

## Developing mobile game application for introduction to financial accounting

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### ABSTRACT

The financial accounting subject is one of the core subjects that is essential for any accounting student. However, this subject is perceived as boring and difficult to comprehend particularly for students who lack in the accounting knowledge. The aim of this research paper is to present the adoption of the gamification learning concept in designing and developing a mobile game application to cultivate better understanding in the financial accounting subject. This mobile application was developed for Android operating system and was designed using the modified game methodology. Further, this mobile application was subjected to several testing phases using numerous participants. The results indicate the adoption of gamification has aided the students in understanding the financial accounting subject. Furthermore, the participants also indicated that learning using gamification has encouraged them to think critically which then allowed them to better comprehend the financial accounting subject. The development of this mobile game application also contributes to the gamification literature which is vastly used in learning, and its advantages in improving the understanding of how games can be adopted to foster better understanding in the financial accounting subject.

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## 1. INTRODUCTION

In recent years, the vast development of information and communication technology (ICT) has not only impacted the industrial economic world but has also significantly impacted the world of education. The advancement of technology is changing the dynamics of the learning process from various aspects such as the access to educational resources, methodology and connection with students. In recent years there has been several changes to the design and delivery of learning materials to students. These changes mainly focus on greater interest in a student-centered approach. This is because the use of ICT in the learning environment can be one of many suitable tools to increase student-centered self-learning processes progressively [1]. One of the most popular techniques in fostering student-centered learning is the game-based learning also known as gamification [2]. Defines gamification as “an informal umbrella term for the use of video game elements in nongaming systems to improve user experience (UX) and user engagement” (p.2).

Gamification uses the game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems. Games have been suggested to provide more effective learning by bringing more fun, appeal, and learner-centred environments [3], [4]. Furthermore, the gamification technique also promotes better critical thinking skills, in subjects like financial accounting. Financial accounting is one of the core subjects that is essential for students who wish to further their careers in the accounting field. Among the topics covered in this subject are: a) income statement, b) balance sheet, c) statement of cash flows, and d) statement of shareholders' equity.

Financial accounting helps prepare students with values relating to the fundamental practices of the accounting discipline, which then helps them to understand the commercial activities that contribute to the economic development of a country [5]. However, studying financial accounting is interpreted as boring and difficult to understand especially for students who lack background knowledge in accounting. Furthermore, financial accounting cannot be mastered by mere memorization of the basic rules, it requires total determination, sound theoretical knowledge and frequent practice in application [6]. Students learning financial accounting are also exposed to problem-solving activities which is an essential part of the accounting profession. However, if the student feels that learning financial accounting is boring and finds it difficult to grasp the essentials of problem-solving activities, this then may lead to students struggling to understand the whole theoretical concept of financial accounting [3]. The adoption of the gamification technique in the financial accounting subject, is said to have a positive impact as it: a) immediately puts a background to the knowledge learnt, b) provides feedback, and c) evaluates students' scores immediately [7]. The adoption of gamification in accounting allows the students to visualize themselves in an actual business situation [8], [9]. This is an advantage as students can spread their knowledge to explain business accounting matters and grow their critical reasoning skills over game actions which is seen as an vital aspect in understanding the financial accounting subject.

## 2. LITERATURE REVIEW

Gamification can be described as applying the mechanics of games to make learning more fun [10]. Studies have suggested that using gamification approach in students' learning processes can help promote students' interest, motivation, perseverance, and thinking skills [11], [12]. Gamification approach can also improve learning and social interactions as students need to collaborate with other players in completing the structured tasks [8], [13]. Apart from making learning more interesting, gamification approach also promotes students to be more motivated to participate in the game and it enhances their cognitive growth, such as factual knowledge [14], increase problem-solving skills and ability to apply concepts and principles [10], [15]. Games have the potential to excite students' interest in content as well as engage them in classroom discussion [16]. Passive students as well as those who require extrinsic motivation find games particularly appealing. The use of gamification has also been promoted in the active learning pedagogy. Active learning is a pedagogical approach that combines the learning efficiency with effectiveness of interaction for learning which can be put into practice using gamification [17], [18]. The effectiveness of gamification in active learning has gained increased importance in accounting education, with much evidence pointing to better outcomes in the financial accounting subject [19]-[21].

