THE INTERACTIVE EDUTAINMENT PLATFORM FOR PRIMARY LEVEL MATHEMATICS

By

Su Li

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology
(Kampar Campus)

JUNE 2020

UNIVERSITI TUNKU ABDUL RAHMAN

REPORT STATUS DECLARATION FORM

Title: The Interactive Edutainment Platform for Primary Level Mathematics

Academic Session: January 2020

I _____ SU LI _____

(CAPITAL LETTER)

declare that I allow this Final Year Project Report to be kept in
Universiti Tunku Abdul Rahman Library subject to the regulations as follows:

1. The dissertation is a property of the Library.
2. The Library is allowed to make copies of this dissertation for academic purposes.

Verified by,

_____

(Author's signature)

_____

(Supervisor's signature)

Address:
Persiaran Gopeng 8,
Taman Golf,
31350 Ipoh, Perak.

SAW SEOW HUI

_____

Supervisor's name

Date: 09th September 2020

Date: 11/09/2020

THE INTERACTIVE EDUTAINMENT PLATFORM FOR PRIMARY LEVEL MATHEMATICS

By

Su Li

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology
(Kampar Campus)

JUNE 2020

DECLARATION OF ORIGINALITY

I declare that this report entitled "**THE INTERACTIVE EDUTAINMENT PLATFORM FOR PRIMARY LEVEL MATHEMATICS**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : 

Name : SU LI

Date : 09th September 2020

ACKNOWLEDGEMENTS

Firstly, I would like to thank my supervisor, Ms. Saw for sharing her valuable input knowledge and time dedication. I had a very comprehensive and clear-cut image on what I am doing with the assistance of Ms. Saw. When I am perplexed or faced any difficulty problem, she had patiently explained and guided me step by step.

In addition. I would like to thanks my family and my friends who spend gave me some precious feedback and suggestion. This helps me to improve during the development process of the system. Their ideas and comments have made my FYP project looks better and successful. The most indispensable is thanks a lot to my cousin sister, brother and their friends for their active participation of testing phase although currently is COVID-19 phase. They are still willing to help me to complete the testing process.

Besides, I would like to thanks to my moderator, Ms. Nur who gave me some feedback and spend her time to review my documentation and marks for FYP I and FYP II project.

Without them, I would unable to get a better idea in accomplish and carry out my FYP report and system. Lastly, I hope that all the information and learning material can bring more excitement and interest to the primary level student. Thanks again to everyone who helped in doing the project.

ABSTRACT

Interactive edutainment platform help student to gain learning material quickly and heighten in their studies. Most of the students elect to occupy most of their time on mobile or any other device in this day and age. Learner will be more savour to gain additional knowledge when saw some innovative animation or graphic rather than just construe using text. Through the use of online edutainment platform, user can increase to acquire new knowledge and skill. Besides, students may perceive more unrestrained to learn individually during their leisure hours. Different learning surrounding help to boost learning mood and flush increase comprehension during the course of learning. Therefore, the main target is to become more approachable and undemanding to incorporate into the educational process with the usage and combination of edutainment. Furthermore, help to promote and increase the interest topics that students might otherwise disregard is one of the accomplishments of edutainment that comprise in variable learning content and resources. This project is target on the mathematics subject and user between age of seven to nine years old students. It divides into three different standard which are standard 1, standard 2 and standard 3. Each of the standard consists of different learning material such as lecture note, tutorial question, video quiz and games. Besides, basic formulas and calculator link are provided in the system for student as a reference. Formula can help student grasp simple calculations like transform between different measurement units. Game is including in the system for students so that they do their revision while play game. Various multimedia elements are included in the system such as animation, graphic, interactive design and features, audio and text. They may feel more interest using any of the online platform rather than a traditional way such as textbook.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

VR	Virtual reality
AR	Augmented Reality
UI	User Interface
UID	User Interface Design
n.a.	No Author
n.d.	No Date
FYP I	Final Year Project I
FYP II	Final Year Project II
EXE	Executable

Chapter 1

Introduction

1.1 Problem Statement

1. **Lack of interactivity and features of edutainment platform.**

   Dissimilar and creative component of cartographic design is one of the most important process. The design of the edutainment platform must be creative and add some unique or additional button feature for user to look forward the tutorial or lecture resources. So, it must not design in a too simple way but the user interface should also not be too complicated. More visual, interactive and auditory to appeal in multiple learning style is encouraged. “Interactive concepts such as ‘‘simulation interactivity” or hyperlinked interactivity” (Sims, 1997), which describe different ways in which the learner can navigate, access and manipulate learning material within a specific learning environment. The higher the interactive with the system, the more motivation, learning outcome and benefit” (Stephan, 2010). “Overall, the more interactive the experience can be, the closer we are to the constructivist pedagogy that encourages the learner to discover, to explore and to construct his own knowledge” (Bruner, 1966).

2. **Lack of information for user to be a reference and clearly understand the solving skills.**

   Insufficient of further or more detail information for user to clearly understand the solving method is consider as a poor design system. “A good design allows to visualize difficult and naturally dynamic concepts, promote active learning, problem-solving, and critical thinking with interactive simulations and virtual environments, interact with the content with self-quizzes, and access content anytime, anywhere, at any pace” (Huang, 2005, p.224). The system should provide step-by-step solving method for student to follow and they can know the important reasons of doing the previous or next steps. One of the researches conducted that, “The instructions for use of the system should be visible or easily retrievable whenever appropriate” (Nielsen, 1994). Also, one of the researches showed that “It is better to provide a simple and abstract symbol with detailed information to user as a reference” (Lee, Forlizzi and Hudson, 2008).

3. **User unable to memorize the learning knowledge and remember the solving method for a long time.**

   The system needs to design in a non-linear way that allows the users to jump around the material by interacting or control the system. One of the researches conducted that, developing strategies to overcome barriers and increase the pace and effectiveness of implementation is a high research priority" (Enola, 2013). It is useful by giving some simple explanation or short step to solve the problem. Recognition rather than recall, minimize the user's memory load by making objects, actions, and options visible. So, user no need to think back to the information from one part of the dialogue to another. It can also compare the effect of different implementation strategies and essential information. The information can also design by using the 5 media elements to help the users to remember and learn it easily such as text, graphic, animation, video and audio. One of the researches mentioned that care was taken not too overwhelm the learner too many choices, since animation can present information too quickly and be too complicated for learner to grasp (Chandler, 2009).

1.2 Background and Motivation

1.2.1 Background Information

Over the past few decades, technological and interactive edutainment platform is an important issue that everyone focuses to make their daily life easier and attractive. Since everyone are living in a world which is influenced and reliance on the modern technology and seem that most of the people is difficult to live without using any technological item or internet especially young generation. Through the use of interactive edutainment platform, user can experience something that might not be able to experience in the real world to activate their engagement with the learning stuff. User capable to conduct the self-learning and self-improvement at the same time without side auxiliary. Edutainment emerge with the aim of increase education broadly and improve the standard of learning which already accessible (Apter, 2015). Also, one of the researches pointed out that "Edutainment combines educational content into an entertainment context facilitating learning and entertainment simultaneously" (Singhal and Rogers, 2002).

Edutainment is a form of entertainment that design and transfer in a more creative and attractive way for children during the process of learning. The purpose of Edutainment is to teach someone the skills and increase people knowledge on the particular segment. Action Science is also a practical way to present fundamental topics of science, technology, engineering and mathematics (STEM) education embedded in approaches that are entertaining, also known as edutainment (Robertson and Lesser, 2013). In this high-speed development information age, it is important and the main reason to offer a creative and attractive platform to engage an enjoyable learning environment. It can inspire the thinking and imagination of user through the controlling of edutainment platform. VR is one of the technology examples that allows user to perform interaction with the system. It helps to increase the quality of learning and user is able to control the system safety and freely in the virtual world.

Furthermore, come out with an interactive and safety edutainment platform which attract student attention and interest is an important and everyone values in society. User can move and interact with the system during the process of learning instead of just sitting down practicing the question without any interaction with technology system. It can increase the learning speed; time spend and able to memorise automatically. Young generation are willing and interest to learn and increase their knowledge through the learning of e-learning system. Also, parents are rest assured and allow their child to spend more time play on any of the

edutainment games, platform or system rather than those games that are violent and cruel. Practicing the challenge questions using the interactive edutainment platform can engage their memorization on the critical sequences more effectively and faster. According to one of the researches mentioned that “Educational technology is the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and learning” (G.O.M. Leith, 2011).

