subsequent sessions (Cano et al., 2016). In another study, Cariaga and Feria (2015) presented other different kinds of information about LA, such as the number of times the learner logs into the system, number of times the learner plays the game, number of questions that are correctly answered, time spent in response to the activity, time spent prior to the first use of a hint, number of mistakes, and number of times a hint is pressed. It is hoped that the information collected could give us an overview of the learning process of the learners and their engagement, the effectiveness of the learning design, and the validity of the user requirements described.

RESEARCH METHODOLOGY

This study proposes a conceptual framework specifically for self-learning in Quranic memorisation using gamification elements and learning analytics. Therefore, the three phases below were conducted to achieve the objective of this research.

Phase 1: Analysis

In the first stage, three things have been analysed: 1) Issues or problems faced by Tahfiz students; 2) Comparative studies from related Quran mobile applications and literature; 3) Learning theories related to the learning techniques/strategies used in memorisation.

Issues or Problems Faced by Tahfiz Students

When memorising the Quran, Tahfiz students face many issues or problems. Based on the problem analysis, researchers conclude that there are three main problems faced by Tahfiz students, which are:

- a. Difficulty in permanent memory retention: Many Quran learners find it difficult to maintain the quality of memorisation once the memorisation is completed (Shukri et al., 2020; Yusuf et al., 2019), despite them having spent time reciting it for numerous repetitions (Abro et al., 2012; Almosallam et al., 2015). Although the method of repetition is a common practice used in Tahfiz schools, it cannot guarantee that all students can memorise easily through the same method applied to all students (Zaki et al., 2019). Therefore, the question arises about the level of mastery of students' Quran memorisation because they are given a short time to complete the memorisation of 30 Juzuk of the Quran, ranging from only 2 to 5 years.
- b. Lack of interest and motivation: According to (Abdullah et al., 2003; Purbohadi et al., 2019; Rosmansyah & Rosyid, 2017; Shukri et al., 2020), one of the obstacles in memorising the Quran is a lack of interest and motivation among the younger generation of Tahfiz students to learn and memorise the Quran traditionally. In addition, some students only joined the Madrasah due to their parent's wishes. Therefore, students tend to be bored when they need to memorise different verses or pages daily for an extended time (Sabbri, 2016; Mustafa & Basri, 2014a; Priatna et al., 2020).
- c. Absence of multiple learning styles: Mustafa et al. (2019) have found that issues of poor student achievement are due to the absence of good memorisation techniques based on student VARK learning styles. As mentioned by Muluk et al. (2020), students apply more than one learning style to assist them in understanding the materials and actively exchange the learning style based on their needs. It shows that combining the learning styles may help the students speed up their memorisation process.

Based on the three problems mentioned above, the next sections will discuss memorisation techniques (or strategies) that have been applied in related applications and literature. Subsequently, the gamification elements were adapted to a holistic user-

centred approach to increase the memorisers' interest, motivation, attention and learning performance, as Rozi et al. (2019) mentioned. In addition, multi-sensory learning styles were emphasized to capture learners with different abilities and characteristics for memorising the Quran. Finally, all relevant learning theories, learning techniques/strategies and game elements with adaptive gamification aspects, including player/learner profiles, learning styles, behaviours and skills/knowledge, have been described as the proposed framework in the design stage.

Comparative Studies from Related Applications and Literature

Recently, many applications support memorisation features and use different methods to implement them. Therefore, a preliminary study was implemented by observation and comparative studies on the existing Quranic mobile applications available in the market, such as Juz30, Hifdh, King Saud University Electronic Quran, and House of Quran portal. Based on the observation, most applications currently are based on the following criteria:

- a. Repetition: Many products employ repetition of the recitation either for a specific Quranic verse or for the whole section (set of verses) with a specified number of times.
- b. Memorisation progress: Some products review the progress of memorisation. Generally, the review involves different sections that need to be memorised and is used to manage and evaluate each user's memorisation level.
- c. Memorisation test: Two common tests have been used to verify the memorisation accuracy and evaluate its quality. The methods are explained below:
 - i. Recording: Users can confirm their memorisation by recording their recitation and then listening to the recording to discern any errors and correct them.
 - ii. Filling in: The Quranic or section may be shown for a given time to the user before they are asked to fill in a few words or the whole section to confirm their memorisation. Therefore, the user cannot skip any word or section without being sure of their spelling.

