Mobile Game for Children

By

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12610

Dissertation submitted in partial fulfilment of

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Universiti Teknologi PETRONAS

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CERTIFICATION OF APPROVAL

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Approved by,

_____

(Assoc. Prof. Dr. Wan Fatimah Wan Ahmad)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
August 2012

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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(KHAIRULANWAR NAZRI)

ABSTRACT

In order for young children to learn in school, there must be an effective way in providing good and suitable learning technique for them to understand well. Some children are having difficulties while facing mathematical problems. This is because, between 5% and 8% of school-age children have some problem of memory or cognitive deficit that may interferes with their ability to learn and interpret the concepts or procedures in mathematics. Thus, by providing puzzle game for children may help these children in learning mathematics. There are already puzzle game focuses on mathematic in the Internet, such as Sudoku, Math Lines, and many more. Still, these games only can be play by using Internet and computer. By following the technology nowadays, smart-phones in the market can be used as a platform to develop the puzzle game, providing mobility, fast, and easy to use. Moreover, most mobile games that are already in the market are not really suitable for young children to learn mathematics. As the reason to this, the author come up with mobile-based game, called Mobile Game for Children. It will be develop based on children problems and the theory of puzzle suitable to be put in this project. The prototyping methodology is being used in this project as any few refinements can be made before developing final solution. The process is divided into four stages which are planning, analysis, design, and implementation. This report will provide a findings about learning disabilities, the benefits of games towards the children, and the technology been used nowadays.

ACKNOWLEDGEMENT

I would like to take this opportunity to acknowledge all parties who had helped to contribute for the completion of my final year project. The past seven months have given me with huge experience and knowledge that can be useful in the future.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Technologies are moving rapidly nowadays. There are estimated to be 1.5 billion mobile phones in the world today, making more than three times the number of personal computers (PC) [17]. Mobile application is getting popular and more demand than computer or PC because of its high portability. Mobile technology in education provides a variety of benefits on the educational sector. The impact of mobile phones towards educational may improve the quality of teaching and to enhance the education of students in new and innovative ways. The educational method should be change from old method which uses pen and paper to these new technologies.

Mobile phone provides more portability than PC which means the learning process will not fixed only during class times but offer students to learn at all times and in all places such as during holidays, at home, during recess, and many more. Thus, mobile learning provides higher flexibility for students to learn in effective and efficiency way.

This project focuses on primary school student in learning mathematics. There are studies showing that students at the young age are having difficulties in learning mathematics. Therefore, in this project, puzzle game approach is being used to help young children in learning mathematics in effective way.

Mobile Game for Children is a mobile based application aiming to provide users with unique and interesting mobile game for android users that is available to use it anywhere and anytime. This project will be done by looking back at all android

games whether it meets all the users' wants and needs. This is the main factor in bringing this project to be at the top level of android games plus helping the users in increasing their knowledge skills throughout the game. The author find it interesting to develop a mobile game for children as it just not aiming to give entertainment for the user, but to help user in using their knowledge skills in finding the solution. Moreover, the author feels that with this mobile game, children will find it interesting to learn mathematics.

1.2 PROBLEM STATEMENT

Nowadays there are so many people that own an Android device. Most people use their own Android device to play games as there are many games available to be downloaded either free or not. The main concern here is to understand how to give the excitement for the children to play mobile game. The problem arise when the designer develop a game that is not suitable for the children and can make them easily frustrated and boring. Therefore, the author feels that puzzle game is suitable for children and can bring excitement for them. Moreover, some children are not easy to learn at the young age because of learning disabilities [15]. Plus, there has been increasing in attention on students who face challenges learning mathematics skills and concepts that are taught in school. There are about 5% and 8% of school-age children have some problem of memory or cognitive deficit that may interferes with their ability to learn and interpret the concepts or procedures in mathematics [14]. By using puzzle game, children with learning disabilities may find it interesting to develop their learning abilities.

1.2.1 Problem Identification

Developing a good mobile game for children is very important as there are many games to compete in the market. This is because, there are many new games appearing on the App store almost every day. The author need to make sure that this project will make the user like the first five minutes of play such that they won't throw it away and give it a bad rating. This is because, children are easily can be frustrated and easily bored with the game that they are playing [7]. Therefore, puzzle game has been chosen for this project as it is simple for the children to understand and play the game. Moreover, learning at the early stage of children is very important. However, children at the young age are not easy to make them to understand and to catch their attention to learn. Children at the young age are having difficulties in learning mathematics like learning number names, counting, and to identify how many items are in group. Plus, not many children can easily sit down and read a book and understand everything inside the book. By developing a good puzzle game with good

interface, children will find it interesting to learn and can learn faster as they will be more focus in completing the mission.

1.2.2 Significant of the Project

Mobile Game for Children is very useful to be play by all ages as it provides a simple interface and interesting quests to be solved. However, this project is focusing mainly on children as this project will help them in solving a simple quests and problems that requires them to use all their knowledge. This is because children are more attractive to learn by playing puzzle games [1]. There are many skills can be develop by young kids and children such as critical thinking, language skills, cognitive abilities, and many more. Moreover, for older persons, puzzle games have shown a good significant for them as it slowing down the aging process of the brain [2]. By actively involved in this puzzle games, they can avoid health conditions such as Dementia and Alzheimer's.

1.3 OBJECTIVES AND SCOPE OF STUDY

1.3.1 Objectives

The three main objectives to be achieve in this project:

- To research on application of puzzle theory suitable for the game.
- To develop a game focusing on how to develop their skills and knowledge by learning mathematics using puzzle games.
- To evaluate the user experience testing either the game meets their criteria or not.

1.3.2 Scope of Study

The scope of study on this project mainly will be focusing on the application of puzzle theory needs to be done on how to develop the puzzle game in this project. This is important to make the storyline and plot for the game that will be developed. Besides, developing a good interface for this puzzle game will be in this scope of studies as it is the

main point on how to attract user for the first time view on this game. Moreover, analysis on games towards the kids and children will be including in this project. The author need to identify what type of game is suitable for children. In the literature review, the author will provide the reason why children should play game in helping them to learn and improving their knowledge and skills. Lastly, the author will focus on Android OS Smartphone. The author needs to do a lot of research on how to develop a game on Android devices.

1.4 THE RELEVANCY AND FEASIBILITY OF THE PROJECT

There are a lot of benefits when doing a project based on Android OS Smartphone. This is proven by the research done by Gartner whereby the worldwide Smartphone sales are reaching 468 million units in 2011, increasing 57.7% from 2010 [3]. Android is becoming the most popular operating system (OS) worldwide and building on its strength to account for 49% of the Smartphone market. Therefore, there will be a good point to develop this project for Android as more people are using it.

Moreover, Android apps are written in java. As a student who is done taking few courses related to java, the author has knowledge in java to write the coding for this project. Plus, during the internship period, the author has been supervised to develop and learn to make a web based system that run on java. This will help the author a little bit in developing this project. Even though it is the first time for the author to develop a game on Android device, it is believed that by doing some research and few tutorials, he can achieve to carry out this project.

CHAPTER 2

LITERATURE REVIEW

2.1 LEARNING DISABILITIES IN CHILDREN

Learning disabilities or learning disorders is not related with children that lack of intelligence or motivation. These children are not lazy or dumb to learn something, but in fact their brains are not functioning well with the other children. It affects them on how they receive and process information [15]. The most common problems faced by these young children usually revolved around reading, writing, or mathematics.

2.1.1 Learning disabilities in reading (dyslexia)

There are two types on learning disabilities in reading which is the basic reading problems and reading comprehension problems. The basic reading problems usually occur when children having difficulty in understanding the relationship between sounds, letters and words [15]. These children can be detect to have learning disabilities in reading on their reading speed and fluency, vocabulary skills, and to recognize the letter or word in the reading material.

2.1.2 Learning disabilities in mathematics (dyscalculia)

Usually, young children who have learning disabilities in mathematics may have problems with memorization and organization of numbers, operation signs, and simple number calculation. They may also have problems in counting numbers like counting by 2s or 3s [15].

2.1.3 Learning disabilities in writing (dysgraphia)

There are two types on learning disabilities in writing which is the basic writing disorder and expressive writing disability. The basic writing disorder occur when children are having problems forming words or letters while expressive writing disability refers to children having problems in organizing thoughts on paper [15]. These symptoms can be detected when children having problems in their spelling, writing organizations and coherence, or accurately copying letters or words.

2.2 MATH DISABILITIES

Recently, there has been increasing in attention on students who face challenges learning mathematics skills and concepts that are taught in school. At the early age, young children have difficulty learning number names, counting, and to identify how many items are in group. According to a research been done, between 5% and 8% of school-age children have some problem of memory or cognitive deficit that may interferes with their ability to learn and interpret the concepts or procedures in mathematics [14]. Below is the type of problems for children who have learning disabilities in math:

2.2.1 Math calculations

Children with a learning disability in math calculations are having problems with their memorizing and cognitive skills. This may lead them in difficulty to learn even simple basic skills in early math like arithmetic combinations such as 2+5, 5X5, 10-6, and many more. This problem usually will be persistent and characteristics for children having difficulty in memory or cognitive abilities [14]. Children who have learning disability in math calculations may have problems like:

- Identifying signs and their meanings.
- Understanding commutative property such as 3+4=7 and 4+3=7.
- Solving multi-digit combinations and understanding the concept “borrowing” in subtraction and “carrying” in addition.
- Understanding the concept of decimal points

2.2.2 Math word problems

This type of learning disability which is math word problems may affect children to figure out how to solve math problems. This type of problems is the most common for children and always faced by many teachers who are involved in math educations [16]. There are five categories of difficulties that children may experience while facing math word problems:

- Reading and understanding the language in a word problem which is children are not able to interpret the words in a word problem, not able to understand hard vocabulary and cannot concentrate while reading a word problem.
- Having problems in recognizing and imagining the context in a word problem or their approach is been confused by the context in a word problem.
- Children not able to form a number sentence to represent the mathematics solution involved in a world problem and thus lead them to choose incorrect calculation.
- Having difficulty in carrying out the mathematical calculation and making choice in calculation strategy with a world problem context and the size of numbers involved in a world problem given.
- Children cannot interpret the answer in the context of the question.

2.2.3 Math rules and procedures

Children who have learning disability in math rules and procedures may not be able to learn faster about the rules and procedures in solving math problems. Example of math rule is like any number that multiply with 0 will always give the answer 0. For math procedures, these children may demonstrate developmental delay in learning the steps for solving simple arithmetic problems such as addition, subtraction, multiplication, and division. These children may master math rules and procedures at a slower rate than the other children.

2.2.4 Math language

Children with math language problem may have difficulty in understanding the meaning of the language or vocabulary or mathematics such as greater than, less than, equal, and many more. Sometimes this math language cannot be seen from a context as children also need to know the symbol for this type of language. For example, 64 < 90 True or False, 2 X (3+4) = ?.