Most of the young generation know and able to use modern technology handy such as smart phone, computers, tablet, smart board and many others technology. Through the interactive edutainment platform, it is possible to increase the interest of young generation learning on something which may be difficult or challenge them and reduce the time spending on learning. It can help user to truly engage in the learning material and enjoy their learning moment at the same time. Palmer (1998) mentioned that creative and meaningful learning can happen in many inconsistent places and not merely in the classroom. The potential benefit of animated instructional tools for students with dyslexia in higher education and showed that appropriate animated instructional materials facilitate learning more when compared to static materials (Taylor, M., Duffy, S. & Hughes, G., 2007). “Learning can therefore be conceived in terms of the “capacity to know more” via the Internet rather than relating to the individual accumulation of prior knowledge in terms of what is currently known by everyone” (George Siemens, 2004).

1.2.2 Motivation

Edutainment platform can help student to learn mathematics subject and enjoy the games at the same time. Edutainment platform can also help to amplify their studying experience and ensure interaction between user and technology system. Because nowadays children are more willing to spend their time in technology product and item, so it is a good idea which come out with the combination of technology system and education learning. They no need to spend too much time sitting to revise, practice different type of questions and just only memorizing the note or formula that listed on the textbook or from any others hardcopy material. One of the researches mentioned that “Edutainment depend deliberately on modern visual material, on depletion or game-like formats, and on more informal, less didactic styles of address” (Buckingham and Scanlon 2000).

1.3 Project Scope

The participants that make use of this interactive edutainment platform is aimed at primary level student with the subject of mathematics which range between the level of standard one to standard three. The mathematics edutainment platform provides the lecture notes, tutorial questions, formula note, quiz questions and multiple interactive games that involve technology system. For the lecture part, the system provides different solving method step by step so user can choose which is suitable or easier for them to memorize and clearly understand. The system is more focus on the design of the mathematics calculation such as plus, minus, divide and multiplication skills. The games will design in a quiz method which provide four different answers for user to choose and select the right one. Besides, the system will also design a game part which need to use and interact with the modern technology such as VR. The system provides many different learning material and resources as a reference for student to clearly understand the solving skills before do any practices, quiz or even take any of the exam in their school.

1.4 Project Objectives

1. **To study artistic or image approaches and different learning method used for create interactive edutainment system.**

   The artistic or image approaches used in the system can attract the user's attention and provide further information about the different ways of mathematics solving method. It is important to make edutainment system more productivity and improve the quality of learning. Primary school student may interest and attract by the cartoon style image or graphic. One the researches stated that "All the elements of a Web application and the UID that develops a particular element by depicting the presentation of input and output parts of the user interface" (Zhu et al., 2010). In addition, a study stated that "All of the interface sign is an important elements of Web user interfaces such as navigation links, small images and graphical animations, thumbnails, short text, and button" (Islam and Bouwman, 2009). The system can provide different solving method of the mathematics subject so that user can compare and choose the method that may be easy and suitable for them to memorize or solve the similar questions in future.

2. **To develop edutainment system that have friendly and creative user interaction that let user manage and gain knowledge in a dynamic way.**

   One of the researches classified that, interactive learning environments are viewed as a promising option not merely for presenting information but for allowing the learner to engage actively in the learning process (Renkl and Atkinson, 2007). The accurately of information will increase and more effective of user use to learn mathematics subject. Good and meaningful design is important to redesign a simple and easy look of an existing product or service with some iconic symbol or images as it able to immediately appeals to user senses. Furthermore, a good or creative design can make the interface if the interface if the application functionally interactive and reinforce its usability.

3. **To apply a fascinating game with the combination of quiz and escapade game with multimedia technology that can attract user's interest.**

   With the combination of game like adventure element and quiz, users can learn some information when playing the game. It can get the user interest and learn faster if the system is design with the multimedia element such as 3D or 2D graphics and animation that contain education values. "Multimedia has the potential to revolutionize the way we work, learn and communicate" (Stemler, 1997). "A Serious Game is an educational scenario combining play and technology in a video game that can be applied in diverse areas from education, health, to scientific exploration, engineering, and many other domains" (Alvarez, 2007). "Games can keep students from getting bored, generate enthusiasm and stimulate thought learning processes" (Royse and Newton, 2007). It is important to develop a fast-strategic thinking and problem-solving edutainment platform instead of traditional learning method. "Students perceived gamified courses to be more motivating, interesting, and conducive to learning than other courses" (Dicheva et al, 2015). Come out with a more creative and irritate games that need for user to think carefully in order to solve the challenges problem. Student might need to remember the aspects in order to solve the games and memorize critical sequence.

1.5 Impact, Significance and Contribution

Through this project, student may interest and they have more motivation on increase their mathematics subject knowledge and familiarly practice tutorial question. Student will able to achieve high score after having some practice or clearly understand the solving skills after using the gaming as a learning plan of action. Student can also increase their individual's skills and improve their learning environment. With the combination of education and entertainment, parents and teachers will be able to focus more on manage and educate their academic performance. One of the researches pointed that "The Internet isn't just a powerful tool for communication" (Jeb Bush and Dawson, 2013). It's arguably the most potent force for learning and innovation since the printing press. And it's at the centre of what is possibly America's mightiest struggle and greatest opportunity: How to reimagine education for a transformative era". Teacher in school able to provide immediate feedback to student for a better interaction and motivation. Student who is active can also have some interaction with others instead of sitting down quietly in the class. They can absorb better the knowledge and skills of the mathematics subject quickly by using the interactive edutainment platform.

Interactive, meaningful and creative learning platform can increase their learning enthusiastic and stimulate their imagination so that they can faster recall back if face the similar problem or question in future. Edutainment platform also provide tutorial or guide them step by step. Student may be better understanding of the concept or subject if develop a 3-D gaming environment such as VR or AR. It is because some of their parent not able to free up their bustling schedules to educate children. User are able to keep-in mind the points or formula in order to face the similar question or problem in future. The edutainment platform provides each of the questions with solving skill step in multiple different ways to motivate them in learning something new. The activities which join were created to educate elementary mathematics theory in algebra and geometry in an approach that make use of transformative academic plan, which helps students to increase their memorizing and establish knowledge in creative and useful way (Mezirow, 2003).

1.6 Report Organization

Chapter 1 describe further information and the incentive development of the system. This chapter accumulative the information which covers the difficulty that might be faced, background information, motivation, project scope, the goal of development, impact, significance and contribution of the project. Chapter 2 discuss and make a comparison of strengths and weaknesses between the different platform of the Mathematics. Different feature and advantage can be seen clearly with a further description through the list of tables.

Chapter 3 essentially present the system design phase. The overall interface that may occur in the system such as start page, menu page, standard menu page, three different standards of lecture, video, exercise and video UI will be described using a storyboard, flowchart by providing the further description. Chapter 4 explain what is the justification for choosing the methodology method and how is the process of the method. Chapter 5 illustrate the overall document of the requirement that gather such as investigated results and tools. Furthermore, FYP I and FYP II Gantt chart will be comprised by clearly stated the time taken for the complication of the whole process and diagram such as use case diagram will also be embodied in this section.

In the further chapter which is chapter 6 and 7 presents the information and procedure of performance and development of the system. Result of the testing will be mentioned and documentary in a table format. Collect feedback of the primary level student after the testing of the system by providing them with a questionnaire survey and the result will be recorded in a pie chart way. Last but not least, the ending chapter used to describe what has learned during the process of developing the system and make a summary done of the project.

