THE IMPLEMENTATION OF MOBILE APPLICATION GAME ENVIRONMENT TO ENHANCE CHILDREN MENTAL CALCULATION SKILLS

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DEDICATION

I would like to dedicate this thesis to CEO Kids Centre who have been supportive towards this project and providing me opportunity to perform this project's testing with their students. Also, this thesis is also dedicated to my supervisor, Dr Ahmad Naim Bin Che Pee @ Che Hanapi who have been supporting me throughout this project.

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ACKNOWLEDGEMENTS

I would like to express my utmost gratitude to my supervisor, Dr. Ahmad Naim Bin Che Pee @ Che Hanapi for providing me this opportunity to propose and develop this project along with his guidance, assistance, suggestions and advices. Secondly, I would like to thank CEO Kids Tuition Centre for giving me permission to conduct my 5-days long testing with their students and teachers which helped me in collecting useful data for this project.

Also, I would like to show my gratitude to my evaluator, Mr Nazreen Bin Abdullasim for giving me various useful suggestion and improvement could be made for my product after evaluating it. Lastly, I would also like to appreciate the support and assistance given by my family and friends who often provide me with technical, physical and mental support whenever I faced problems.

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THE IMPLEMENTATION OF MOBILE APPLICATION GAME ENVIRONMENT TO ENHANCE CHILDREN MENTAL CALCULATION SKILLS

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This report is submitted in partial fulfilment of the requirements for the Bachelor of Computer Science (Interactive Media)

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ABSTRACT

Mathematic is a subject where every school consider it as an important subject which every student should be able to master it. Yet, it is found out that the students are becoming weaker in the subject and this is due to the lack of interest in the subject itself which caused students to avoid it. Thus, this project is carry out to investigate the use of game environment for enhancing basic mathematical calculation skills, design and develop the mathematical calculation game and finally evaluate the effectiveness of the game. For this project, a mobile game which utilise the android platform entitled "Jump!" will be developed. The main target user will be primary school students focusing on standard 2 while the topic covered will be the addition, subtraction and multiplication of number within 10. Before the game is developed, several existing systems is researched and compared to understand the function and objective of the game to be developed. For this project, AGILE model is used as the project methodology due to its adaption to constantly changing situations.

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ABSTRAK

Matematik merupakan satu subjek yang dianggap sebagai salah satu subjek yang penting oleh setiap sekolah yang harus dikuasai oleh setiap pelajar. Namun demikian, terdapat pelajar yang menjadi semakin lemah dalam subjek ini. Ini disebab oleh kekurangan minat dalam subjek tersebut dan ini menyebabkan pelajar mengelakkan diri daripada subjek tersebut. Oleh itu, projek ini dijalankan untuk menyiasat mengenai penggunaan persekitaran permainan untuk meningkatkan kemahiran pengiraan matematik asas, mereka bentuk serta membangunkan permainan pengiraan matematik dan akhirnya menilai keberkesanan permainan tersebut. Untuk projek ini, satu permainan mudah alih yang menggunakan "Android" sebagai platform bernama "Jump!" akan dibangunkan. Sasaran utama merupakan pelajar sekolah rendah terutamanya pelajar darjah 2 manakala topik yang dilindungi adalah penambahan, pengurangan dan pendaraban nombor dalam 10. Sebelum permainan ini dibangunkan, beberapa system yang sedia ada akan dikajikan dan dibandingkan untuk memahami fungsi dan objektif permainan yang akan dibangunkan. Model AGILE akan digunakan sebagai metodologi projek oleh sebab penyesuaiannya terhadap keadaan yang sentiasa berubah.