In addition, comparative studies from the existing literature were gathered. These comprise journal articles, dissertations, books, and reliable online materials. Finally, according to the analysis, some additional memorising techniques are commonly applied as follows:

- a. Repeats (Takrir) the memorisation of the Ayah several times. For example, the minimum number of repetitions that have been suggested is five times (Shamsuddin et al., 2016), and the maximum number of repetitions is 60 times (Senan et al., 2017).
- b. Systematically organises and meaningfully divides or breaks down the memorised Surah into several segments of Ayah, pages, or the smallest meaningful

parts. There is a significant impact in understanding, memorising and practising as needed when the main topics from a Surah in the Holy Quran are summarised and visualised coherently, such as chunking/breaking down verses into the smallest meaningful parts (Moulana, 2017; Shamsuddin et al., 2016), and visually displaying verses or Surahs in mind maps according to their topics (Böckle et al., 2018; Shamsuddin et al., 2016).

- c. Promotes multi-sensory learning styles such as verbal/textual, auditory/sound and visual/image as the main criteria used to capture the learners' interest and attention to memorise. For example, some previous research, such as by Ahmad et al. (2018), Hamiz et al. (2014) and Moulana (2017), used mnemonics (either Loci or sign language or any navigation cues) to facilitate students with different verbal, auditory and visual abilities, especially among elderly learners and learners with disability.

Learning Theories Related to the Learning Techniques/Strategies Used in Memorisation

The method of memorising the Quran is a series of structured and systematic actions that aim to achieve learning objectives with steps structured in short time blocks. The idea to adapt some of the traditional methods suggested by Darul Quran, JAKIM in Yaacob et al. (2019) into a proposed framework is illustrated in Figure 1 with some learning theories such as:

- a. Dual-Coding theory: The multi-sensory approaches promote variegation regarding the learning styles, teaching and learning methods. It can be done by combining written and pictorial annotations and will have a differential effect on the learning performance of students with different verbal and visual abilities.
- b. Rote Learning theory: Saleem (2018) claimed that students repeat and rehearse the recitation of the Quran to preserve and maintain it in memory because they do not understand the 'meaning' to assist them in memorisation.
- c. Self-Determination theory (Intrinsic Motivation): A metatheory of human personality and motivation concerned with how the learner interacts with learning subjects for a certain period. It defines intrinsic and extrinsic motivation (Böckle et al., 2018). Thus, it is required to motivate learners to keep repeating their memorisation (Murajaah).
- d. Constructivism Learning theory (Active Learning): The basis for using educational games to enhance learning is supported by the ideas of constructivism. Constructivism learning theory is based on the idea that learning is an active process in which the learner builds new knowledge based on prior understanding and experience (Rouse, 2013).
- e. Self-Monitoring theory: This is one of the strategies involved in a self-regulatory learning process. Two essential criteria for self-monitoring are regularity and proximity

(Schunk, 2012). Regularity means monitoring behaviour continuously rather than intermittently. Proximity means that behaviour is observed during the incident and not soon after. In conclusion, monitoring activities include the following activities such as checking the level of understanding, predicting outcomes, evaluating the effectiveness of effort, planning activities, deciding how to estimate learning time, revising, or switching to other activities to overcome difficulties. Hence, it could allow students to improve their work (e.g., revise work for a better grade), use different evaluation forms, and conduct assessments privately.