In recent years, there have been great developments in the adoption of gamification especially for financial accounting subjects [22]-[24]. Although, there are many advantages in this adoption, there are also several drawbacks which if not addressed promptly might result in the failure to enjoy the benefits of using gamification in education. One of the major drawbacks, is the quality of the game itself [25]. The quality: a) of the games needs to be designed so that students can repeat them in case of an unsuccessful attempt, b) of the game feedback should be a motivation for their further students' activities, and c) of the game scenario itself needs to be more trivial. Furthermore, motivators elements like badges, and leaderboards are not helpful for students who are not naturally competitive, and if these elements have a central role, non-competitive students will lose their interest.

Therefore, this research project aims to design and develop a mobile application that combines the gamification concept features with the hope of being able to provide a more profound learning experience in accounting education. The development of this mobile application will focus on the financial accounting subject as a proof of concept. The objectives of this research project: a) to develop a sound practical mobile application using the gamification concept feature, and b) to provide a better-quality gamification concept feature in the mobile application. In recent years, there have been great advancements in technology which resulted in several changes in accounting education, such as several international accounting bodies have suggested to accounting educators to adopt a more active learning teaching strategy that integrates the creative use of technology in the accounting curriculum [11], [26]. This suggestion is in line with [27] who recognizes student engagement and active learning as important factors in improving teaching and learning.

Thus, this is in line with the main aim of this project, which is to develop a mobile application as an alternative learning tool that will leverage the immersive nature of gamification.

**3. RESEARCH METHOD**

The main objective of this research project is to develop a mobile game application that adopts a gamification approach in which the students can develop their interests to learn the financial accounting course. To achieve this objective, this research project adopted the agile scrum development methodology proposed by [28]. The usage of this methodology helps to: a) determine if the development of the mobile application achieves the main goal, b) determine if the newly developed mobile game application can reach the targeted audience (i.e., students), and c) determine the appropriateness of the gamification technique in the newly develop mobile game application. There are three phases of the agile scrum game methodology which include the: a) pre-production, b) production, and c) postproduction. Each phase consists of different sets activity, that needs to be fulfilled to complete the development cycle of the mobile game application. The following sub section will briefly explain each of the phase.

**3.1. Pre-production (planning)**

A game mobile application must conjugate to the users by having applicable features and an instinctual user interface, that promotes the gamification technique. As such, preceding to developing this mobile game application, a methodical and through literature review was steered. The findings from this methodical review revealed several elementary features and information which was very much needed and was used throughout the progress process of this project.

**3.2. Pre-production (design and develop)**

This phase designs and develops the mobile game application. Further, this phase also details out the software requirement for designing and developing this mobile application. This mobile application was developed using android studio package combined with Java as the programming language. Other softwares used in this development is Unity, Adobe Photoshop, Mono-Develop, and Audacity. In production phase, the project flow and architecture is also formulated. The project architecture is a graphical diagram that represents a set of concepts and to show the overview including the principles, elements, and components that are involved in the development to create the project. This project architecture diagram is important to understand and clarify the system structure that is to be used in the mobile application development. The project flow and architecture diagram is shown in Figures 1 and 2 respectively.