Chapter 2

Literature Review

2.1.1 CK-12 Application (Neeru Khosla & Murugan Pal, 2018)

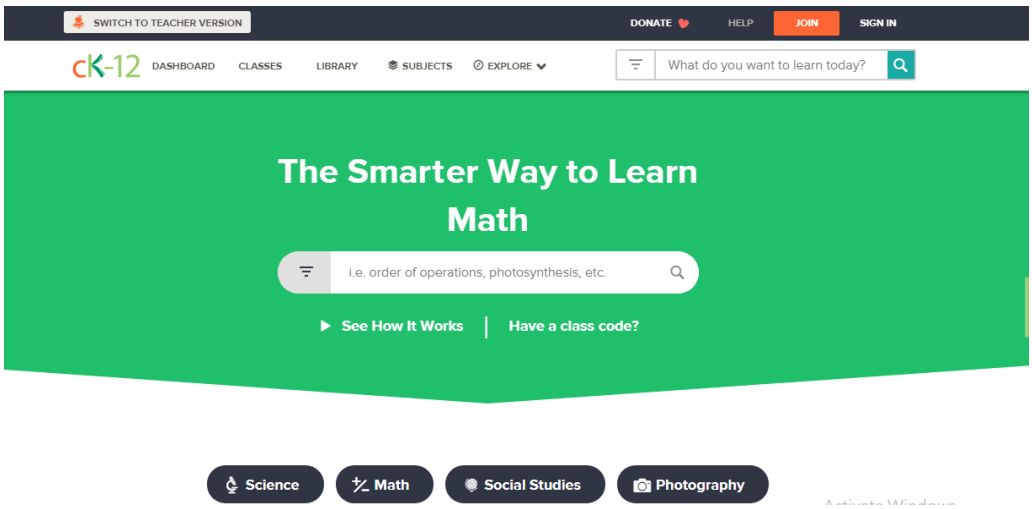


Figure 2.1.1.1 Main page of CK-12 website.

CK-12 is a free application that available on Android, iPhone or iPad, Windows computer and web platforms. CK-12 is also a high-quality content with the latest technology. The interactive learning activities offers include adaptive practice, PLIX and simulations. It is easily to control and access in anytime, anywhere. The website contains lecture notes, tutorial questions, quiz and also tests.

Strength

CK-12 provide many different chapters that include in the mathematics subject as shown in Fig.2.1.1.2 below. User can choose the chapter that they fell difficulty or misunderstanding the solving skills which contain in CK-12 application. User can directly access the information and get the knowledge immediately because the system provides multiple solving methods and the explanation is in-depth exploration. The website also provides tutorial questions, learning video and some interactive activities as shown in Fig.2.1.1.3 below. Interactive activities that provide for user to challenge can improve user imagination. Most of the exercise are for user to increase their mathematics knowledge and thinking speed. The information is arranged well and the property content is magnificent. User can edit the articles and save in Google Drive for the use of revision in future.

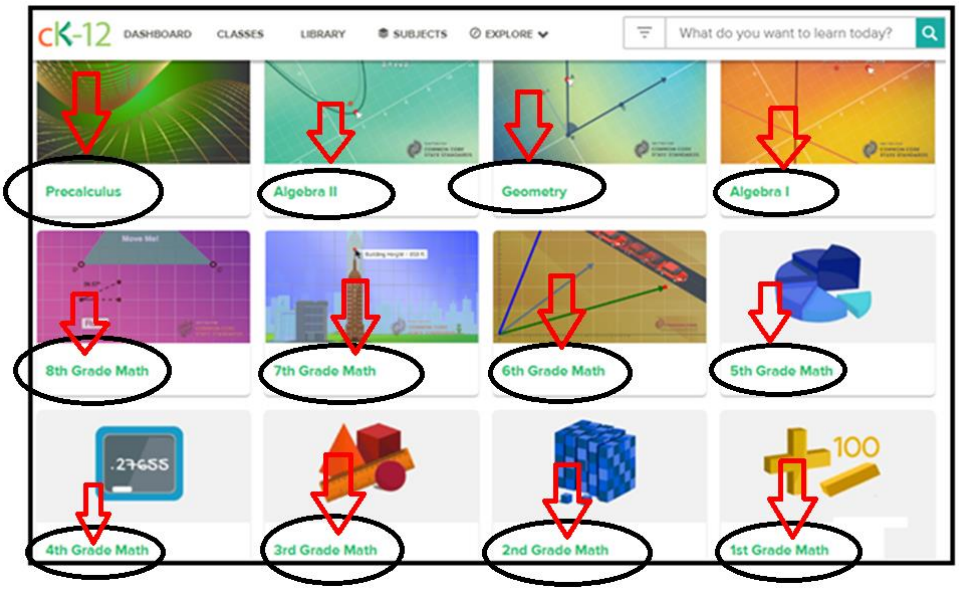


Figure 2.1.1.2 Different chapters and topic provide in the website.

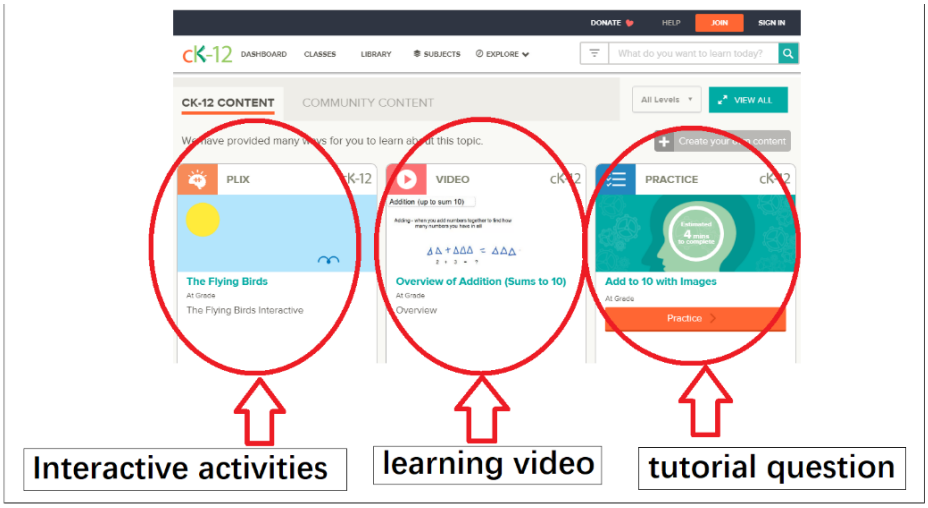


Figure 2.1.1.3 Different learning method provided

Weaknesses

The edutainment platform did not provide any adventure or innovative game. Furthermore, the system is lack of creative animation, graphic and background music to attract user attention. The user interface is too simple without any creative images.

2.1.2 Math Playground Website (Colleen King, 2002)

Figure 2.1.2.1 Main page of Math Playground website page.

Math Playground website is an online website games that range the student from 7 years old to 15 years old. The site contains mathematics learning skills such as arithmetic, equations, functions, fractions, graphing, measurement, patterns, geometry, decimals and percentage, multiplication, addition and fractions. The website is free for charge for all the games provide in the website. The website require user to install Flash Player and Java software before access it. "Students loved learning with math games and wanted to keep playing at home" (Colleen, 2013.). That's how Math playground came to be. Nowadays children everywhere like to explore multiplication, fractions, geometry and more with our fun and unique math games".

Strength

The website provides different grade for user to level that suitable for them to enjoy as shown in Fig.2.1.2.2 below. Every different level same is similar but the question ask is more difficult compare with the lower level. Next, math playground website provides different learning method such as storytelling and math video as shown in Fig.2.1.2.3 below. The main purpose of the creative interaction and feature provide by the website is for student to give response rather than just boring sitting in the classroom focussing on what teacher is teaching. Different style of game such as classic games, spelling games are provide as shown in Fig.2.1.2.4 below. Especially multiplayer math games which require few people participate into the game also provided. User can communicate, interact and join into a small group with

their friends when playing the multiplayer games. They also even can make new friends and improve their communication and social skills. The user interface provides share button for user to share the website link to Facebook as shown in the Fig.2.1.2.5 below. User can also share their performance after attend a small quiz that provide in the website for user to participate. As shown in Fig.2.1.2.6 below, the website also provide a sound button that allow user to click and play the background music or read out the questions automatically. Lastly, some of the games provided in the website suitable for adult and children to play. It is important and big advantage for whole family to interaction and spend their time together and increase their knowledge and thinking speed.

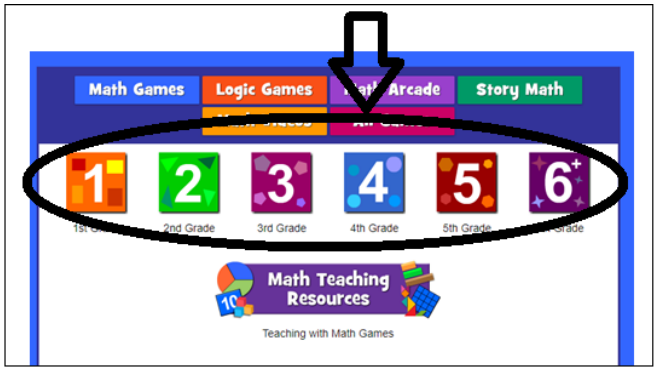


Figure 2.1.2.2 Different grade provide for user to choose.