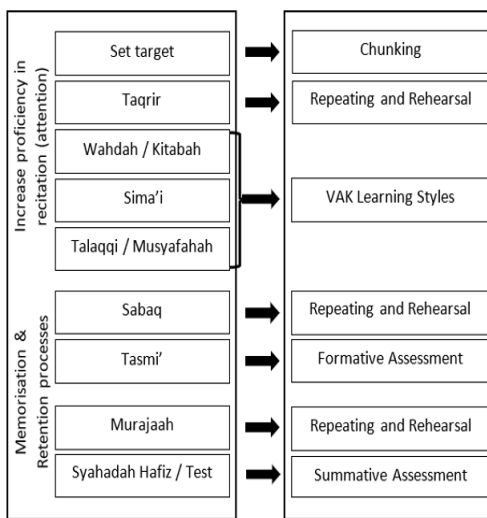


Figure 1. The illustration of Quranic memorisation processes

Figure 1 illustrates the Quran memorisation processes that use common practical techniques in the Malaysian Model of Al-Quran Memorisation Method (Ahmad et al., 2019). The process begins with the 'attention' process to the achievable target of memorising parts of the Surah which will later accumulate to completing all 30 Juzuk of the Quran. The determination of memorisation rates and limits depends on the students' varied abilities that require chunking as one of the most used learning strategies to maximise memory function. It involves organising information according to specific criteria in a meaningful way that could enhance the ability of the mind to process the

information consecutively, as noted by Frankenmolen et al. (2018) in Shukri et al. (2020). 'Attention' in Quranic memorisation refers to the focus given to the information that is kept in the memory through visual, auditory, and kinesthetic (VAK) sensory senses, which is crucial in ensuring the accuracy of the processed information when transferred to Long Term Memory (Shukri et al., 2020). It includes reciting the verses fluently and correctly (according to Tajweed rules) before memorising, writing the verses on paper before memorising, reciting the verses with others and teachers, and listening to the verses from the cassette, CD or MP3 before memorising (Yaacob et al., 2019). All these processes are repeated (Taqrir) as often as possible to increase the proficiency of recitation during the memorisation process later.

Repetition and rehearsal are inherent parts of memorisation. Anwar (2019) explained that repetition of the Quran verses has three forms: 1) repetition of new verses (Sabaq); 2) repetition of old verses (Murajaah); and 3) overall repetition of the memorised verses

(Syahadah) in two ways: Syafawi (oral) and Tahriri (writing). Rehearsing information keeps it in Working Memory (WM) but does not necessarily elaborate. Hence, a distinction can be drawn between maintenance rehearsal (repeating information over and over) and elaborative rehearsal (relating the information to something already known) (Schunk, 2012). Besides, the emphasis on the role of repetition and rehearsal in memorising the Quran is in keeping with the claim that repetition of sequences in Short-Term Memory (STM) is necessary for chunking in phonological Long-Term Memory (LTM) as consolidation of information in LTM.

Lastly, formative and summative assessments evaluate the performance or progression of students' memorisation. Formative activity is assumed as similar to the Tasmi' test. At the same time, Syahadah (as the final evaluation) is considered a summative evaluation after the summative assessments are completed. The student's progression is evaluated based on certain levels, from the easier to the difficult stages, according to students' abilities.

Phase 2: Design

In the second stage, a conceptual framework named Gamification Learning for Al-Quran Memorisation (GLAM-Q) was designed based on the memorisation techniques, learning strategies and adaptive gamification elements. The game mechanics must be designed with structured learning activities that include summative and formative assessments to capture the learning analysis in memorising the Quran. The summative evaluation provides information on activities such as assessments or certification. Meanwhile, formative assessment consists of learning activities in which students act (e.g., respond to questions) and receive feedback on the quality of their efforts. It provides students with direct information about their learning and performance and direction for improvement (to tell them what they can do to improve their learning).

A variety of methods exist to conduct formative evaluations during the learning process. In this study, the researchers proposed three categories of assessment methods: 1) Fill in the blank; 2) Sort; 3) Guess the location. The goal is to monitor student learning and to provide ongoing feedback that can be used to improve their Quranic memorisation. This study used game mechanics, dynamics and aesthetic elements in formative assessment activities. All game components have been applied to make the GLAM-Q application more engaging and entertaining. Table 1 shows the details of the mechanics, dynamics and aesthetic components. In addition, these formative assessments were classified into three difficulty levels: easy, intermediate, and challenging, as shown in Table 2.