2.3 THE TECHNOLOGY

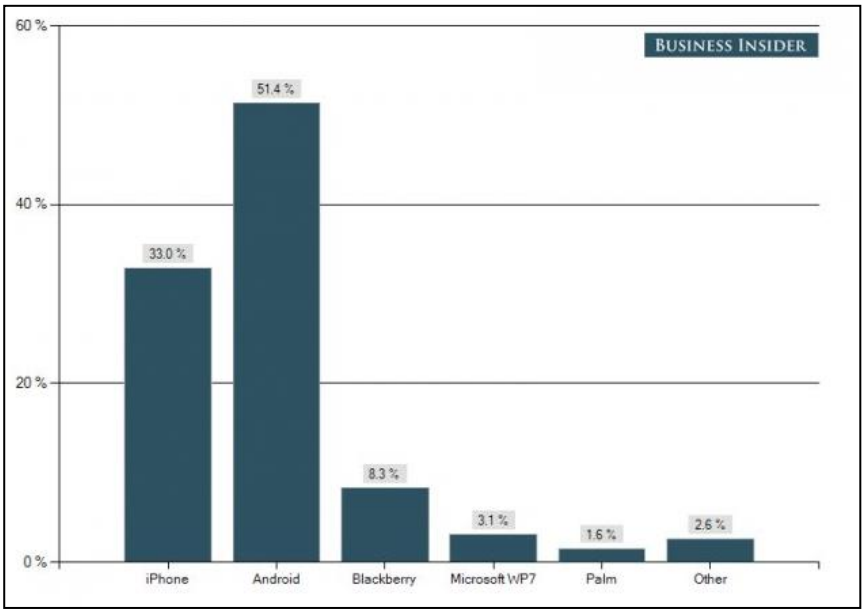

Figure 2.1: Statistics on Smartphone Users

There is survey had been done in April 2011 to show that there are many users are using Android Smartphone (51.4%) because of its features and platforms. Android now has a third of the US market (33%) while Apple only holding at 25%. The Android gains a lot of user because technology platform markets tend to standardize around a single dominant platform like Windows in PCs, Facebook in social, and Google in search [4]. The developers are strongly support Android platform by building their apps and provide it to the Android. As quoted by Henry Blodget *"it's not a question of which platform is better. It's a question of which platform everyone else uses."* Looking at the smartphone market nowadays, Android is the top one on the top market.

From the report prepared by Gartner Inc, worldwide Smartphone sales is reaching 468 million units in 2011, increasing 57.7% from 2010. By the end of 2011, Android is becoming the most popular operating system (OS) worldwide. Furthermore, Android will build on its strength to account for 49% of the Smartphone market by 2012 [3].

Worldwide Mobile Communications Device Open OS Sales to End Users by OS (Thousands of Units)

OS	2010	2011	2012	2015
Symbian	111,577	89,930	32,666	661
Market Share (%)	37.6	19.2	5.2	0.1
Android	67,225	179,873	310,088	539,318
Market Share (%)	22.7	38.5	49.2	48.8
Research In Motion	47,452	62,600	79,335	122,864
Market Share (%)	16.0	13.4	12.6	11.1
iOS	46,598	90,560	118,848	189,924
Market Share (%)	15.7	19.4	18.9	17.2
Microsoft	12,378	26,346	68,156	215,998
Market Share (%)	4.2	5.6	10.8	19.5
Other Operating Systems	11,417.4	18,392.3	21,383.7	36,133.9
Market Share (%)	3.8	3.9	3.4	3.3
Total Market	**296,647**	**467,701**	**630,476**	**1,104,898**

Source: Gartner (April 2011)

Figure 1.2: Worldwide Mobile Communications Device Open OS Sales to End Users by OS

Based on Figure 2.2 above, Android platform Smartphone will increase in its sales compare to other Smartphone in few years' times. Therefore, this shown that it is relevant to conduct this project based on Android OS Smartphone.

2.4 ANDROID AS A MOBILE DEVELOPMENT PLATFORM

One of the main reasons why people buy Smartphone today is because of its features and wide choice of cool application to choose. Many developers also try to make money by creating or developing some cool applications to be put in the market. Below is the reason why the author chooses the Android OS Smartphone from other Smartphone device to be used as a platform for this project.

2.4.1 Ease of Developing on the Platform

As quoted by Cedric *"Anyone can develop Android applications (any programmer at least!)"*[5].Basically, the author had an experienced on writing Java language from subject taken while studying in University Technology PETRONAS. The author needs to download the Android SDK and a few necessary tools for Eclipse to develop the project. Then, the author just needs to write the code by using these tools like Eclipse. Plus, there are many tutorials provided in the Internet for the author to revised and learned.

2.4.2 Open-source

Cedric also quoted that *"Android is the only mobile development platform where developers can get this much freedom"* [5]. Unlike Iphone IOS, we need to get a few licenses by them to develop the applications, thus creating burden for some developers. By being open-source, Android encourages developers to create creativity. That is why we can see variety of applications is in the market can be used.

2.4.3 Easy to Test Applications on Multiple Device

By using Android, we can install any applications to the Android Smartphone from any source. In this project, the author use Eclipse SDK to develop the project. The author can easily install the system that is being developed into the Android device without having any problems or license to be approved first. This is because the tools include in the Android SDK is very useful for any developers to install and run the application on the Smartphone whenever the applications need to be

compiled. It provides a comprehensive set of development tools such as debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials [6].

2.4.4 Barrier of Entry is Low

Another reason to choose Android over other platform is because of its lower barrier of entry. This is because, the author just need to do few simple step to put the applications into the Android Market. The author just need to register as developer, prepare, and submit the applications. Within less than hour, the applications that has finished developed can be seen at the Android Market. While for appstore for Iphone IOS, we need to get a few licenses and even pay them to ask for their permission to put the applications in the appstore. Then, a few testing will be made by them to see whether the application is suitable to put in the appstore or not. Therefore, we can see here Android has a simple application approval process rather than appstore.

2.4.5 Popularity

Nowadays, Android is getting popular with its user-friendly platforms and the number of developers for Android is getting increased. Therefore, it is easier for the author to do the documentation in developing this project. Because of this many number of developers, the author also can get many tutorials by them on how to develop the project. As quoted by Cedric *"There's also the fact that Android now holds about 50% of the Smartphone market share meaning a lot of potential downloads"*[5].Therefore, we can say here that developing an application on Android platform can reach a much greater market and bring benefits for the author to reach user in testing the application.

2.5 BENEFITS OF GAMES TOWARDS KIDS OR CHILDREN

Many adults find that game is giving a bad side or negative effect to their children. Despite from other games that waste time and money for their children, puzzle or brain games give a lot of benefits to the children or teenagers, plus to the adults too. As quoted by Joseph Berg, *"In older persons, puzzle games have been linked to slowing down the aging process of the brain"* [2]. The puzzle games will slow down the rate of memory decline, and avoid conditions such as Dementia and Alzheimer's. Without them even knowing, the adults also get the benefits from playing games.

The children can enhance their thinking abilities when doing some reasoning for the solutions of the puzzle games. This will sharpen their intellect when trying to overcome all the challenges. Cognitive abilities can be developed and gained by children and will make their life easier to learn in this stage of learning. The children now will have a reason to learn specific subjects like math, language, and many other skills.

Playing puzzle games will help the children to relax their mind after having a long day at class or during stressful times. This will help and improve their productivity to continue study and focusing in the class. Learning process always be symbolized as boredom, but it is not the same issue when using the puzzle or brain games in the class. Many teachers are using puzzle or brain games in their teaching materials. This has shown a great interest and productivity for the children learning in the class.

2.6 THE GAME CONTENT

The content of the game is really important for satisfying the user needs and requirements in playing the games. Mostly people will look at the review and the screenshot of the game to download it to their device. However, people will get mad if the content of the game is not reasonable for them to pay for the game just to finish it for only two hours of play. As quoted by Mark Overmars *"People nowadays expect hours of play for their one dollar"* [7]. The game content should have lots of levels and unique design for enjoying the game. Providing the user with the leader boards and achievements can make them to play again to get the highest possible score, thus increasing their needs to play the game.

2.7 TOP PUZZLE GAMES FOR ANDROID

2.7.1 Apparatus

Figure 2.3: Apparatus Puzzle Game

Apparatus is a puzzle game whereby user needs to solve the physics-based puzzle to build a machine structure to bring one or several marble to the goal [9]. Creativity is important in this game as it encourage user to build a strong machine so that the marble can be deliver safely to its destination. This game also allow user to modify and create the level to be upload and shared in the community. The average rating on this game is quite high which is 4.6 from 5 star rating. The author found that user like this game based on its physics concept and they are given chance to build their own machine. Plus, the 3D appearance on this game also make user satisfied with this game.

2.7.2 Angry Birds

Figure 2.2: Angry Birds Puzzle Game

This game require user to use different type of birds to destroy the greedy pig's fortresses [9]. Each bird in this game has different unique powers like self-destruct, duplicate, and many more. This game challenge user's ability in physics on how accurate can the bird fly to the pigs. This game also gets a rating of 4.6 stars from user. Many review shown that user like this game because of its different challenges at different level. This game also very addictive not just among the kids or children, but at all ages.

2.7.3 Cut the Rope

Figure 2.3: Cut the Rope Puzzle Game

This game is very popular in the iOS App Store and had won an award-winning mobile game from ZeptoLab [10]. The popularity also increase when this game move into Android. The average rating for this game is 4.7, more than Angry Birds and Apparatus. This game basically has three main objectives which is cut the rope, catch the star, and feed little monster Om Nom a candy. More importantly, user is satisfied with this game because of its smoothness, whereby unlike many games, they usually experience freeze or lagging while running the game. Moreover, many users like its challenges which are more unique than Angry Birds.

2.8 THEORY OF PUZZLE

Puzzle always been focus on the meaning of game that require single decision maker and enjoyable to play. By focusing more on definition of puzzle, it is a game that should have a solution which is esthetically pleasing and gives user the satisfaction in reaching the goals [11]. A good puzzle maker should know the theory of puzzle in order to build a fun and challenging game. Below are few examples of theory of puzzle game.

2.8.1 Action Sequences

This type of puzzle game is common and can be seen its appearance in the App Store. It has variety type of actions like jumping, rolling, climbing, driving, and many more [12]. Because of its fast action, it trains user's brain to think fast to complete the objective. For example, "Temple Run" puzzle game require user to escape from the vampire by jumping and sliding continuously together with collecting stars to collect points.

2.8.2 Angle Adjustment

There are many games that require user ability to adjusting the angle of a thing to reach the goals [12]. For example, "Angry Birds" require user to aim carefully the birds towards the pigs to make it explode. This type of game also build based on the concept of physics.

2.8.3 Arrange Objects

This theory of puzzle will train user ability in arranging some object carefully and strategically to pass the obstacles or release a thing [12]. For example, "Unblock Me" game is popular with its strategy game whereby user needs to arrange the wooden block in order to make a way for its special wooden block to pass through the hole.

2.8.4 Colour

Colour matching game is popular and suitable for the children as it will train them to match some item with the right colour. For example, “Sam and Max Hit the Road” game need user to go through a series of door in the right order based on the door’s colour [12].

2.8.5 Board Games

This type of game requires user skill in thinking ability and solving skills like chess, poker, battleships and many more games [12]. This type of games usually require a lot of time to think about the solutions and too boring for children to play. This type of game also is easy to develop as it not requires a lot of scripts.

2.8.6 Math Skills

Mathematics always had been referred to a hard subject for children to learn. By using game, it will solve children in solving mathematical problems in a fun way like weight and measure, addition, subtraction and many more.