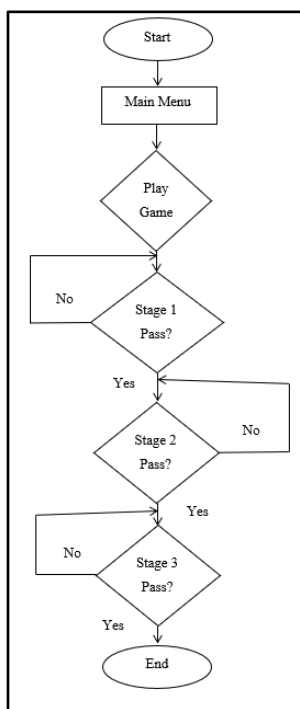


Figure 1. Project flow

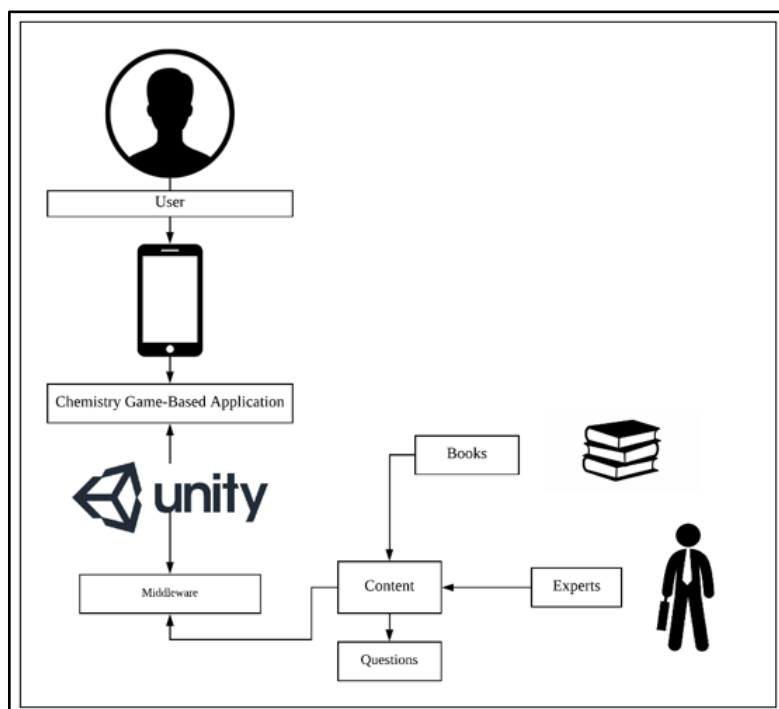


Figure 2. Project architecture

### 3.3. Post-production

The post-production phase, the newly develop mobile application will undergo an overall game functionality testing. Overall functionality testing is a systematic process to determine the quality and effectiveness of the final product. The test must be performed, to capture information if the project brings benefit and meets the requirements and expectations from the users. Once these testing are completed, a review process will also be performed. This process is vital to analyze as there may be a need for further improvement.

### 3.4. User interface

The user interface acts as a mediator between the user of the mobile application and the real system. Each of the user interface in this application is developed grounded on several important aspects in the gamification concept. Figures 3-6 shows each of main interfaces in this mobile application.



Figure 3. Main screen



Figure 4. Gameplay screen (easy level)

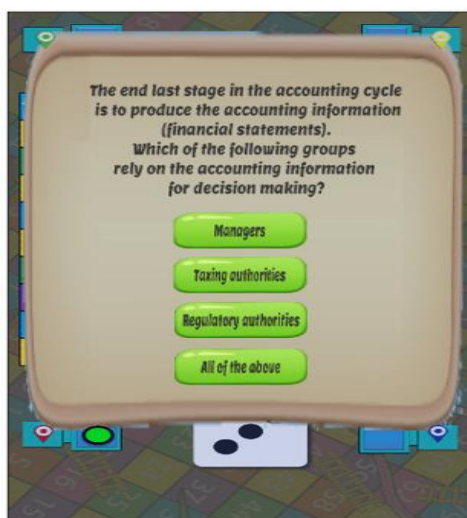


Figure 5. Question (easy level)

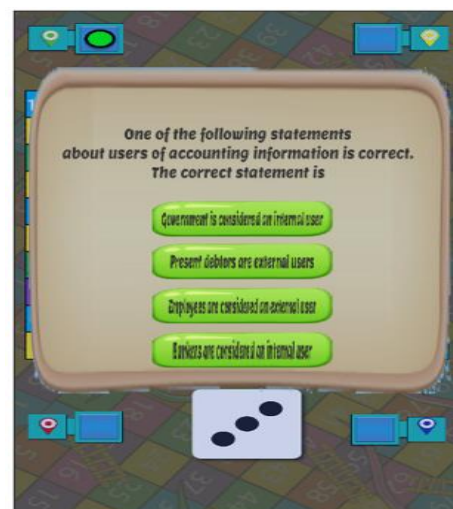


Figure 6. Gameplay screen (advance level)

## 4. RESULTS AND ANALYSIS

In this section, the results of the testing phase (post-production) is illustrated in the following figures. This mobile application was tested using 30 participants who were taking the financial accounting subject at a local Malaysian university. In this testing phase, participants were evaluated in 4 areas mainly:

a) the overall design of the interfaces, b) participants overall satisfaction of the mobile application interfaces, c) participants experience, and d) the overall participants learning experience.