Weaknesses

The website did not provide any colourful or creative animation or graphic that attract the attention of user. User interface is too simple and without any creative or meaningful graphics that cannot make user feel interest of playing it. Furthermore, most the game question that ask in the website is too difficult for primary level student to clearly understand meaning of question ask. Next, the tutorial video did not provide any replay button or download button. User need to refresh the page before play back the video again. Lack of impressive which seem that the design of the learning material for entertainment is over education that lead user feel distract. Unfortunately, the software platform need to the Adobe Flash support. User need to download the Adobe flash become access to the website. User unable to access and enjoy the games if they did not install the Adobe Flash software as shown in Fig.2.1.2.8 below. Most of the grade is out of the range. Student unable to answer the question even it is the simplest games of the particular grade. “This site looks great, but it’s not for six years old the way the review states. My 1st grader is smart, but the simplest games here are definitely out of her

range" (Kutt, 2009). Also, "The most of the mathematics grade is above the skill level even they choose the easiest game level" (Amesisland, 2008).

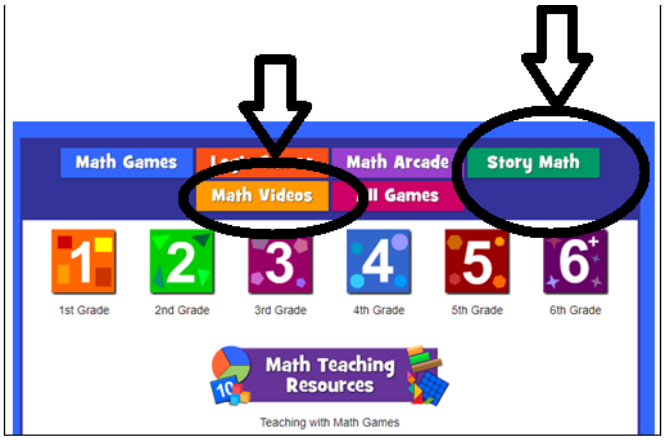


Figure 2.1.2.3 Different learning method I.

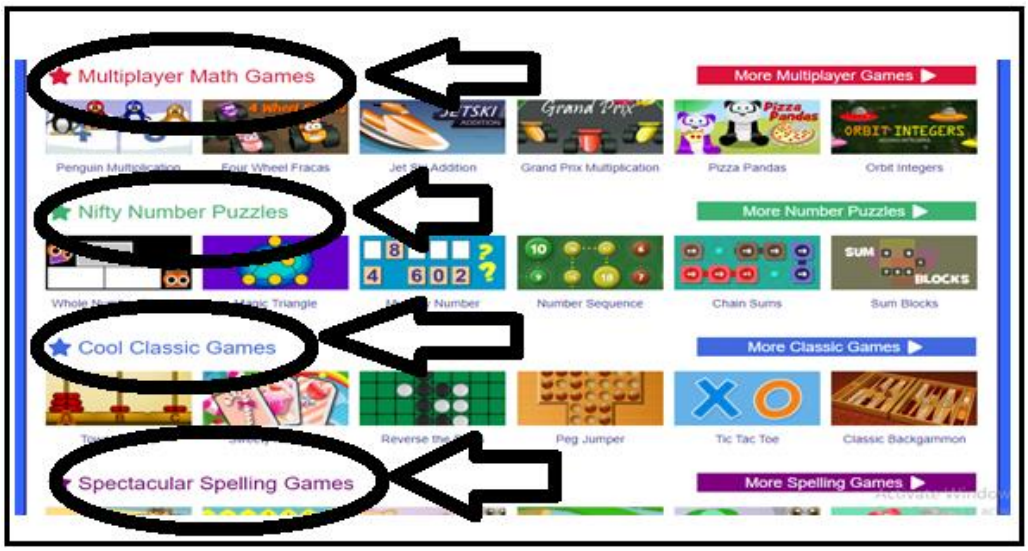


Figure 2.1.2.4 Different learning method II.

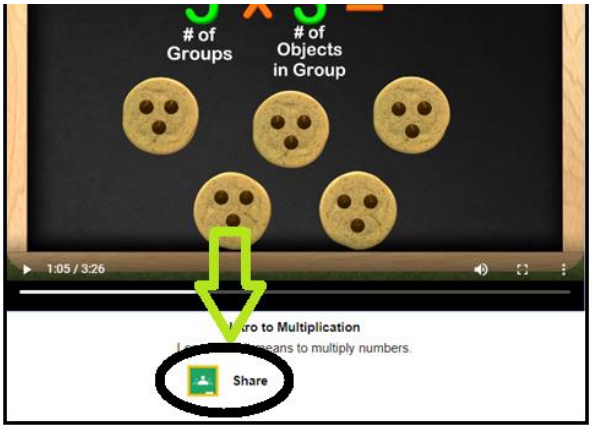


Figure 2.1.2.5 Share button provided on the bottom of the page.

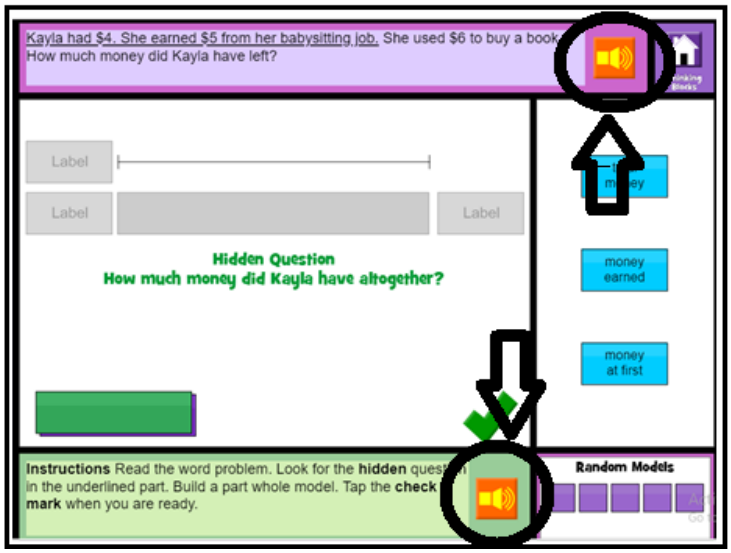


Figure 2.1.2.6 Sound button use to play or mute the background music function.

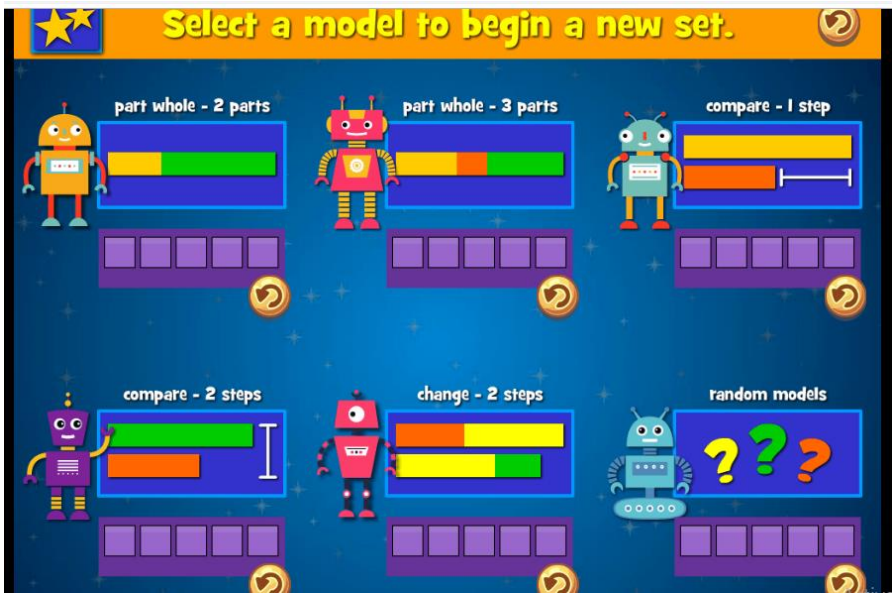


Figure 2.1.2.7 Questions that asked by the website is difficult to understand.

Figure 2.1.2.8 Unable to work and access without Adobe Flash installer.

2.1.3 BuzzMath Application (Claude Laverdure, 2003)

Figure 2.1.3.1 Personal account page of BuzzMath application.