2.8.7 Maze

A maze is an interconnected series of passageways and corners which that has its starting point and ending point [13]. In some game, there will be some clues to get through the maze like following the sound or light.

CHAPTER 3

METHODOLOGY

3.1 RESEARCH METHODOLOGY

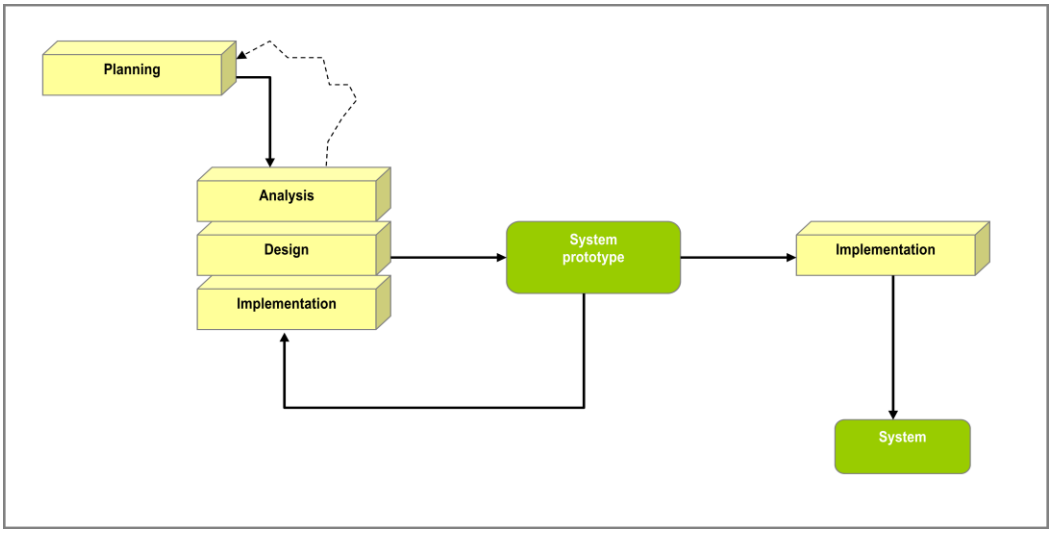

Figure 3.1: The Prototyping Methodology

The research methodology for this project will focuses on reviews of books, journals, internet resources, and other resources that is useful in developing this project. The prototyping methodology is being used in this project as it allows the author to think a new solution to fix any problems and make a few refinements before developing the final solution [8]. This type of methodology also important to make any changes to the final solution if the stakeholders have a new idea to be built into the project. The process is divided into four stages which are planning, analysis, design, and implementation.

- Planning – Data Gathering

  In this first stage, the author is putting a few problem statements on developing this project. The author will think a few reasons why this project should be developed. This stage is important to think about a few benefits that can be giving to the users and to look further about the development of mobile technology features nowadays.

- Analysis – Data Analysis

  This is where the solution of all the problem statement will be taken place. The author will be looking and doing research by looking at books, journals, and internet resources to find out about the important and the solutions regarding to this project. The objective of this project also being done by looking back at the problem statement that has been arise. During this project, all the information that has been gathered and reviewed will be put in the literature review to find out about the importance and benefits of this project.

- Design – System Development

  During this phase, the author needs to do research to do the development of this project. This is the phase where the real system or software will be developing. The author will use the Android OS Smartphone as hardware to test the system. The tools such as MIT App Inventor and Android SDK are important for the author to write the java code to develop this project. Plus, the author needs to think nice and interesting user interface for the game that is going to develop.

- Implementation

  This phase is important for the author to see the results and opinions from the user to see any bugs or problems from the system. All the comments from the user will be revised to develop a better system. The system will be finalized when the user is satisfied with all their requirements and needs.

3.2 PROJECT ACTIVITIES

The first start to develop this project is by doing a few researches and collecting data that is relevant in helping to build this project. The author will look at all the problem rise before at all resources found to make new changes to this project. While doing the project, the author will revise to his supervisor to ask for opinion to make some changes and what to be put in this project. The author will also follow several tutorials in understanding the concept of Java language in Android and how to run it on the device. Before finalizing the whole project, a few testing will be run to see the weaknesses found in the project. The whole process will be repeated while developing until the final result is done.

3.3 KEY MILESTONE

Table below shows the key milestone that the author needs to achieve during two semesters in final year project 1 (FYP1) and final year project 2 (FYP2).

Key Milestone	Week
Project Proposal	Week 3
Extended Proposal (10%)	Week 6
Proposal Defense (40%)	Week 9
Interim Report (50%)	Week 11

Table 3.1: FYP1 Milestone

Key Milestone	Week
Progress Report (10%)	Week 7
Pre-SEDEX (10%)	Week 10
Dissertation (40%)	Week 12
VIVA (30%)	Week 13
Technical Report (10%)	Week 14

Table 3.2: FYP2 Milestone

3.4 TOOLS

3.4.1 Hardware

During this project, Android device such as HTC Desire S that run on Android OS v2.3 is being used to test the game that being developed. The device support application that run on Java and can be used to flash any custom Android application that is being used for testing. Furthermore, a personal computer will be used as a platform to run the system before implement it to the Smartphone. This is to ease the work so that the testing process can be done faster and easier.

3.4.2 Software

For the software, the author has chosen MIT App Inventor as the platform to design the interface and to build the code. MIT App Inventor is open source software that runs on cloud computing, plus had been used by many developers who wants to develop game for Android device. The author also will use an emulator which equipped with the Android SDK that acts like Android device that running on the author's personal computer.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 GAME FLOW (THE DRAFT)

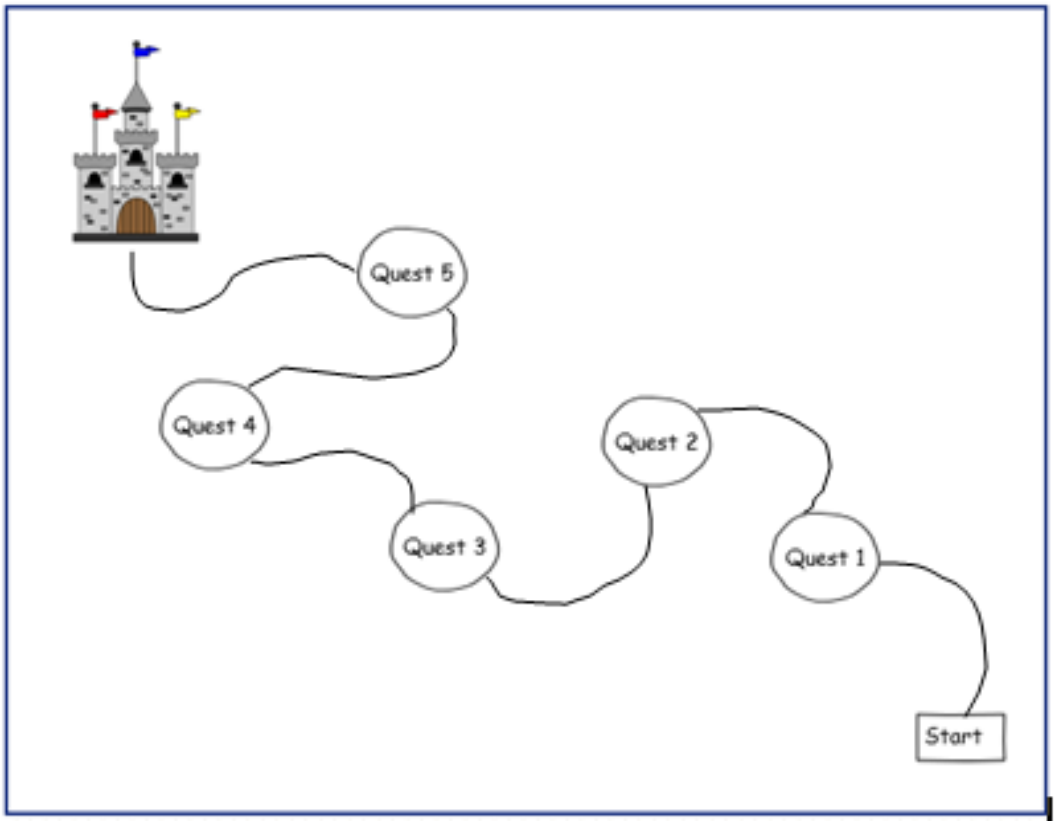

Figure 4.1: Main Menu in Mobile Game

Based on figure 4.1 above, the author comes out with rough idea on how to develop the interface for main menu for this project. There will be few quests for user to complete in order to reach the castle. By clicking at the start menu, user will be automatically prompt to go to quest 1. After completing the mathematical problems at quest 1, then the quest 2 will be unlocked for user to complete it and so on for the next quest. There will

be different mathematical problems at different quest like addition, subtraction, multiplication, and division. Below are few example of puzzle game that can be used in one of the quests:

- Cross the River (Quest 1)

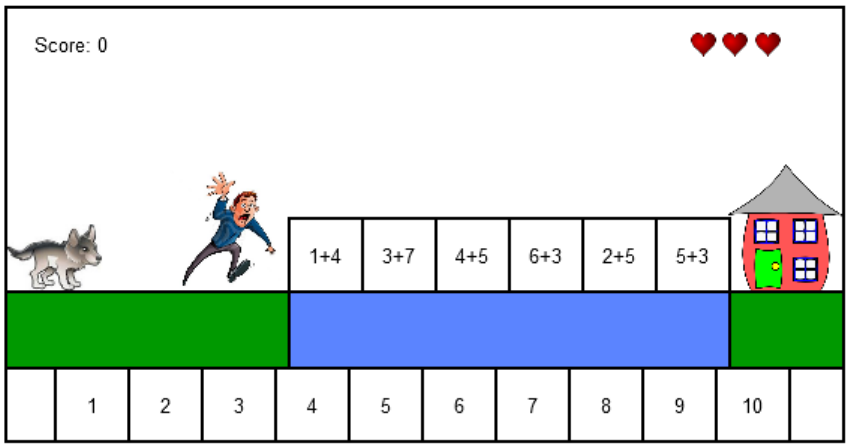

Figure 4.2: Cross the River game

In this game, user will be asked to help the human to cross the river to reach to the safe house before the wolf can catch him. User will need to solve one of mathematical operation which is addition. User need to choose the right number at the bottom of the screen to answer the questions provided in each blocks. The blocks will go downwards when the user answer it correctly. There will be obstacle face by the user as they need to solve it quickly or else the wolf will catch the human.