Table 1

Summary of game mechanics, game dynamics and game aesthetics used

Game Mechanics	Game Dynamics	Game Aesthetics	Purpose
Point/Score/ Badges	Reward	Achievement/ Motivation	Scoring offers learners clear feedback on how well/poorly they are learning. It ties to their progress in learning. Learners with the best scores receive rewards such as badges, achievements, or redeemable rewards to boost their motivation in learning activities.
Level/ Challenge	Feedback/ Restrictions	Status/ progression	Learners are challenged to complete the first level of memorisation to continue to the next stage. It indicates that an individual has achieved better achievement and progression. In addition, the level is used to identify the achievement status of a particular learning task.

This study accepts the MDA (mechanics-dynamics-aesthetics) framework as a model of the main structural components of gamification as it has been seen as a common framework for in-game system design and gamification (Sezgin & Yüzer, 2020). Game mechanics are basic functional components that include actions, behaviours, and controls used to ‘gamify’ learning activities to stimulate certain emotions of learners. Meanwhile, game dynamics result from desires and motivations that reflect the emotions stimulated by the game mechanics. Feedback and support, restrictions, and progressions are among these dynamics. Finally, aesthetics emphasizes students’ feelings during and at the end of the memorization process, such as feelings of achievement, joy or happiness for achieving the desired target.

Table 2

Framework

Difficulty Level	Formative Activity	Purpose
Easy	Fill in the blank	Completing the unknown verses in the correct order
Intermediate	Sort	Arranging the order of unsorted verses according to their location numbers
Difficult	Guess the location	Randomly guessing the verses according to the given location number

The conceptual framework named Gamification Learning for Al-Quran Memorisation (GLAM-Q) for designing and modelling a Quran Memorisation application is shown in Figure 2. It was designed based on the relevant learning theories (as discussed above), learning techniques/strategies (such as chunking, mnemonic and mind map) and gamification elements (namely game mechanics, game dynamics and game aesthetics) used for the assessment in formative and summative activities (as explained in the previous section).

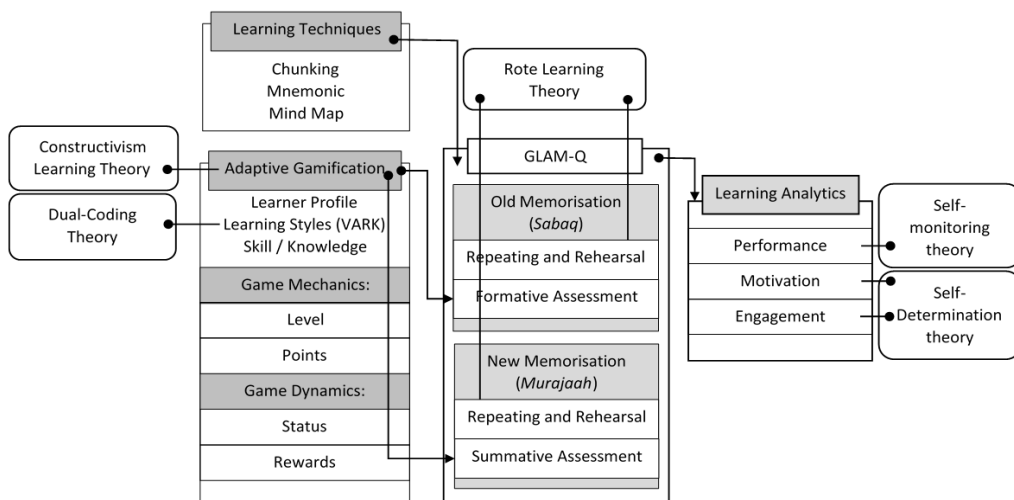


Figure 2. The conceptual framework of GLAM-Q

RESULTS AND DISCUSSION

Phase 3: Evaluation

In the third stage, a proposed conceptual framework was evaluated to get experts' relevant criticism and recommendations from multiple areas of expertise. The experts were selected based on several criteria as follows:

1. Expertise either in Instructional Design or User Experience (UX) or Mobile Application or Multimedia or Computer Science (CS) or any related areas, and/or
2. Have been researching Quranic memorisation and/or
3. Have been doing research in gamification or game-based learning and/or
4. Have been doing research/teaching in Multimedia, IT, or CS areas for at least 5 years.