BuzzMath application or website is a mathematics edutainment platform that suitable for middle school students. It is suitable to manage teachers and students on the associate application. The application contains the chapter such as patterns and sequences, fractions, ratio, algebraic expressions, measurement, geometry, data, graphs and probability, number properties, decimals and many others topic. BuzzMath is a free software application that currently available in English language only.

Strength

Buzz math website provide pencil button feature for user to list down the working step or calculation as shown in Fig.2.1.3.2 and Fig.2.1.3.3 below. User can jot down any additional information in any empty space. The application allow user to interact with the system as shown in Fig.2.1.3.4 below. User can drag the facial expression to any diagram to increase the interaction between user and the system. As shown in Fig.2.1.3.5 and Fig.2.1.3.6 below, the system provide the solution and description of the question if they answer wrongly. User are able to know the reason of answering wrongly and they may not repeat the same mistake again when face the similar question in the future. User can also repeat the question again by only need to click on the repeat button. Besides, user can save the data or information into my favourite files as shown in Fig.2.1.3.7 below. It makes easier for user to revise or get the information in the future. User no need to spend their time on searching for the question

that they want. The application provide lecture note for user to clearly understand the solving skills as shown in Fig.2.1.3.8 below. User allow to download and save the lecture notes.

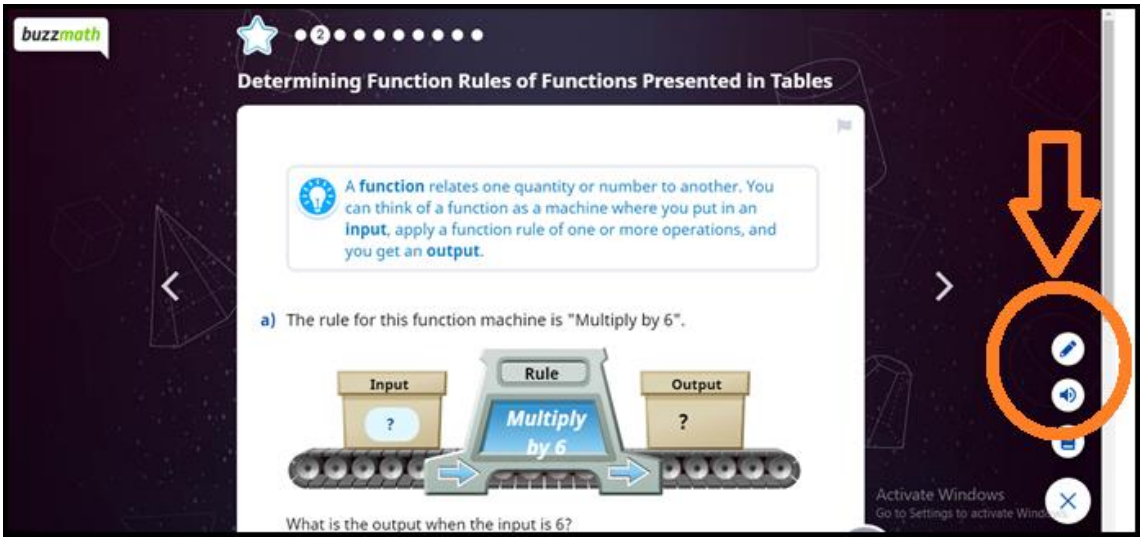


Figure 2.1.3.2 Paint button is provided for user to jot down any additional note.

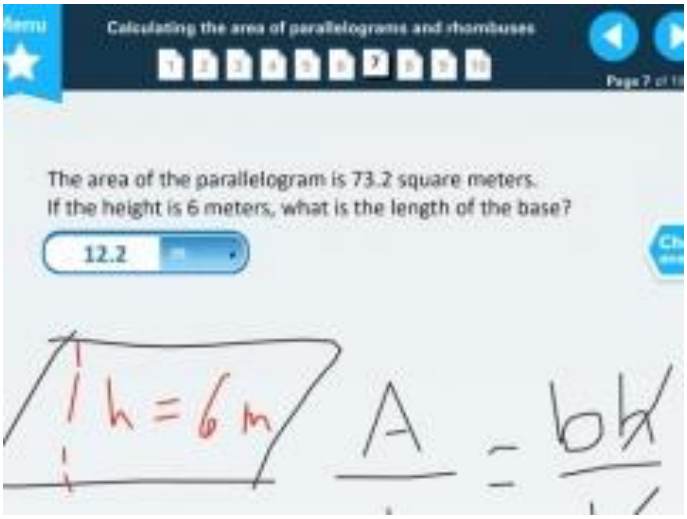


Figure 2.1.3.3 User can draw the working step directly.

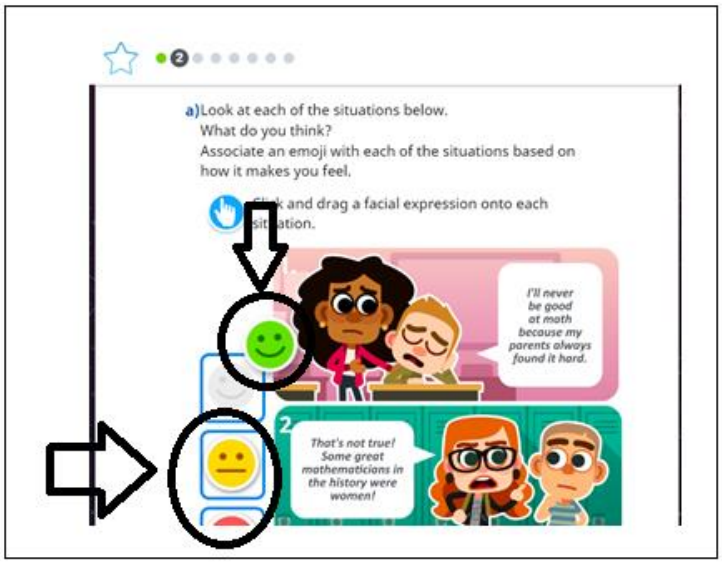


Figure 2.1.3.4 User can drag on the facial expression button.

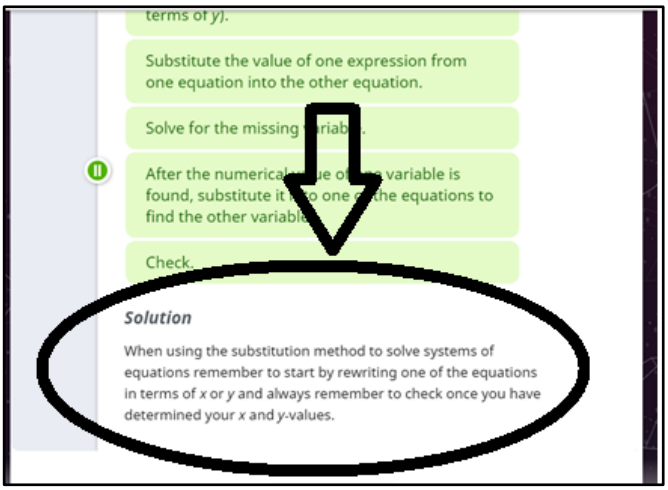


Figure 2.1.3.5 Short explanation or step of the solution is provided.

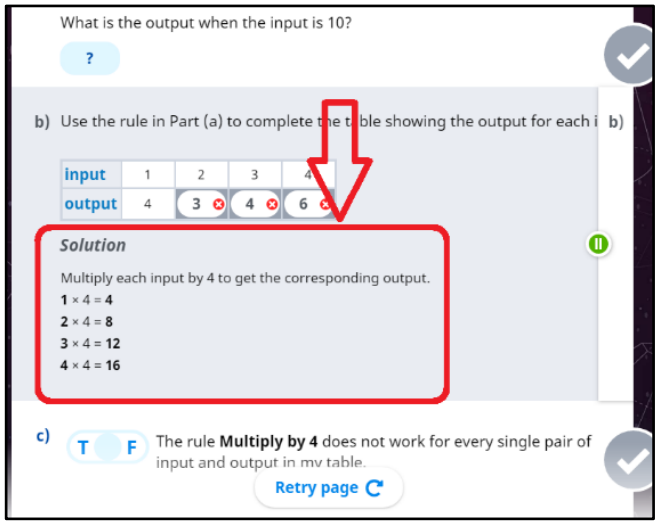


Figure 2.1.3.6 Short explanation or step of the solution is provided.