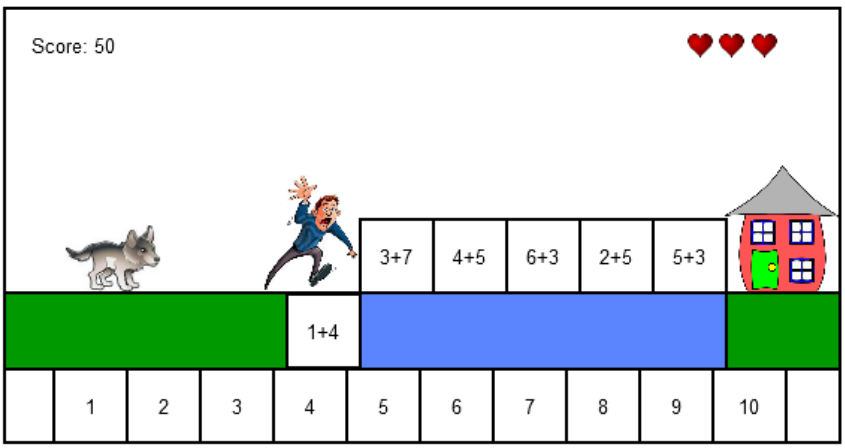

Figure 4.3: First flow of Cross the River game

If user can solve the question and choose the right answer, which in this case; if user chooses 5, the blocks will sink into the river to be the platform for the human to cross the river. User will be awarded 50 points if the answer is correct, however if user choose the wrong number for the answer, 10 points will be deducted.

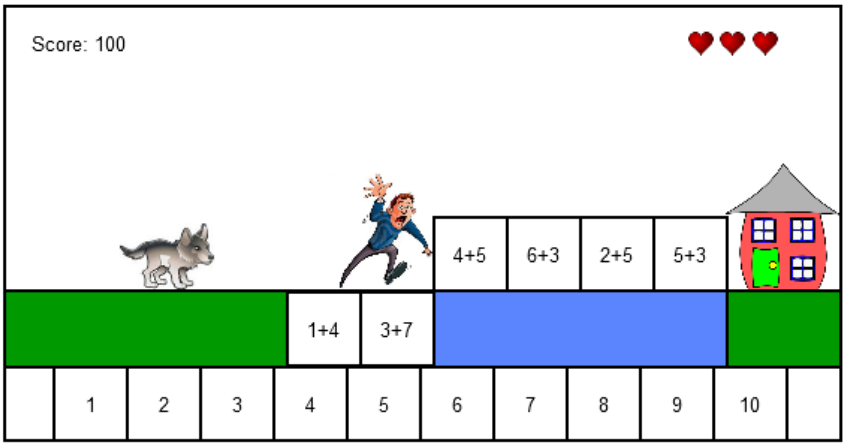

Figure 4.4: Second Flow of Cross the River game

This is the example how the game will keep going on if user answer the question correctly. User need to keep answering the question to make the blocks sink into the river. User also needs to answer it quickly to prevent the wolf from catching the human.

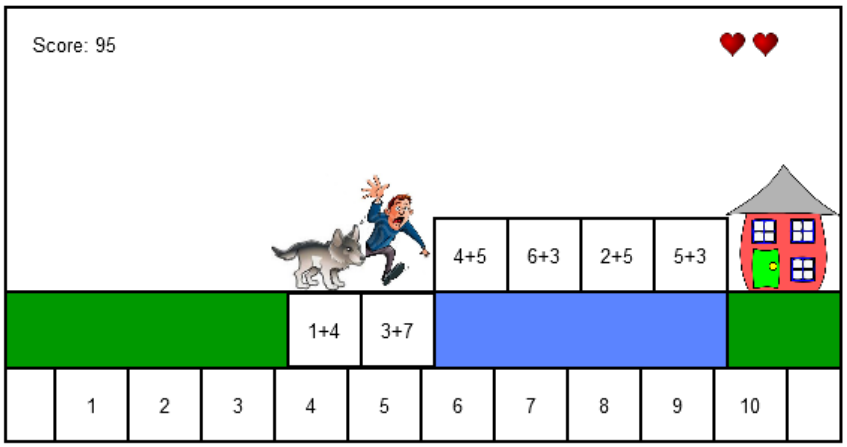

Figure 4.5: Third Flow of Cross the River game

In this situation, if the wolf manages to catch the human, user will lose one health and 5 points will be deducted from the current score.

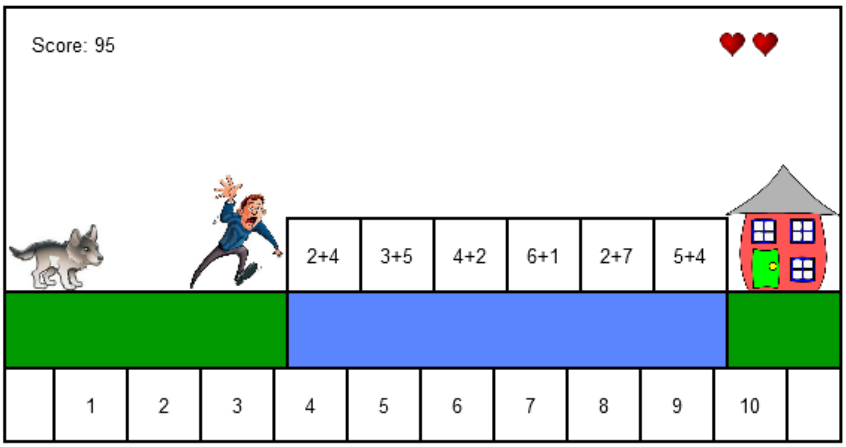

Figure 4.6: Fourth Flow of Cross the River game

User will need to start back the game and new question will be created at each blocks. The blocks also will float back to the surface.

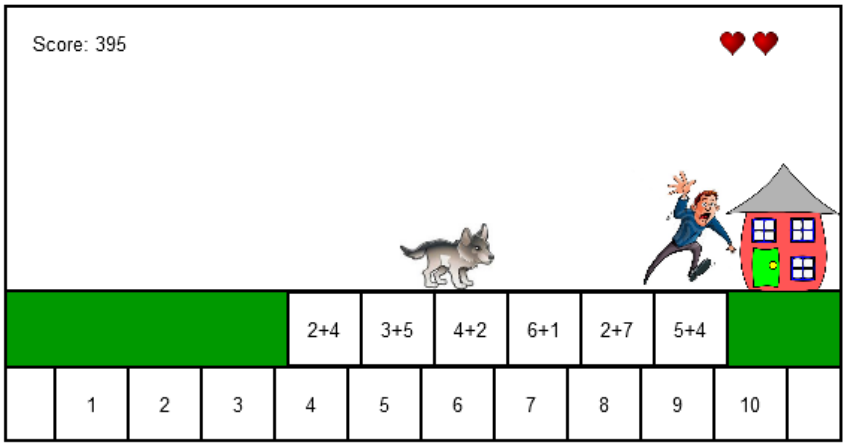

Figure 4.7: Fifth Flow of Cross the River game

This is where the human successfully reach the safe house if user answers all the questions correctly. Then, user will be advance to the next level which involves two digit numbers.

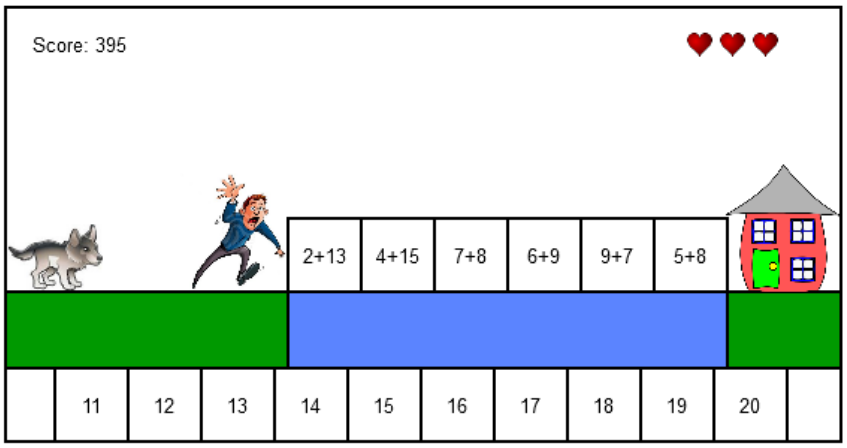

Figure 4.8: Second Level of Cross the River game

This is where the second level of questions looks like which involves two digit numbers and more difficult than before. The health of the human will turn back to the normal when entering new level.

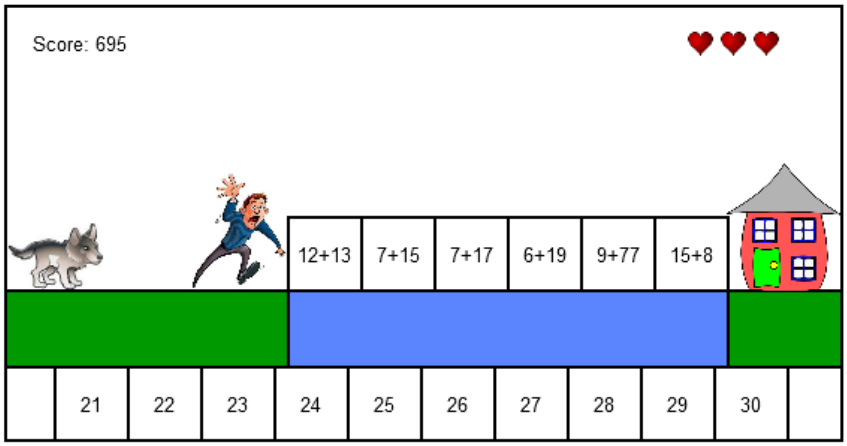

Figure 4.9: Third Level of Cross the River game

At the third level of the game, the questions also involve two digit numbers but a more difficult and challenging than at the second level. The game will stop at this level and the score will be recorded.

- Shoot the Marbles (Quest 2)

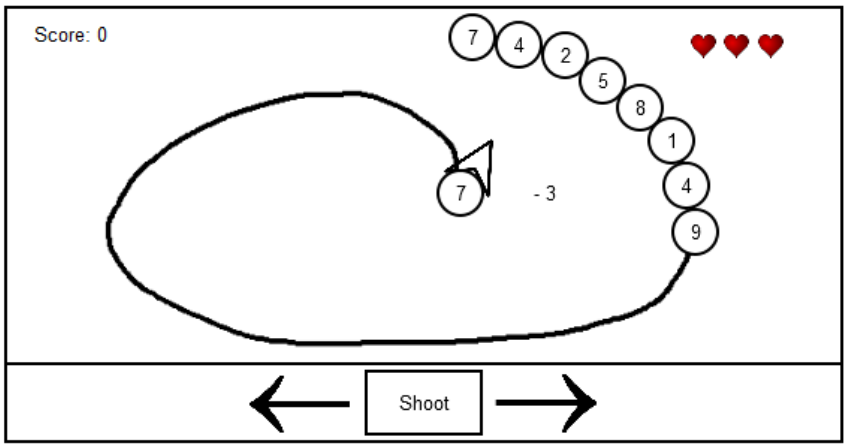

Figure 4.10: Shoot the Marbles game

In this game, user will need to shoot the marble at the center targeting marble that contain number for the answer based on the question provided. Marble at the center will contain any random number that will need to be minus with the number beside it. For example, in figure 4.10 number 7 in the marble at the center will be minus with number 3. User will need to shoot 10 marbles before proceeding to the next level. User need to use the left or right arrow at the bottom of the screen to control the direction of the marble will goes. Then, user will use the shoot button to release the marble to go to the target marble along the ring.