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CHAPTER I

INTRODUCTION

1.1 Introduction

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Mathematic is defined as the abstract science of number, quantity, and space either as abstract concepts or as applied to other disciplines such as physics and engineering. In Malaysia, Mathematic is a core subject in every school and is considered as one of the crucial subject that every student should master. Based on the Malaysia Education Blueprint 2013-2025, around 63% of students received average and fail grade in UPSR at 2011. Despite being weak at mathematic, students often avoid doing mathematic exercises. All of this because they thought Mathematic as a boring subject and discourage them to focus on it. Thus, it is important that another approach is taken to regain student's interest towards Mathematics and encourage them to involve in more exercise. This project is aiming at developing an educational game entitled "Jump!" which will be targeting primary school students especially standard 2 students. Jump! will be presented as a mobile game and only available for android. The content of the game will be covering basic mathematics operation which is addition, subtraction and multiplication. Jump! is developed with 3 main objectives

which is to investigate a different approach to replace the traditional learning tool for enhancing basic mathematical operation, to design and develop the game and finally evaluate the game. The process of developing Jump! will begin with designing phase then development phase and finally testing phase. To develop this game, several software is used which is Adobe Illustrator, Adobe Photoshop and Unity.

1.2 Problem Statements

The main problem for this project is that the students nowadays have less interest in Mathematic subject and they tend to avoid Mathematic related exercises. As a result of their actions, their curriculum will be affected as they will have problem understanding a deeper mathematic knowledge due to their weak foundation for basic mathematic. This is also stated in a research done by Jane and Effandi (2012), where they stated that learning of basic mathematic at an early stage is the foundation to understand advanced level of mathematics concepts. Exposure toward basic mathematics knowledge should be given to student at a young stage as it plays a vital role in learning mathematics into a more advanced level. Tarzimah and Thamby (2010) also stated that many students do not have the basic mathematic skills they should have which were needed in problem -solving where many mathematic skills are involved. The reason behind why students often avoid doing mathematic exercise is due to many reason but mostly is related to the boredom of mathematic and also having a huge impression on Mathematic being a tough subject. Diena Rauda Ramdania *et al*. (2016) said that students dislike mathematics and considered it as a difficult subject is mainly due to them paying attention only to the formulas written by teacher on the board during mathematic lessons. By copying the formulas down and does not fully understand it had causes students to feel confuse on when and how all the mathematic skills can be used.

1.3 Objectives

The objectives of this project are:

i. To investigate the use of game environment for enhancing basic mathematical calculation skills.
ii. To design and develop the mathematical calculation game.
iii. To evaluate the effectiveness of the game in enhancing basic mathematical calculation skills.

1.4 Scope

Jump! will be a mobile game which will be playable on Android platform. The game's main target user will be primary school students especially standard 2. Other than the main target user, preschool students and higher level education students with weak mathematical skills are targeted as well. The content of Jump! will be covering 3 basic mathematic operation which is addition, subtraction and multiplication.

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1.5 Project Significant

If Jump! is developed successfully, it could help students to do exercises on addition, subtraction and multiplication while having fun. Furthermore, this game will also train the user's hand-eye coordination, work under pressure and train their brain to stay focus.

1.6 Conclusion

The final product of this project will be an educational mobile game that will be played by primary school students focusing on standard 2 students in order to assist them in exercising addition, subtraction and multiplication. In this chapter, the topic discussed are introduction, problem statements, objectives, scope and project significant. In the next chapter, we will discuss on the literature review and project methodology.

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CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

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2.1 Introduction

In this chapter, we will discuss in detail regarding the domain, existing system, project methodology and also the project requirement in developing the product of this project. Literature review is the summary of previous project that is similar or related to our project. Literature review helps to support your topic by identifying various studies, models and case studies. Project methodology plays an important role in developing a new system. This is because project methodology allows the developer to be able to identify their methodology in developing the system.

2.2 Domain

As the technology becoming more advanced each year, multimedia technology can be used for teaching and learning in many ways. One of it is Digital Game Based Learning (DGBL) which proved to be much more efficient in learning when the game's quality is good. (Sayed Yusoff *et al.,* 2014) Digital games are originally played for entertainment and is one of the younger generation daily activities nowadays. Digital games can be categorized into several types and the most popular type of games are action, adventure, puzzle, fighting, shooting, role-playing and strategy games.

Digital Game Based Learning can be referred to the integration of game into a learning environment where the game is digital and also act as the central role. According to Marina (2009), Digital Game Based Learning is a type of games that hold educational purpose and subject that have high potential in providing a learner-centred, easy, enjoyable, interesting and efficient learning environment. Sayed Yusoff *et al.* (2014) on the other hand, stated that DGBL is the form of student-centred learning that utilizes digital games for learning purpose while Nor Azan *et al.* (2009) said that DGBL is a concept where the learning content is deliver using digital games as it's medium. It further stated that DGBL is about using digital games at its maximum capacity to engage the end users for a certain objective which in this case is for learning purpose. Aikaterini Katmada *et al.* (2014) also stated that DGBL is a learning approach which combines digital-game activities with educational content.