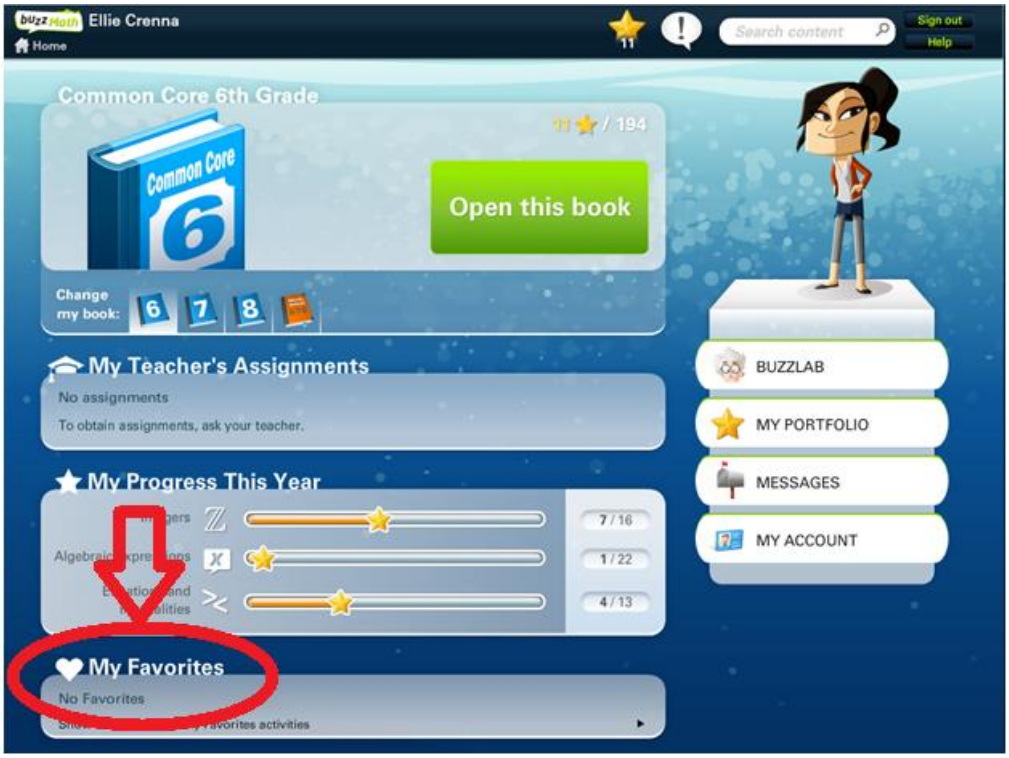


Figure 2.1.3.7 User can save the important in a file that already provided to save their time on searching the previous information.

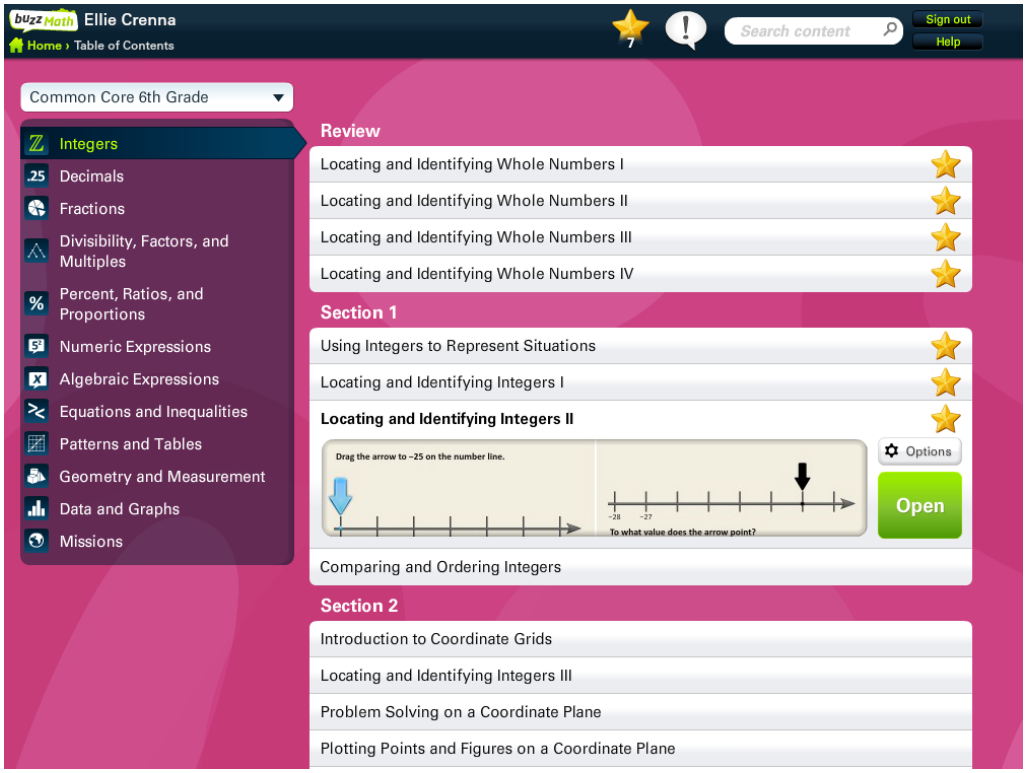


Figure 2.1.3.8 Lecture note for each chapter is provided.

Weaknesses

The system did not provide any back to home button for user as shown in Fig.2.1.3.9 below. User unable return back to the main menu page without finishing all the question provided. Furthermore, the system did not provide any creative animation or graphic that can attract user interest or attention. User interface is too simple as user may easily feel boring of playing it or getting information from the application. The application lack of adventure and creative games for user to increase the mathematics knowledge and skills when playing on the game. It only provides quiz for user to try. The user interface lack of colourful animation or graphic that attract user attention.

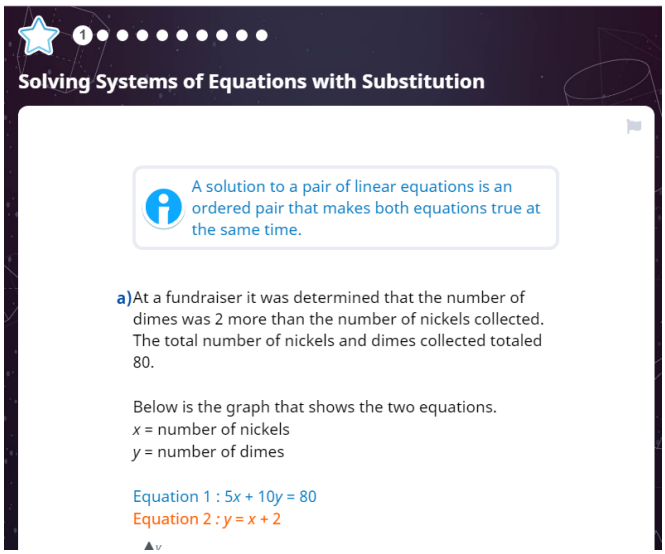


Figure 2.1.3.9 System did not provide any back to main menu button at the top of the page.

2.1.4 Playkids Application Platform (Breno Masi & Eduardo Lins Henrique, 2013)

Figure 2.1.4.1 User interface of Playkids application.

It is a mobile education and entertainment platform for children to increase their knowledge. It includes many other segment and music video in the application. Playkids application is available more than 100 countries and have been downloaded by more than 18 million families. The application is free and the target audience is two to five years old kid. User require register for personal email or Facebook account before login to the application.

Strength

It provides the learning material such as letters, numbering, rhymes and many others as shown in the Fig.2.1.4.2 below. Through the exercising that provide in the website, user can increase and exercise to increase their imagination. It can also build up relationship between parents and their child through adventure games and educational digital content. The design of the application is colourful and various type of animation and graphics as shown in the Fig.2.1.4.3 below. Children will easily get attract to the carton and animation; they will also not easily feel boring with the design of the application. Playkids application stories also provide in two different ways which is audio and text ways, so user can choose either audio play or read the text directly. So that children can spend their time with their parent with the benefit of increase knowledge relate to mathematics subject.

Figure 2.1.4.2 Learning method such as numbering and labelling.

Figure 2.1.4.3 Interactive animation and graphics provided.

Weaknesses

The application frequently pops out the advertising that may causes children cannot constantly contact with learning while playing games as shown in Fig.2.1.4.4 below. It is difficult for children to increase their mathematics subject knowledge as too many advertisings pop up while playing and influence interrupt children learning attention. The design of the games is not interest to user and boring. User have less interaction with the system and cannot control the movement of the character inside. The edutainment platform required to use Internet connection to run the system. Lastly, the weakness of this game-based learning module is the design and flow of the question is the same. When user try to do the quiz in the second time, user can memorize the answer. The flow of the module is in a static way. User can only access the application using smartphone. It does not support any other devices except for android smartphone. The application costly as shown in Fig.2.1.4.5 below.