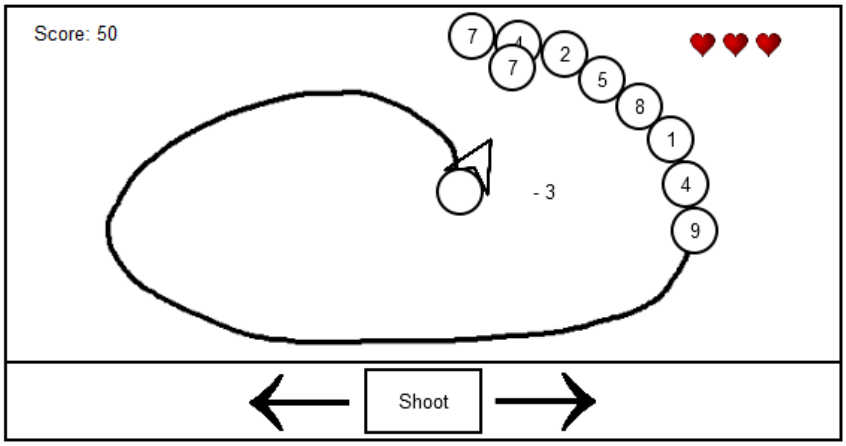

Figure 4.11: First Flow of Shoot the Marbles game

When the user release the marble to the right direction which in this case it hit marble containing number 4, both marble containing number 7 and 4 will burst. User will be awarded with 50 points for the right answer.

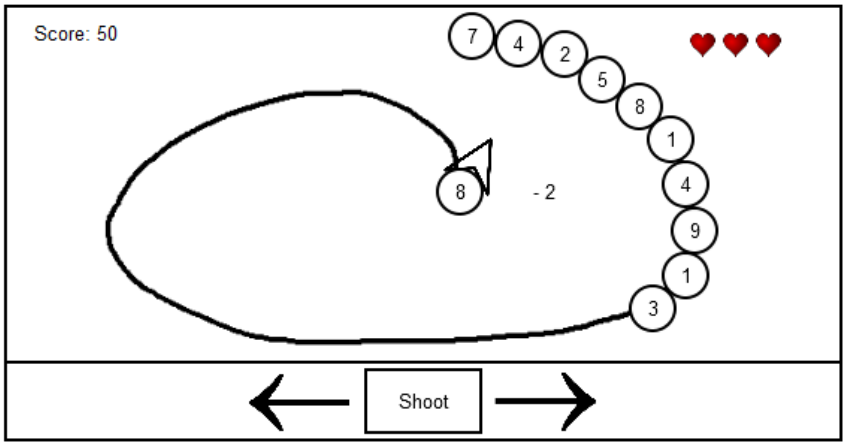

Figure 4.12: Second Flow of Shoot the Marbles game

Then, the marble at the center will contain new number together with the number to be minus with. User will need to solve the question quickly as the new marble along the ring will appear one by one to reach the marble at the centre.

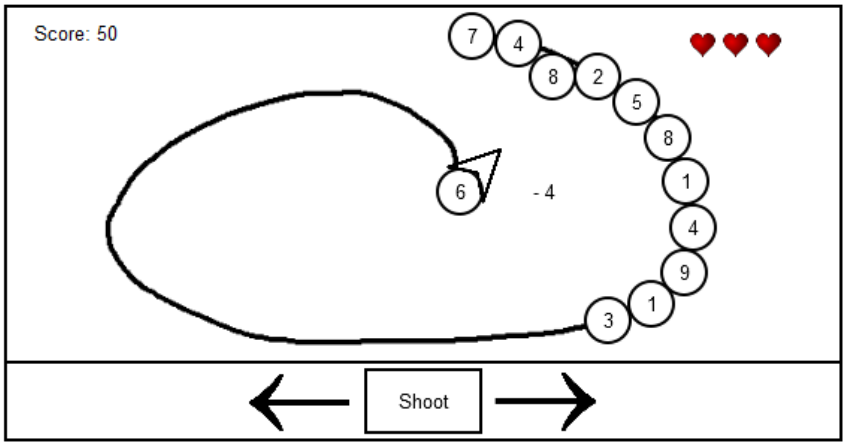

Figure 4.13: Third Flow of Shoot the Marbles game

If user fail to target at the right marble which contain the right answer, the marble will not burst, instead it will fill the ring thus will lead the marble at the ring to reach to the center faster. The new question will appear which means marble at the center will have new number and new number to be minus with.

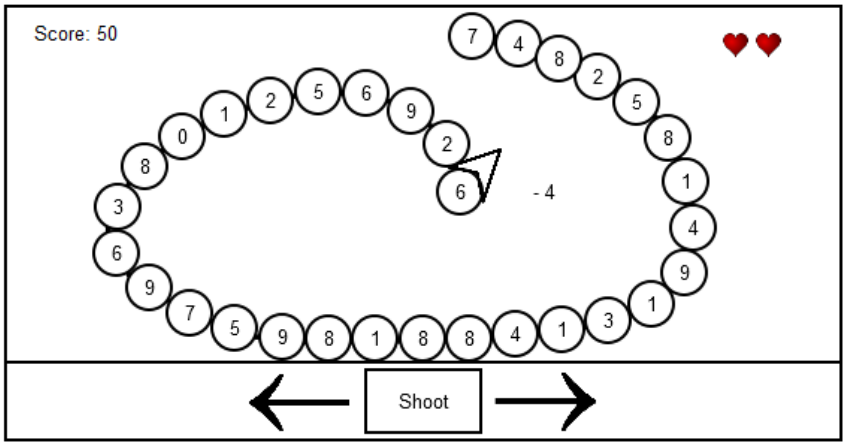

Figure 4.14: Fourth Flow of Shoot the Marbles game

In this case, the marble at the ring already reach the marble at the center and will make user lose on health. The game will start again until user finally can answer 10 questions correctly.

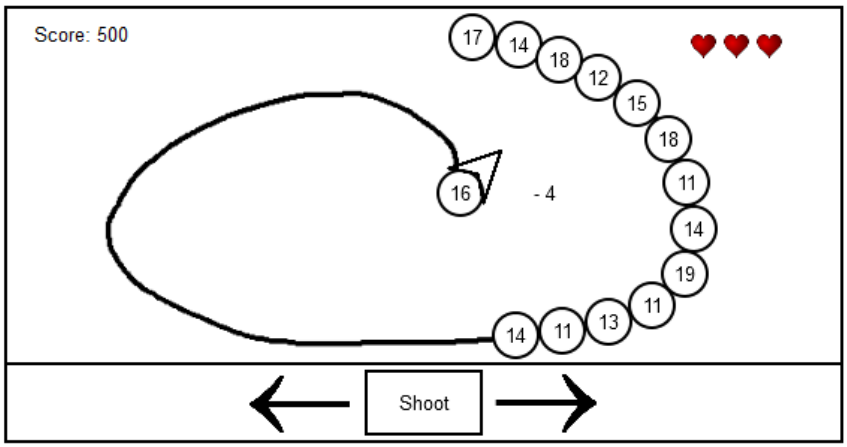

Figure 4.15: Second Level of Shoot the Marbles game

After user successfully complete 10 questions at the first level, user will be advanced to the second level which involves two digit numbers. The health will turn back to normal each time user enter new level.

4.2 FLOWS IN LEARNING

Through this Mobile Game for Children, children will learn different mathematical operation at different quest. For example, children will learn addition at quest 1, subtraction at quest 2, multiplication at quest 3, division at quest 4, mixed operations at quest 5. The reason in setting the same mathematical operation for one quest is to train them in learning and master each mathematical operation. For example, children may be able to solve and master “addition” mathematical operation at quest 1. The author believes that repetitive learning will make them able to memorize and improving their skills in solving mathematical problems in the future.

4.3 GAME DESIGN

4.3.1 Brief Playing Times

Mobile Game for Children will not require a lot of time to finish one quest as it aiming in training children to solve math problems faster. This will improve their ability to think faster and require them to be more focus in solving the math problems. However, providing such short adrenaline rush game will require the game to have many different levels. Therefore, each level maybe require 1 or 2 minutes but in total the game still provide hours of playing time.

4.3.2 Learning Curve

Learning curve in here means the game for this Mobile Game for Children will start at easy level and slowly increase in difficulty. This is important for children that are having learning disorders as they need time to learn even a simple math.

4.3.3 Tutorials

Tutorial is important for children to understand how to play the game. In the first level, the author will provide easy math problems to teach them how to play the game. There will be hint texts or icons to inform the goal of the game and how to control it.

4.3.4 Controls

Android Smartphone do not have buttons and not all of it has large screen. All the games in Mobile Game for Children will require children to control the games by clicking at certain locations by using their fingers. The author will develop the game that has suitable buttons for children to touch.

4.4 THE PROTOTYPE

Mobile Game for Children is currently on its development. The author manages to complete the puzzle game for quest 1 that focuses on addition which is one of simple mathematical operation. There is a bit of changes from the early draft. The main interfaces of the game are as follow:

4.4.1 Main Menu

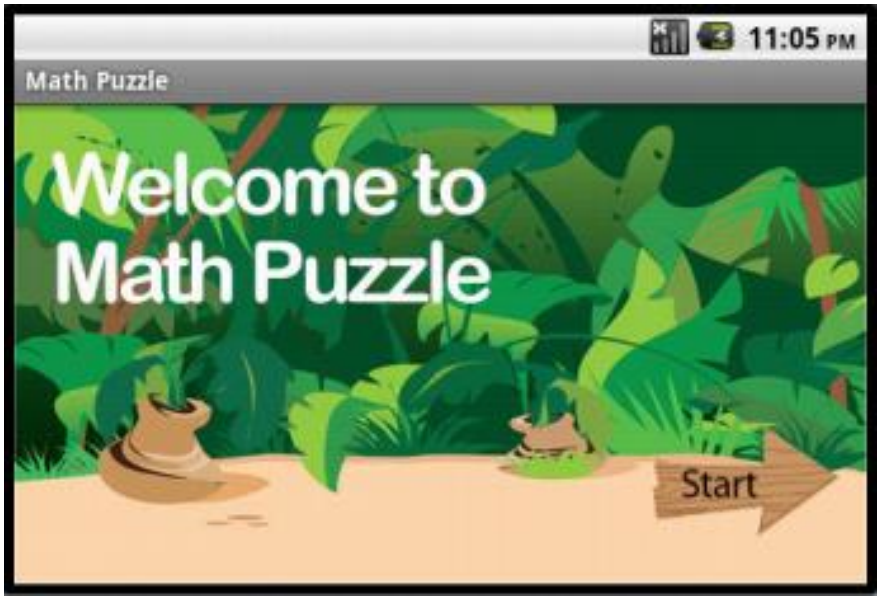

Figure 4.16: Math Puzzle Main Menu

Math Puzzle is the name for this Mobile Game for Children. This is the main menu for the Math Puzzle. This is where the user will be prompt to when opening the Math Puzzle game. There is only one button in this main menu. The user can start the game by clicking the 'Start' button on the wood arrow.