Eight experts from multiple fields reviewed the proposed conceptual framework to collect the relevant criticisms and recommendations for improving the conceptual framework. The evaluation emphasized the personal opinions of experts and their perceptions using a 5-point Likert Scale: Strongly Disagree, Disagree, Somewhat Agree, Agree, and Strongly Agree. The analysis for each component is interpreted in Figures 3 to 7.

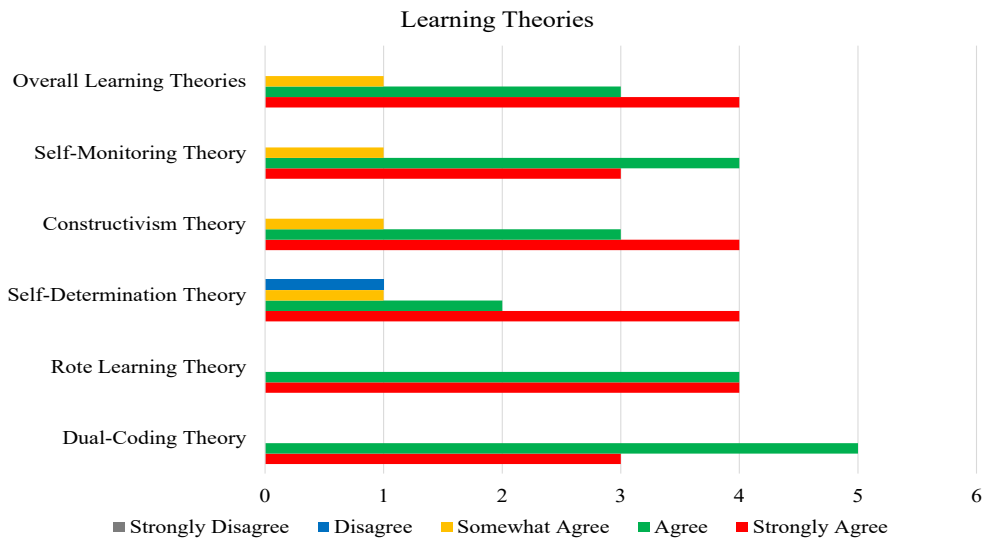


Figure 3. Learning theories

The underpinning theories that support Quranic memorisation through gamification application ensure that learners can improve their learning performance. Five underpinning theories have been focused on: Dual-Coding theory, Rote Learning theory, Self-Determination theory, Constructivism theory, and Self-Monitoring theory. Figure 3 shows the expert review analysis of learning theories applied in a conceptual framework. The overall result concludes that 50% (four experts) strongly agreed, 37.5% (three experts) agreed, and 12.5% (one expert) somewhat agreed with the proposed learning theories. Expert 1 commented that she strongly agreed if theories related to attitudes and behaviours were considered in improving student performance to be more positive-minded and enthusiastic in memorising. Meanwhile, Expert 3, who gave a response of somewhat agreed, mentioned that the proposed theories should align with the needs of education and gamification. Besides, she suggested it is unnecessary to include many learning theories in the framework. Nevertheless, all experts agreed that all these theories should not be removed from the framework.