Figure 7 shows all the respondents agree that the mobile application interface is well designed and easily helps respondents to navigate between screens. Furthermore, the respondents also agree, that the mobile application has pleasant colours and suitable font size for the title and instructions on each interface screen. Next, in Figure 8, most respondents agree the content of the mobile application is relevant to the financial accounting subject. This is a clear indication, that the contents presented in this mobile application is of a good quality and meets the main aim of this project development.

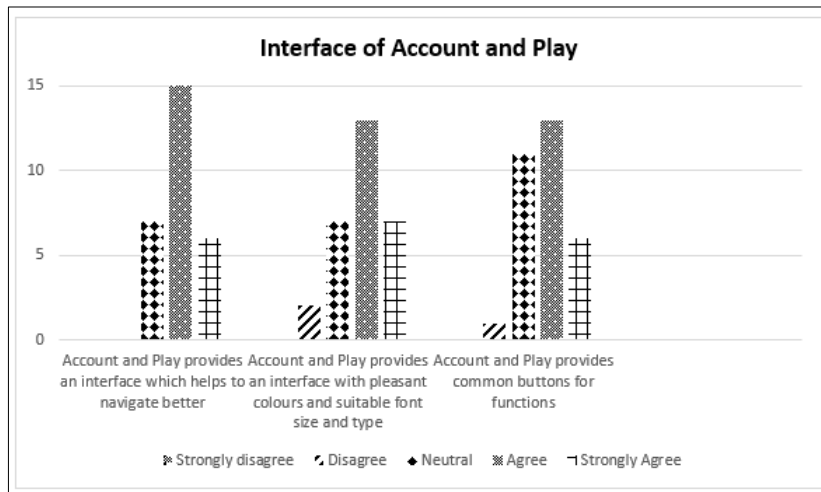


Figure 7. Overall design and interface

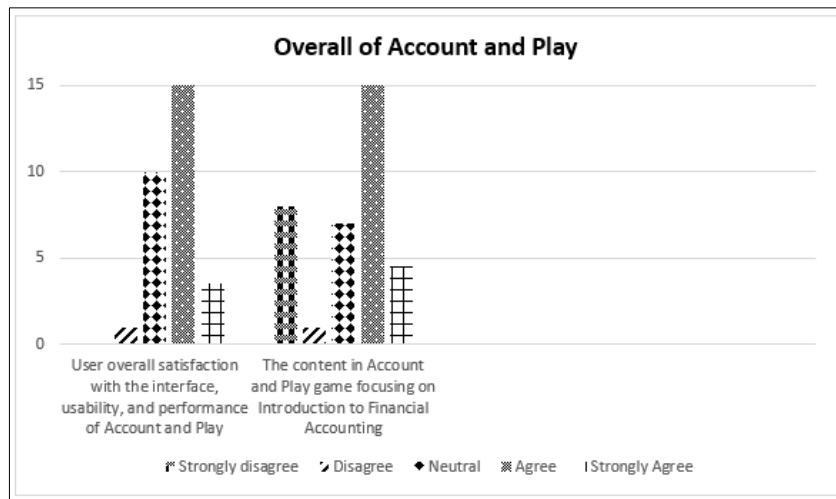


Figure 8. Overall content

Figure 9, highlights the respondents experience using this mobile experience. Majority of the respondents agree that the mobile application is not dull and boring. This is another clear indication, that illustrates the development of this mobile application has met the aim of providing a fun and entertaining method in learning the financial accounting subject. Finally in Figure 10, majority of the respondents strongly, agree that this mobile application provides a better experience in terms of the use of the gamification concept and the interactivity provided in this application in helping them to better understand the financial accounting subject.