4.4.2 Tutorial Screen

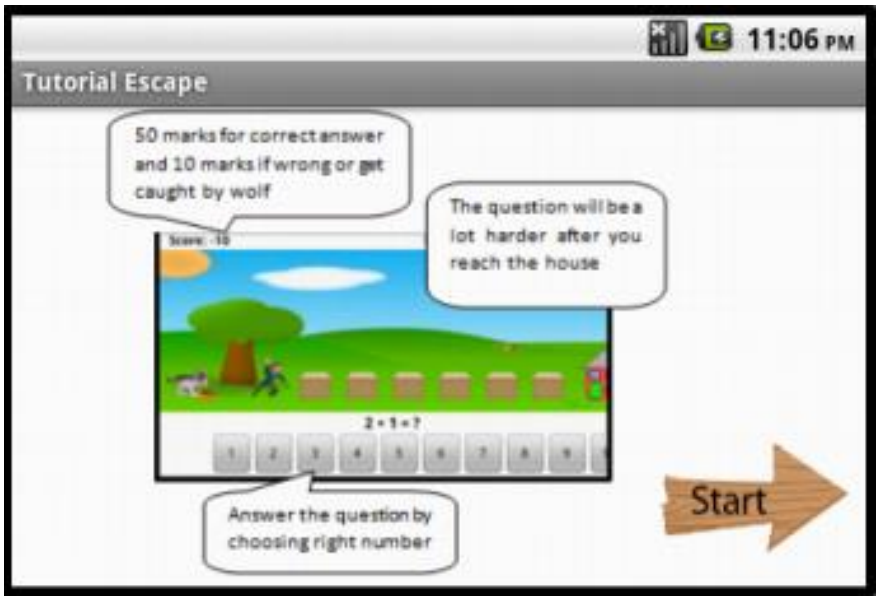

Figure 4.17: Tutorial Escape (Quest 1)

Tutorial screen is provided to assist the user in playing this game. Figure 23 shows the tutorial for the first quest, which is called ‘Escape’. The user can start the game by clicking at the ‘Start’ button.

4.4.3 Question Screen

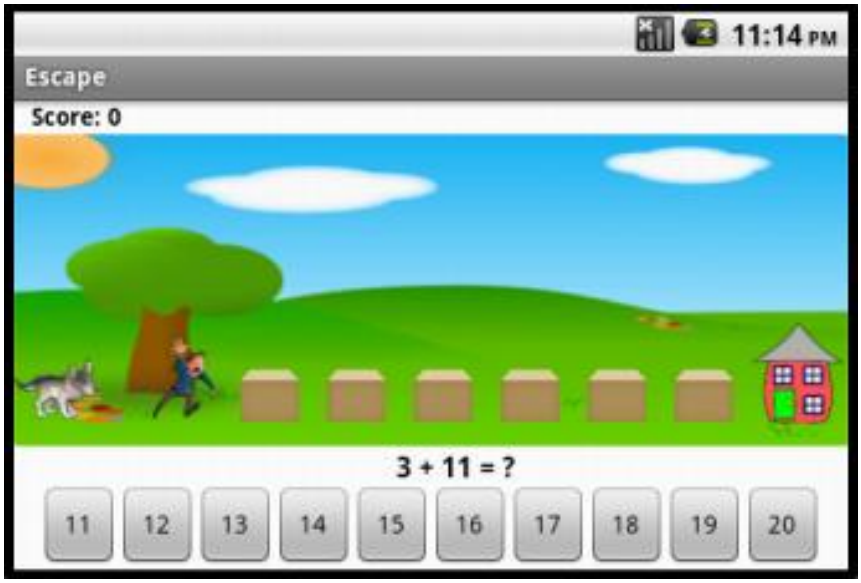

Figure 4.18: Escape Question Screen

Figure 4.18 shows the layout of question in the first quest, called 'Escape'. There are 10 buttons at the bottom of the screen, range from 11 until 20.The question will be generating randomly when the screen initializes. The user need to answer the question by choosing correct number provided on each button. There are 6 boxes between the human and the house which user needs to destroy it by choosing the right answer. There is obstacle face by the user, which is the wolf that will chase the human.

4.4.4 Correct Answer

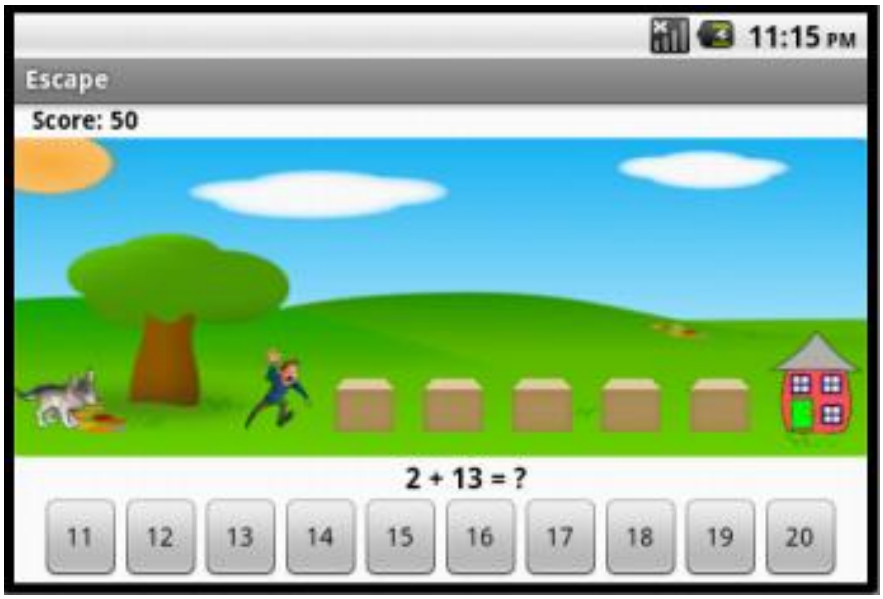

Figure 4.19: Correct Answer

Figure 4.19 shows how the screen looks like when user answers the question correctly. Each of the boxes will be removed and the human also will move forward if user answers correctly. The score column at the top left of the screen will be updated for each question. 50 marks will be given to the user for each correct answer. The next question will be generate when user done answering the question.

4.4.5 Goal Screen

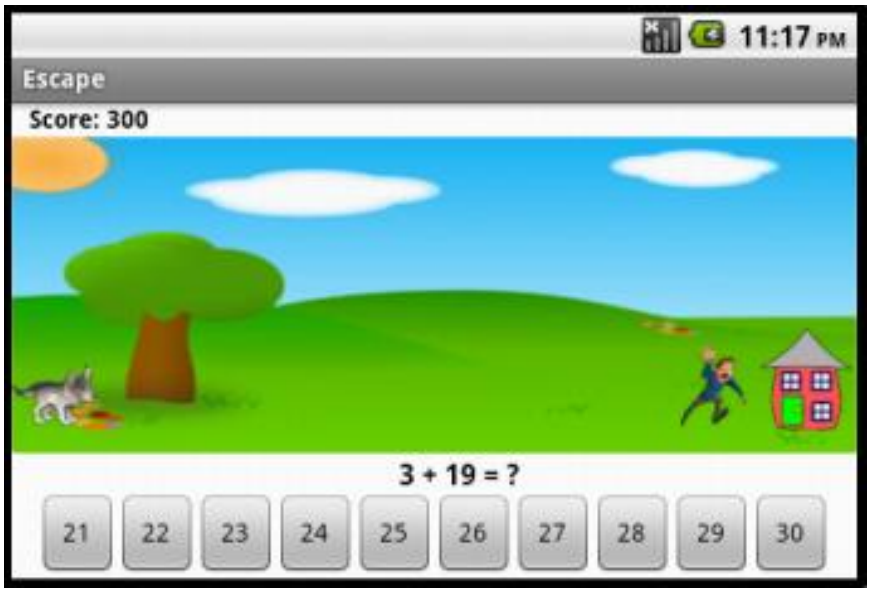

Figure 4.20: Goal Screen

Figure 4.20 shows the human finally reach the house if the user answers the entire question correctly. When user reach the house, the user will be advanced to the next level which contain harder questions and the range choices of answer will be add by 10 for each button.

4.4.5 Other Level

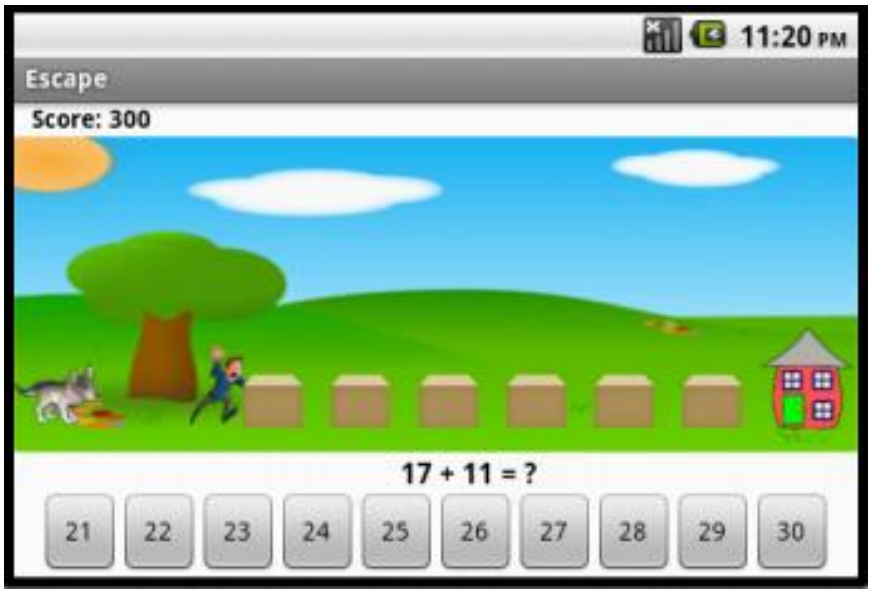

Figure 4.21: Escape for Level 2

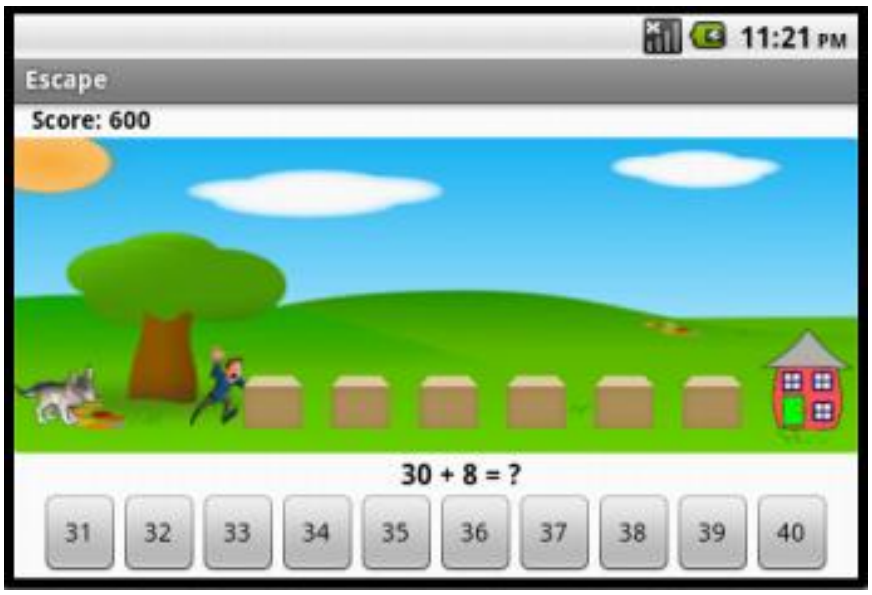

Figure 4.22: Escape for Level 3

Figure 4.21 shows the question for the Escape in level 2 while figure 4.22 for level 3. In level 2, the answer for provided questions will be range between 21 until 30 while in level 3 the answer will be in range 31 until 30.