The learning techniques summarise and visualise the Quran verses coherently, which will significantly impact understanding, memorising, and practising them as needed. Three learning techniques were recommended in memorising the Quran: chunking, mnemonic and mind map. Most of the experts agreed that the learning techniques in the proposed conceptual framework were compatible and relevant, except for Expert 6, a Quran teacher who was not sure how these techniques would be applied later. Statistically, Figure 4 shows the expert review analysis of learning techniques applied in a conceptual framework. The overall result concludes that 37.5% (three experts) strongly agreed, 50% (four experts)

agreed, and 12.5% (one expert) somewhat agreed. In addition, Expert 1 suggested storytelling as an additional method to attract student interest and improve the students' retention in memorising.

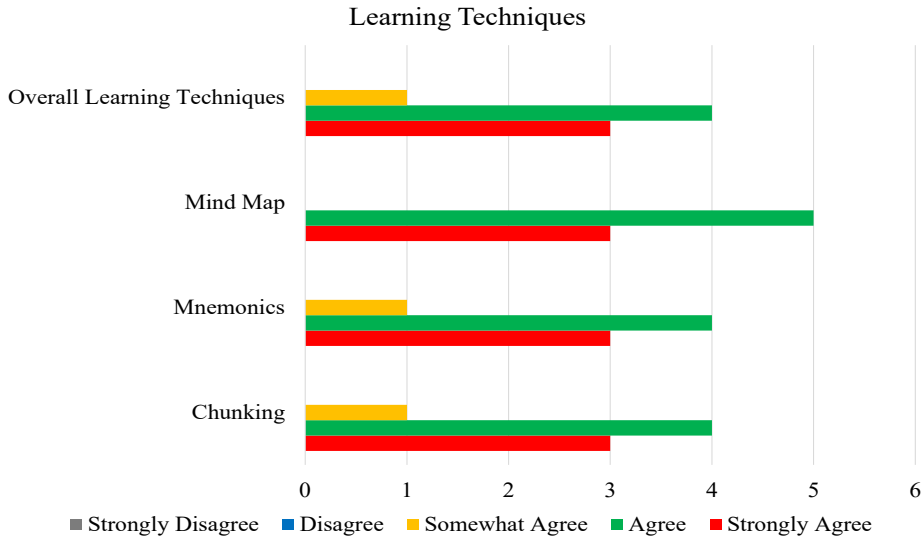


Figure 4. Learning techniques

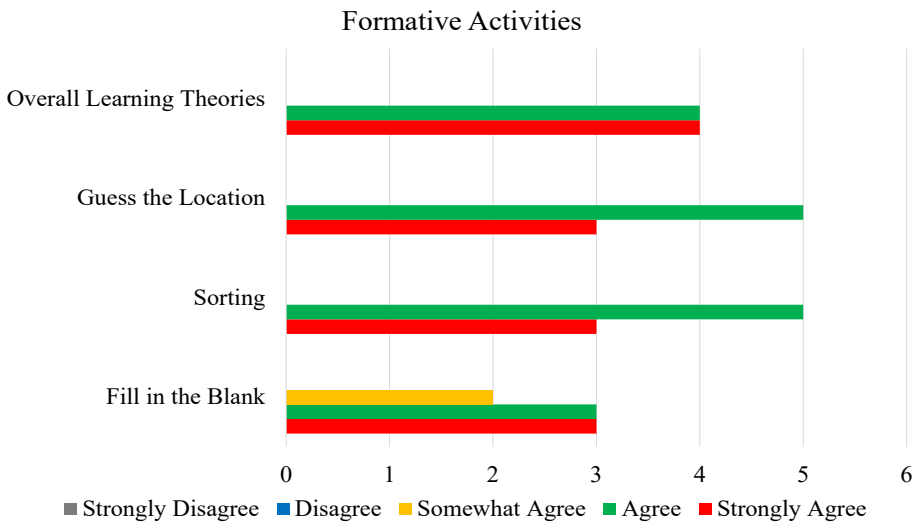


Figure 5. Formative activities

Various methods are applied to conduct formative evaluations during the learning process. The goal is to monitor student learning and to provide ongoing feedback that can be used to improve their Quranic memorisation. The formative assessment was classified into three difficulty levels: easy, intermediate, and difficult. Three formative activities have been proposed in the three assessment levels: completing the unknown verses in the correct order (fill in the blank), arranging the order of unsorted verses according to their location numbers, and randomly guessing the verses according to the given location number. Expert 1 suggested that rewards should be given to encourage students' motivation in each