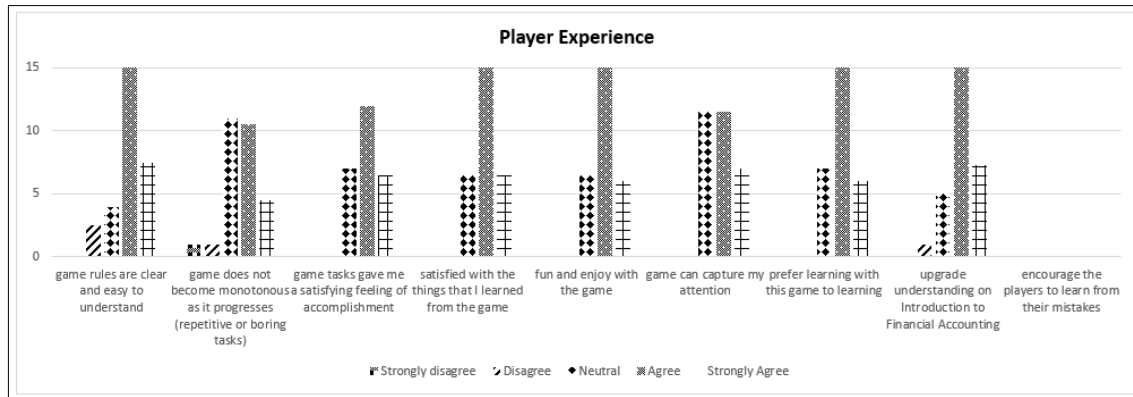


Figure 9. Respondent’s experience

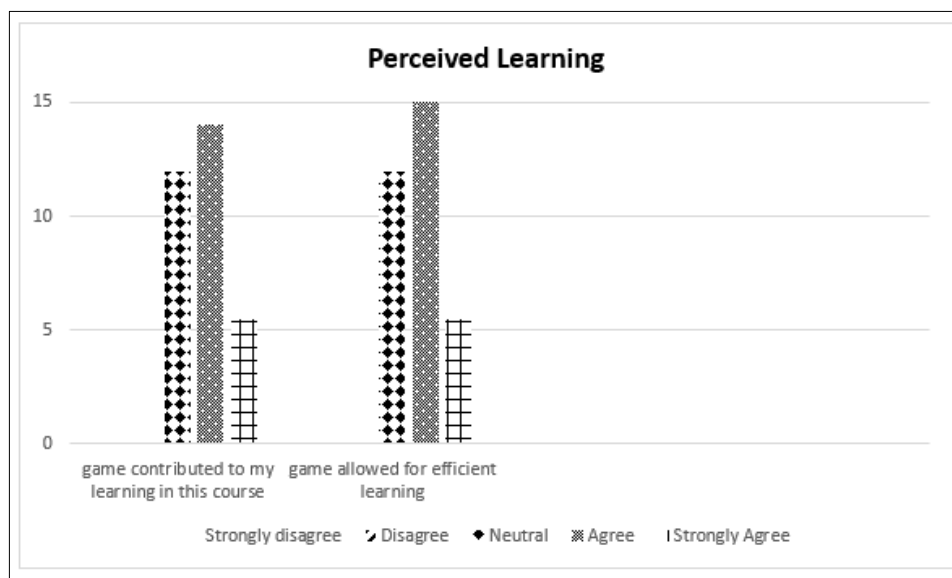


Figure 10. Overall learning experience

**5. CONCLUSION**

This research project is designed to develop a mobile application that merges the gamification concept features which provides students with a self-paced learning program in the financial accounting subject to engage students in a more active learning environment. This mobile application hopes to help motivate and take advantage of the innovation and resourcefulness associated with the gamification learning concept. Furthermore, the content of this mobile application is formally structured, using gamification activities to complement the financial accounting subject. Properly structured contents of this mobile application can also help educators to elaborate complex topics in the financial accounting subject. The gamification features in this mobile application may also offer educators a more fun and interesting teaching and learning paradigm as compared to the non-technological learning paradigm.

Although this research project provides insight into the effectiveness of gamification approach in financial accounting subject, it has some drawbacks as well. The respondents of this research project are merely drawn from one Malaysian university. Future research might need to extend this research to broader respondents, so that the positive effect of gamification on the financial accounting subject can be generalized. As future work, it would be interesting to implement more: a) gamification mechanisms and b) real-world content in financial accounting subject which may help students to be more confident in the subject matter. generate excitement and have a sense of communal pleasure.

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