4.4.5 Obstacle and Wrong Answer

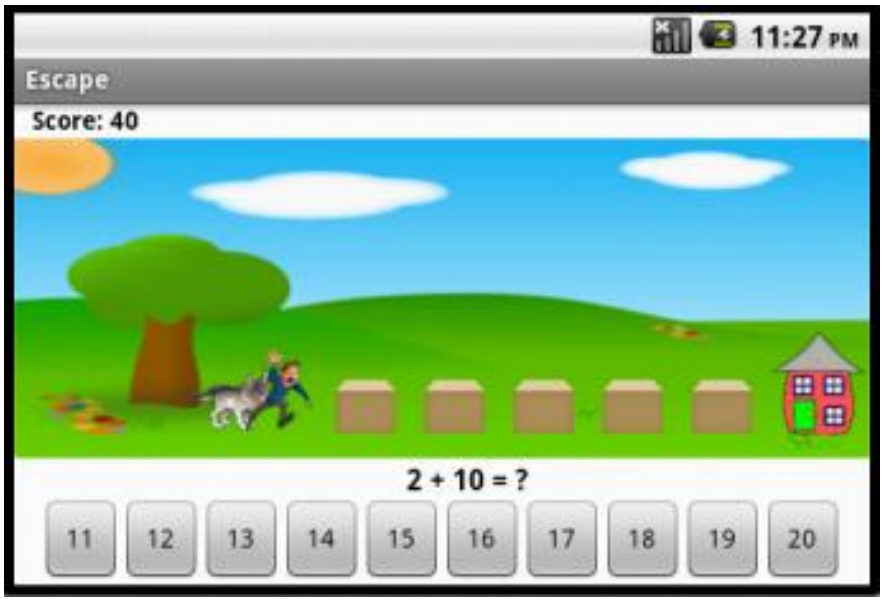

Figure 4.23: Obstacle and Wrong Answer

Figure 4.23 shows the human has been caught by the wolf. The score will be deducted by 10 each time the human caught by the wolf. The wolf will start back on its first position and start chasing the human back. The wolf will keep chasing the human to deduct the user's score. The score also will be deducted by 10 if the user chooses the wrong button to answer the question provided.

4.5 SURVEY AND INTERVIEW RESULT

In order to meet one of the objectives of this project, survey and interview had been done to evaluate the user experience testing either the game meets their criteria or not. These survey and interview were conducted with 20 selected primary school students from Sekolah Kebangsaan Pasukan Polis Hutan. 10 students were selected from top class and another 10 students were selected from lower class. Every student was asked to play the Math Puzzle prototype using the HTC Desire S. Below are the data gathered from the survey and interview that has been conducted.

4.5.1 Usability Testing

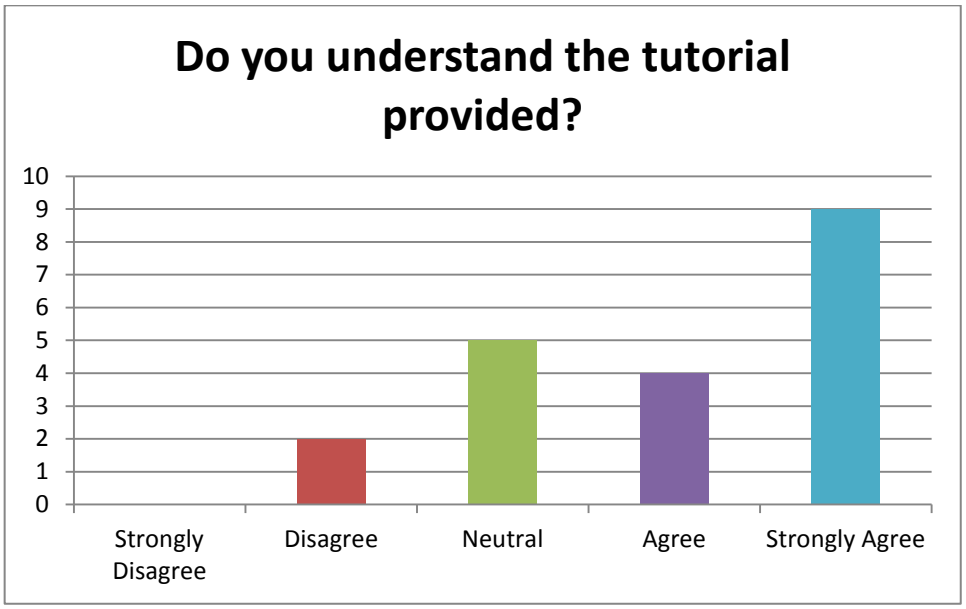

Figure 4.24: Rating for Tutorial in Math Puzzle

Figure 4.24 shows that there are 9 students who had rated strongly agree and 4 students who rated agree for the understanding of instruction provided in tutorial screen in Math Puzzle. However, there are 5 students who rated neutral and 2 students who rated disagree. This is because they are not good in their English.

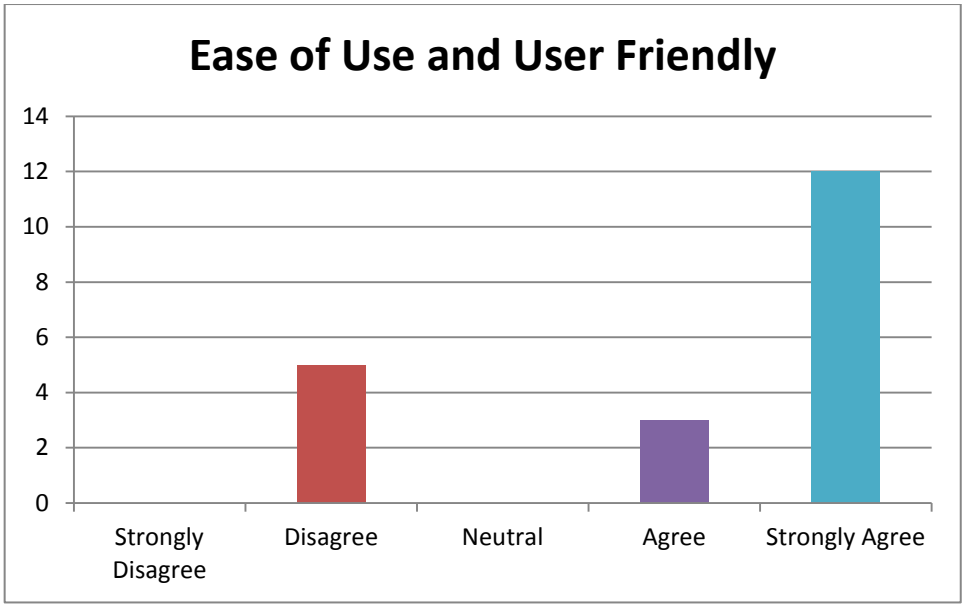

Figure 4.25: Rating for ease of use and user friendly

Figure 4.25 shows 12 students who rated strongly agree and 3 students who rated agree for ease of use and user friendly. This means that most of them know how to play the Escape. However there are 5 students who rated disagree because they need some time to think how to play the game.

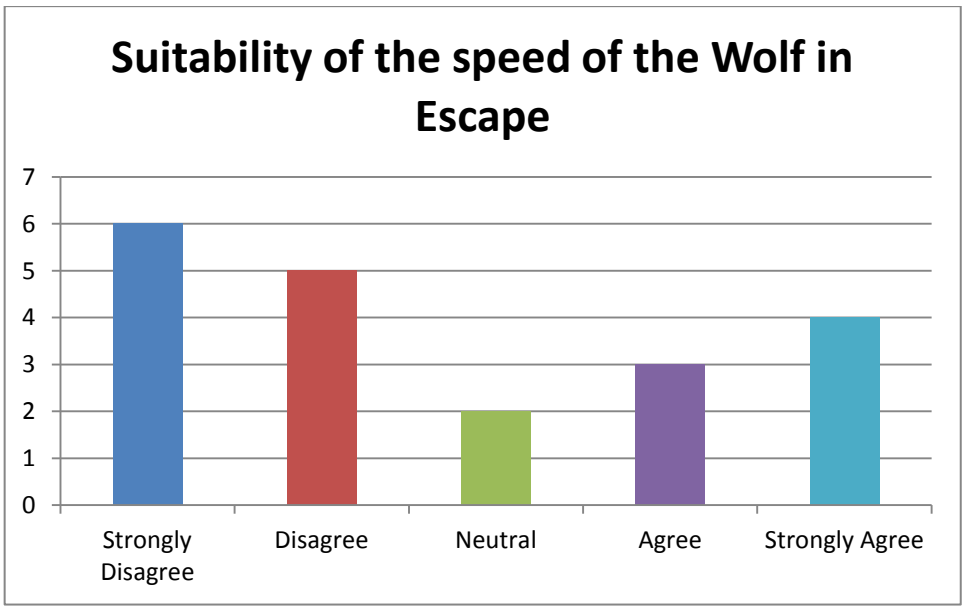

Figure 4.26: Rating for suitability of the speed of the Wolf in Escape

Figure 4.26 shows that there are 6 students who rated strongly disagree and 5 students who rated disagree for the suitability of the speed of the Wolf in Escape. This means that students at young age need to have

enough time to answer mathematics question. However, 4 students who rated strongly agree and 3 students who rated agree like the current speed of the Wolf in Escape. This is because it helps them to think faster.

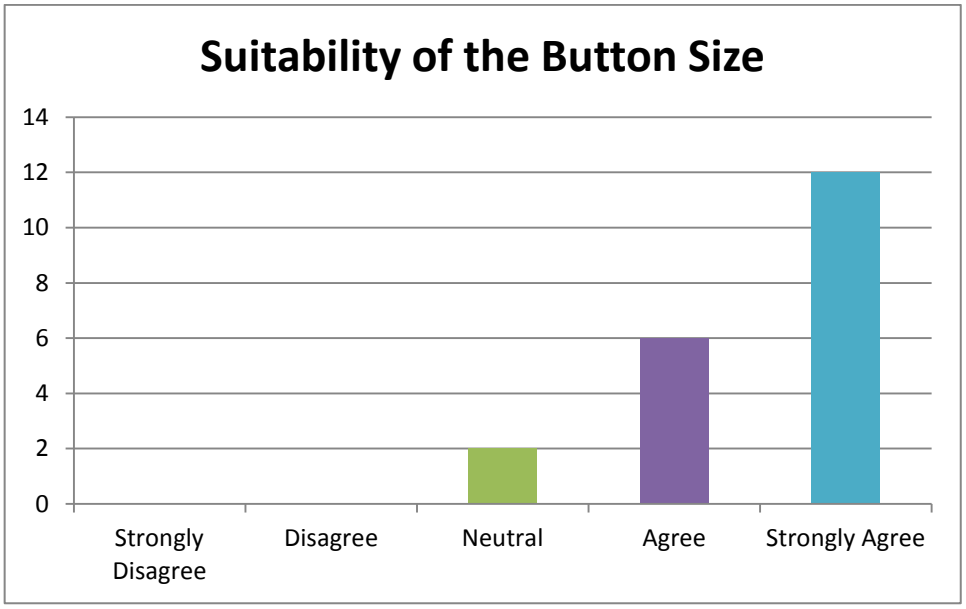

Figure 4.27: Rating for suitability of button size

Figure 4.27 shows that there are 12 students who rated strongly agree and 6 students who rated agree for the suitability of button size. This means that students does not have problem in touching the button provided. However, the button size depends on the screen size of different model of Android devices.