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Digital Game Based Learning can assist users to learn things in a way which is less stressful. This is because they felt like playing game but at the same time, they are learning or thinking. Furthermore, with certain elements involved such as high score or time, it will encourage the users to be more competitive and thus will think faster and perform better. Aikaterini Katmada *et al.* (2014) stated that digital games had become a necessary role in children lives due to the natural motivational attraction and interest provoked toward them via the elements of fantasy, challenge and curiosity. Wan Fatimah *et al.* (2010) also said in their research regarding Game Based Learning where people learn best when they are having fun and also having a strong motivation to obtain new knowledge. According to Diena Rauda Ramdania *et al.* (2016), when students play games, they feel good when a mystery in the game is solved. The feeling

of “fun” when playing game can be used to be the trigger for the use of game in learning.

However, there are doubt whether the students do learn about something when they are playing game. (Diena Rauda Ramdania, 2016). This is understandable as students care mostly on the “fun” part instead of the educational part. Furthermore, Marina (2009) pointed out that there is several previous research stated that games and traditional method does not have much different. Nor Azan *et al.* (2009) also said that there are difficulties to integrate games into education as it is hard to identify the connection between game and the curriculum, potential benefits and practical integration method.

2.3 Existing System

Before developing the game, research should be done on other game based learning in order to understand the function and objective of the game. From the research, we can obtain advantages and disadvantages of each game and applied it onto our product. Furthermore, we can use these games as our guide in developing our game.

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For game based learning in mathematic subject, there are many games available in the internet and Play Store. However, for this project we will focus on 3 existing systems that have been discover for having similar topic to this project. The existing system are web game named as Order of operation, Web Garden and Choose Math Operation Game.

2.3.1 Order of Operation

Order of Operation is a web game hosted by a website named www.mathplayground.com. Other than Order of Operation, mathplayground also provide other web game. Order of Operation require the player to select any number that is available to obtain the answer using the number operation given.

However, this game lack the element of animation where it could attract the attention of students. Also, the time is not in a proper from which should be either in seconds or minutes. This game also lack instruction regarding how to score and how the score is calculated.

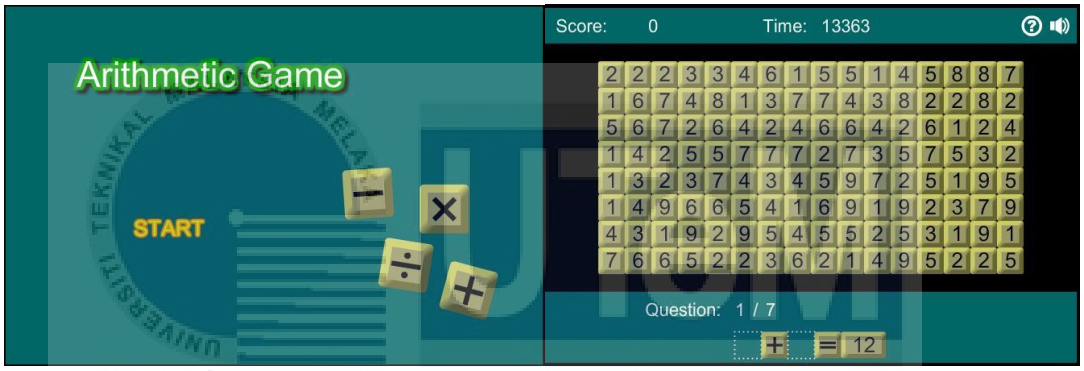

Figure 2.1: Order of Operation

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2.3.2 Math Garden

Math Garden is both a web game and IOS game. Math Garden allow player to choose their mathematic operation and player are required answer all question given within a time given which is resemble as coins. When all the coins were dropped, answer will be revealed and no points will be given to player.

This game is better than the previous game as the interface is intriguing and will certainly catch the eye of a primary school student. However, this game is not for free and required player to pay the full version of it. Having some background music would be good.