Figure 2.1.4.4 Advertisement notice wisely pop out when playing the games.

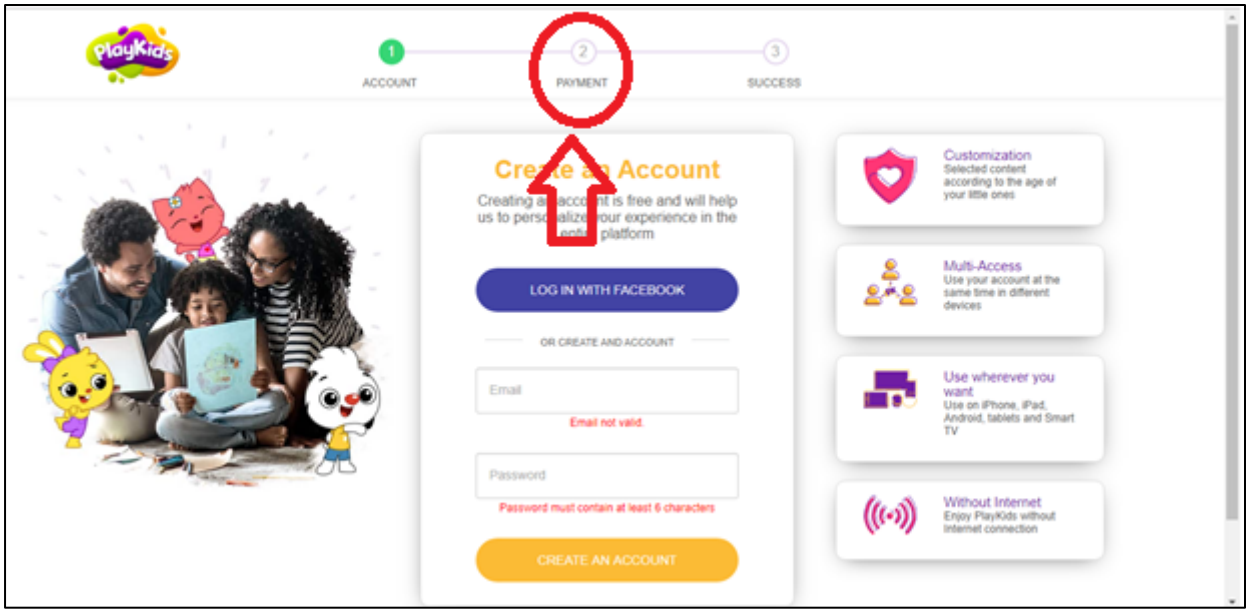


Figure 2.1.4.5 Payment details of Playkids application platform.

2.1.5 Math for Kids Application (n.a. , n.d.)

Figure 2.1.5.1 Main page of Math for Kids application.

The application is suitable for primary level student which range from six to eleven years old. The application is more focus on the four basic concepts of mathematics subject which include multiplication, division, addition and subtraction. Math for Kids application provide quiz and tutorial questions for user to learning and improve their knowledge. Particularly, "Gamification elements can transform boring tasks into interesting ones" (Faiella et al, 2015).

Strength

The edutainment platform provides different grade for user to choose which is the best suitable for them. Every level is divided into easy, moderate and hard level as shown in Fig.2.1.5.2 below. The system provides multiple topic and chapter such as multiplication, subtraction and additions as shown in Fig.2.5.3 below. Each of the chapter contain different learning method that make easier for student to choose with is the best solving skills that can easily memorize and increase the speed of solving questions. "To better grasp the effect of gamification on motivation effectively, researchers need to conduct longitudinal studies or at least identify which combinations of game design elements are most likely to stimulate intrinsic motivation" (Alsawaier, 2018). The system got offer dictionary, worksheets and puzzles to interact with the subject without losing fun and increase new knowledge.

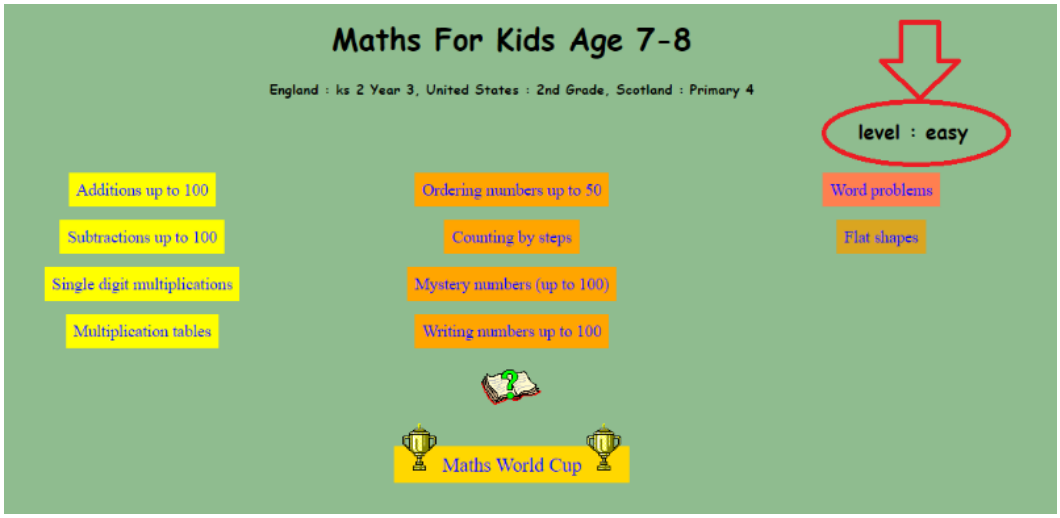


Figure 2.1.5.2 Different level of mathematics subject.

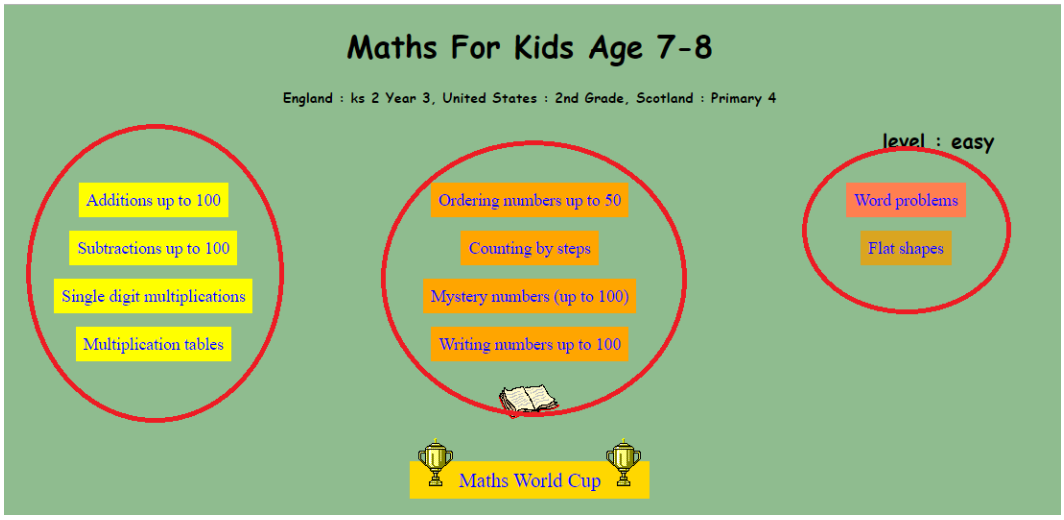


Figure 2.1.5.3 Different topic or chapter of mathematics subject.

Weaknesses

The design of user interface is too simple without any interactive and creative animation or graphics as shown in Fig.2.1.5.4 below. The main menu of the application is too monotonous. It can be solved by adding some creative button, pattern or rhythm. With the attractive and creative design, user can navigate the website that can easily solve their problem and find the information without any effort. The platform did not provide any lecture, learning video for user to revise and clearly understand the information that include in mathematics subject. The system is lack of animation and graphic that attract the attention of user. Games provide in the system is less and not enough creative enough to attract children. The games should design and create in a more adventure and meaningful ways.