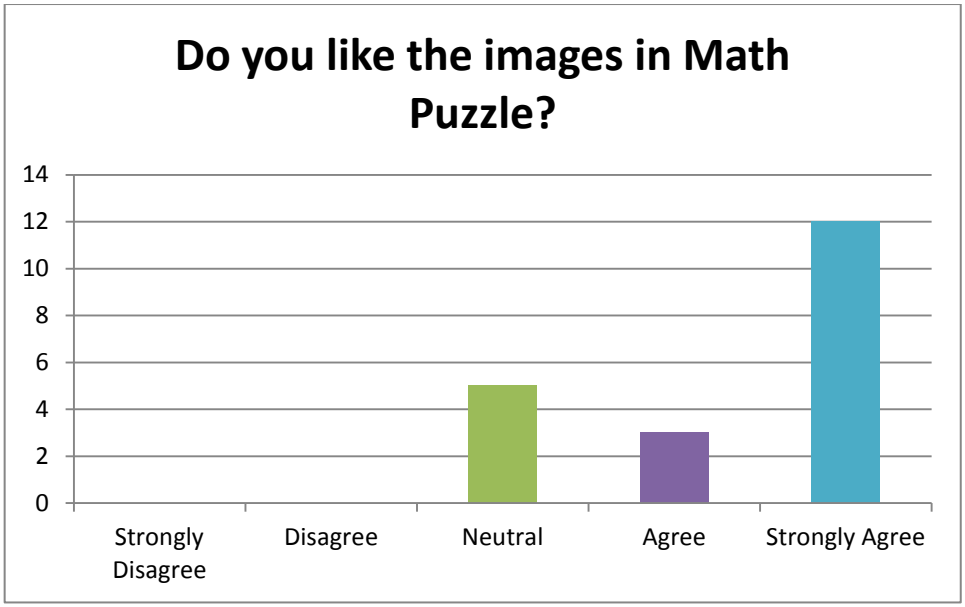

Figure 4.28: Rating for images in Math Puzzle

Figure 4.28 shows that 12 students who rated strongly agree and 3 students who rated agree for the attractiveness of images used in Math Puzzle. There are also 5 students who rated neutral because they want to see the action where wolf eating the human and the human move their leg while running.

4.5.2 User Acceptance Testing

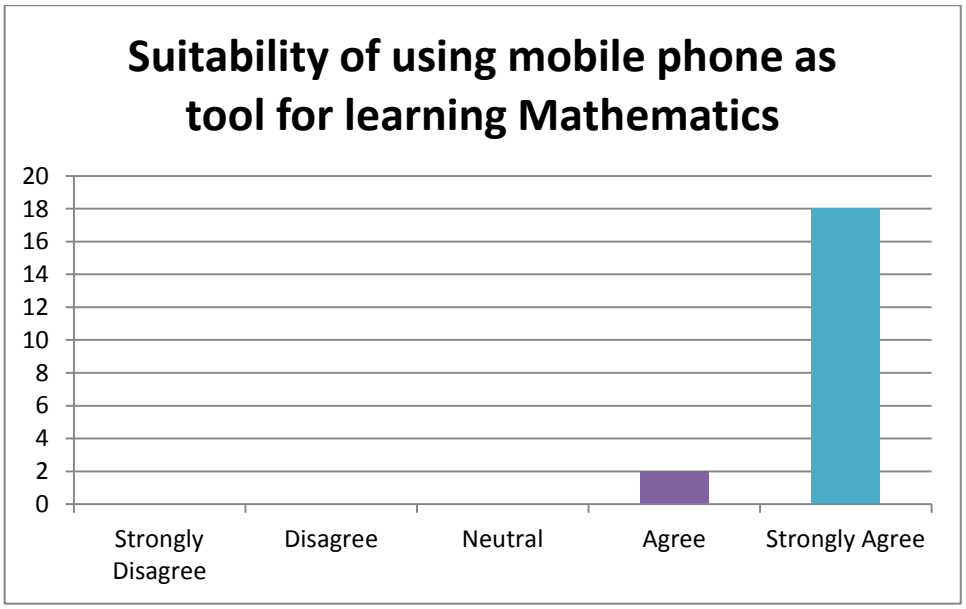

Figure 4.29: Rating for suitability of using mobile phone as tool for learning Mathematics

Figure 4.29 shows that 18 students who rated strongly agree for the suitability of using mobile phone as a tool for learning Mathematics. Most of them answer it easy to practice at any time and at any places. There are also 2 students who rated agree.

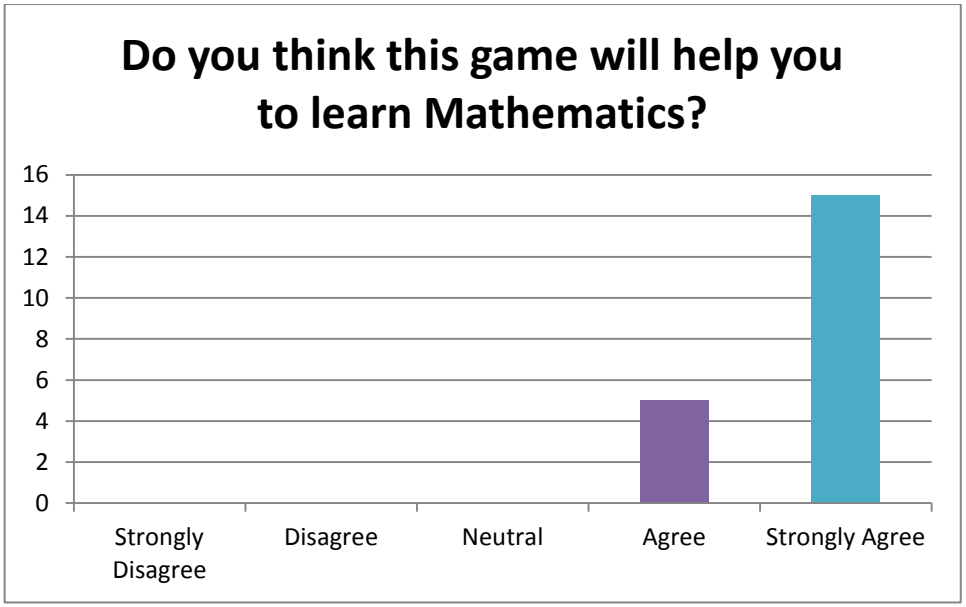

Figure 4.30: Rating for helpfulness of the game in learning Mathematics

Figure 4.30 shows that there are 15 students who rated strongly agree for the helpfulness of this game in helping them to learn Mathematics. Most of them said this game will help them to answer questions faster and will improve their thinking skills. There are also 5 students who rated agree.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

To conclude, there is an effective way to teach math for children mostly those who are having learning disabilities. Mobile Game for Children provides a solution for children to learn mathematics in an effective way. Children need to think and using their knowledge or skills in order to complete the entire quest. Through this game, children are able to gain their knowledge and improving their cognitive skills. Mobile Game for Children also provides suitable theory of puzzle for the game which is mostly using math theory for this puzzle game. Children will learn different mathematical operations in this puzzle game such as addition, subtraction, multiplication, and division. Mobile Game for Children also will meet the criteria in suitability for young children to play game as it only provide simple puzzle game together with simple mathematical operations.

In further development of the project for expansion and continuation, it may have a good prospect and value to further expand its scope for different ages. This project may be expanding by providing suitable mathematical operations for teenagers. It may have the same function like Mobile Game for Children, but with additional mathematical operations and puzzles that is suitable for teenagers.

CHAPTER 6

REFERENCES

[1] Puzzle Universe "Benefits of Children Playing Puzzle Games". http://puzzleuniverse.com/posts/view/265/Benefits%20of%20Children%20Playing%20Puzzle%20Games

[2] Berg, J. 2010, "The Benefits of Puzzle Games". http://www.articlesbase.com/art-and-entertainment-articles/the-benefits-of-puzzle-games-3287125.html

[3] Pettey, C. 2011, "Gartner Says Android to Command Nearly Half of Worldwide Smartphone Operating System Market by Year-End 2012". Retrieved from http://www.gartner.com/it/page.jsp?id=1622614

[4] Blodget, H. 2011, "Android is Destroying Everyone, Especially RIM – iPhone Dead In Water" 2011. Retrieved from http://www.businessinsider.com/android-iphone-market-share-2011-4

[5] Cedric. 2012, "5 Good Reasons to Choose Android as a Mobile Development Platform". Retrieved from http://www.androidmauritius.com/2012/02/15/5-good-reasons-to-choose-android-as-a-mobile-development-platform/.

[6] Meier, R. 2009, "Professional Android Application Development" Published by Wiley Publishing Inc.

[7] Overmars, M. 2011, "Designing Successful iPhone and Android Games with GameMaker".

[8] Bowman, D. 2009, Retrieved from http://www.information-management-architect.com/prototyping-methodology.html

[9] McFerran, D. 2011, "The best puzzle games for Android". Retrieved from http://www.knowyourmobile.com/mobile-games/mobilegamefeatures/1001348/the_best_puzzle_games_for_android.html

[10] McFerran, D. 2011, "The best puzzle games for Android". Retrieved from http://www.knowyourmobile.com/mobile-games/mobilegamefeatures/1001349/the_best_puzzle_games_for_android.html

[11] Kendall, G. Parkes, A. Spoerer, K. 2008, “A Survey of NP-Complete Puzzles”.

[12] Speers, B. “Puzzle Theory”. Retrieved from http://www.adventuredevelopers.com/featuredetail.php?action=view&featureid=30&showpage=1

[13] Speers, B. “Puzzle Theory”. Retrieved fromhttp://www.adventuredevelopers.com/featuredetail.php?action=view&featureid=30&showpage=4

[14] Geary, D. C. 2004, “Mathematics and Learning Disabilities”. Journal of Learning Disabilities.

[15] Kemp, G. Smith, M. Segal, J. 2012, “Learning Disabilities in Children”. Retrieved from http://www.helpguide.org/mental/learning_disabilities.htm

[16] Gooding, S. 2009, “Children’s Difficulties with Mathematical Word Problems.” Retrieved from Proceedings of the British Society for Research into Learning Mathematics.

[17] Attewell, J. 2005, “Mobile Technologies and Learning – A technology update and m-learning project summary.” Retrieved from Technology Enhanced Learning Research Centre.

APPENDICES

1.1 Gantt Chart for the project in 2 semesters

Gantt Chart	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Planning																										
Topic Research																										
Analysis																										
Research																										
Design																										
System																										
Implement																										
Testing																										
Debug Errors																										

Table 7.1: Gantt Chart for the Project Development