activity. Figure 5 shows the expert review analysis of formative activities suggested in a conceptual framework. The overall result concludes that 50% (four experts) strongly agreed and agreed that the activities were compatible and relevant to the framework. In addition, none of the experts agreed that assessment activities should be excluded from the framework. Nevertheless, Expert 3 suggested that the interface design should conform to human-computer interaction principles emphasising usability and user experience.

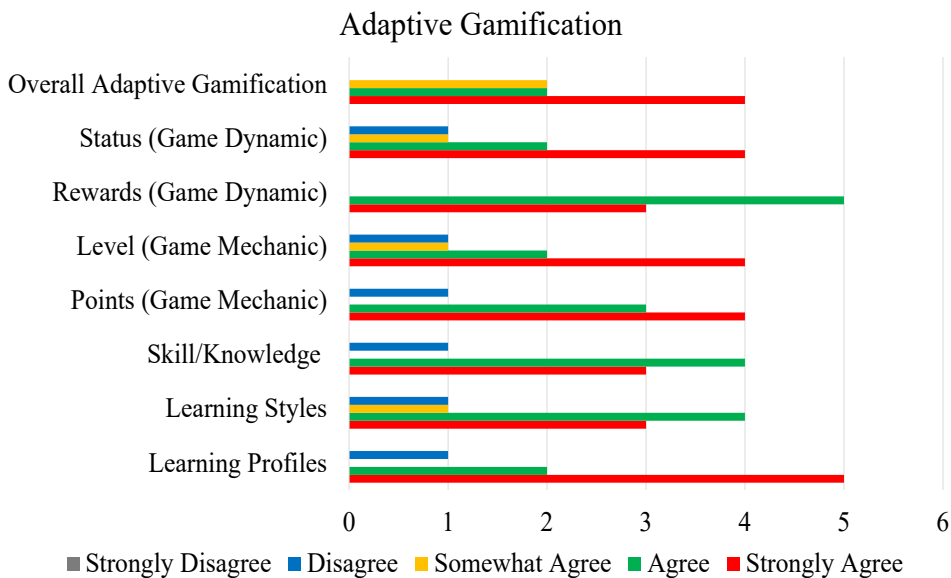


Figure 6. Adaptive gamification

Adaptive gamification addresses personalised incentive mechanisms tailored to particular characteristics of different users and contexts in order to optimise gamification effects. Three input components were considered, which are learner profile (e.g., age and gender), learning style (e.g., visual and auditory) and skill/knowledge (e.g., beginner, intermediate and advanced). Meanwhile, game mechanics are the actions, behaviours, and controls used to ‘gamify’ learning activities to stimulate certain emotions in the

learner. Game mechanics must be designed with structured learning activities that include summative and formative assessments. Lastly, game dynamics result from desire and motivation that reflect the emotions stimulated by the game mechanics above. Figure 6 shows the expert review analysis of adaptive gamification suggested in a conceptual framework. The overall result concludes that 50% (four experts) strongly agreed, 25% (two experts) agreed and somewhat agreed, respectively. The experts who answered somewhat agreed and advised that the mechanic and dynamic elements should further clarify their significance in this study.

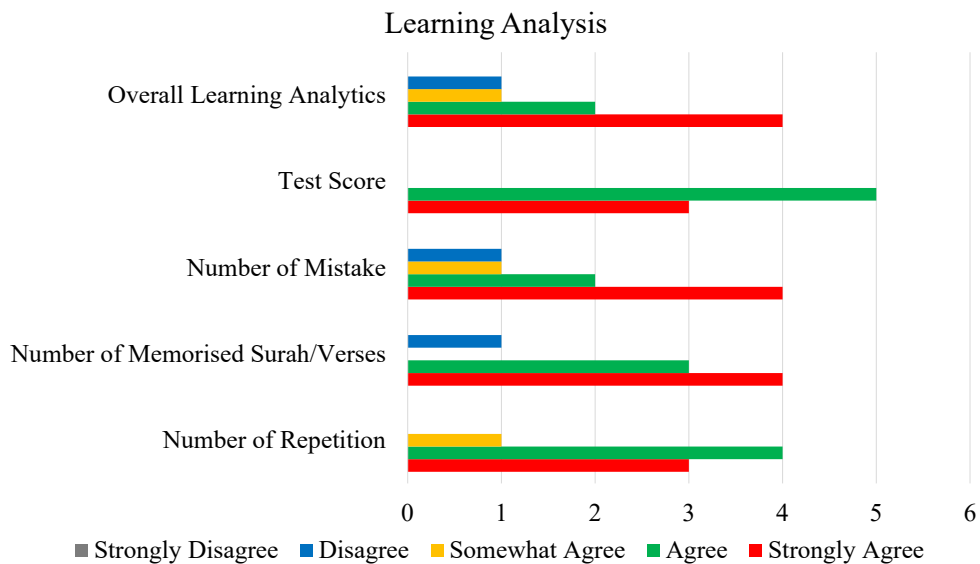


Figure 7. Learning analysis (for motivation and progression)

Dashboard analysis relies on time spent, score, and some assessment at the end of each game for immediate reflection and feedback on the student’s performance that is tracked from the learning environment. The four parameters that will be captured during the memorisation process are as follows: 1) the statistics of rote memorisation (the number of repetitions), 2) the number of memorised Surah/verses, 3) the number of mistakes, and 4) test score (or the overall progression of summative assessment). Figure 7 shows the expert review of learning analysis parameters suggested in a conceptual framework. The overall result concludes that 50% (four experts) strongly agreed, 25% (two experts) chose to agree, and 12.5% (one expert each) evaluated somewhat agreed and disagreed, respectively. Based on the review, none of the experts agreed that assessment activities should be excluded from the framework. In addition, Expert 2 commented that there was a need to add the parameters of learning analysis because of its relevance to the periodic monitoring of student progress.

As a conclusion to the overall results obtained, the authors have concluded the following points:

- 1) All of the reviewers agreed that the connections and flows of all five components are understandable to describe the overall structure of the conceptual framework.
- 2) The conceptual framework proposed is usable for developing prototype applications specifically for self-learning Quranic memorisation.
- 3) None of the components proposed in the conceptual framework need to be removed. However, a reviewer suggested that it is crucial to ensure that only essential theories are applied.
- 4) Fun (aesthetic in gamification) is relevant to make Tahfiz students enjoy themselves and not under pressure when learning the Quran. Nevertheless, most reviewers emphasized the learning engagement and motivation (LEM) of students to keep students' positive attitude in memorising. In addition, they proposed to consider the aspect of usability (e.g., ease of use, learnability, efficiency, and satisfaction) and user experience (e.g., motivation, enjoyment, and pleasure).
- 5) Memorisation requires high imagination. Therefore, it requires additional formative activities (such as filling in the blanks, sorting, and guessing the verse locations).

CONCLUSION

This article briefly introduced the exciting new class of Quranic memorisation applications with effective memorisation strategies and gamification elements. Due to face-to-face constraints during this pandemic, a GLAM-Q conceptual framework specifically for self-learning is an alternative solution that can be used in Quranic memorisation to improve learning motivation and interest among the younger generation. The gamification elements must be designed with structured learning activities that include summative and formative assessments, which allow students to receive instant feedback about their progress to capture the learning analysis in memorising the Quran. We are very excited about the impact and potential that such a dashboard provides to increase motivation and encourage the learning activities to be more fun and interesting. Therefore, the next step of this research will be to design a prototype that captures learning analysis in memorising the Quran. It is important to realise that future analysis to understand and obtain useful results should focus on usability issues and seriously investigate the users' motivation or interest in engaging with this new technology.

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