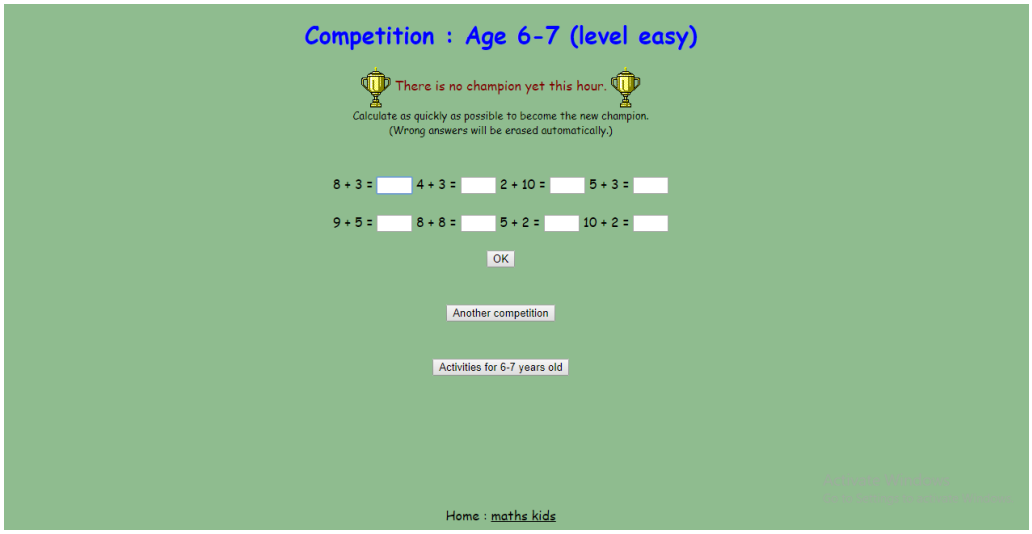


Figure 2.1.5.4 User interface is too simple without any creative ideas.

2.1.6 DreamBox Website (Lou Gray & Ben Silvka, 2006)

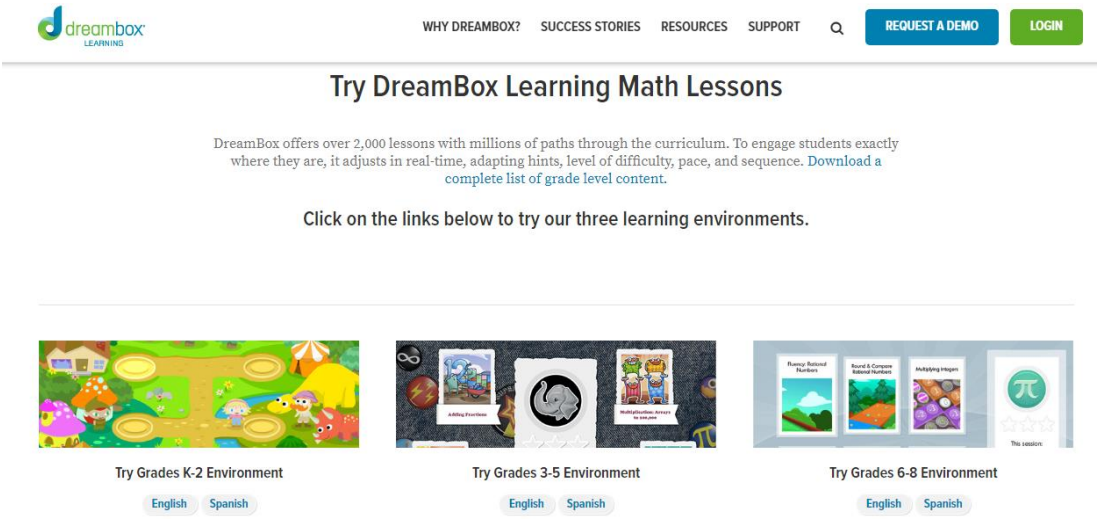


Figure 2.1.6.1 Main page of Dream Box website.

DreamBox website provide the alternate ways and additional assistance to solve maths questions. It is one of the websites where students can learn mathematics skills through engaging games, video and exercise questions. "Gamification is defined as 'the use of design elements characteristic for games rather than play or playfulness in non-game contexts" (Deterding et al, 2011).

Strength

The edutainment platform provides two different languages which is English and Spanish languages as shown in Fig.2.1.6.2 below. It is the proof based to advance student broadening and deeper conceptual understanding by motivate dissimilar pathways and methods to solve the questions. Furthermore, DreamBox website empowers educators with real-time data and academic intuition to notify learning and customizable professional development range to instructional goals and distinct user needs. Next, the website provides different level such as first grade, second grade, third grade, fourth grade, fifth grade, sixth grade, seventh grade and eighth grade as shown in Fig.2.1.6.3 below. The system allow user to choose, save and print out the animation or graphic as shown in Fig.2.1.6.4 below. Furthermore, the system provides meaningful and creative interaction between user and the system. User able to click or drag on any of the graphics and it can easily attract children attention because the cartoon is creative and animated. User can also send personal feedback or opinion as shown in Fig.2.1.6.5

below. A skip button is provided at the top of the website page as shown in Fig.2.1.6.6 below. It come out with the function that allow user to skip or jump to the next page.

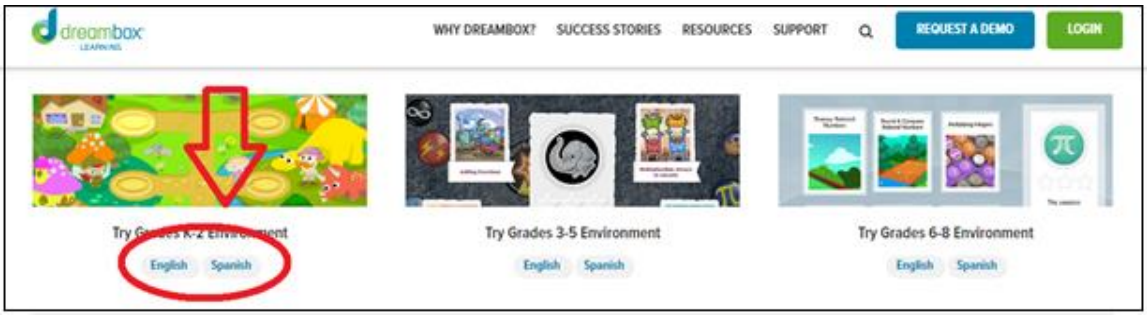


Figure 2.1.6.2 DreamBox platform provide two different language for user to choose.

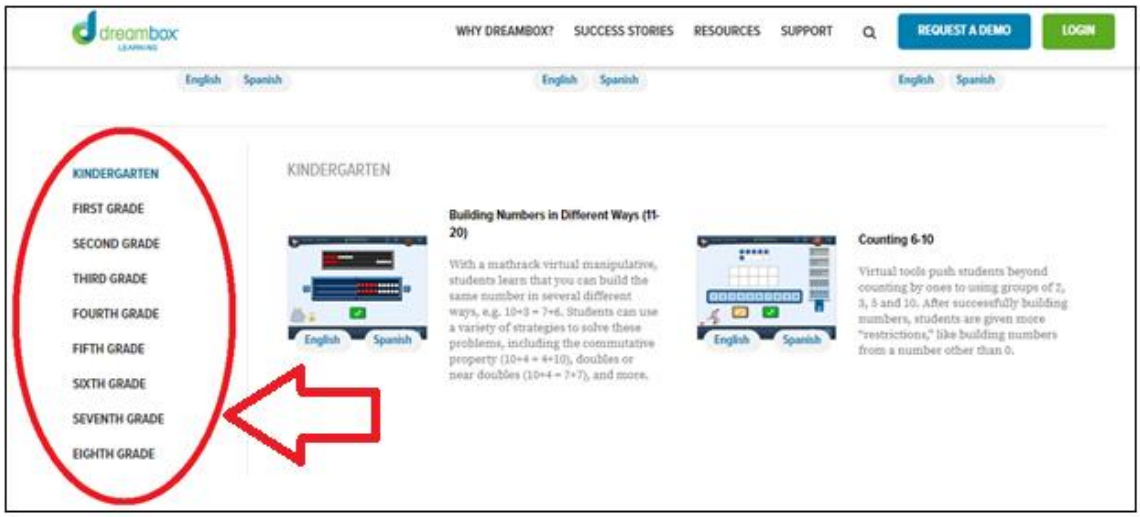


Figure 2.1.6.3 Different level or grade is provided at the side of the page.

Figure 2.1.6.4 Print button is provided for user to print the animation or graphic.

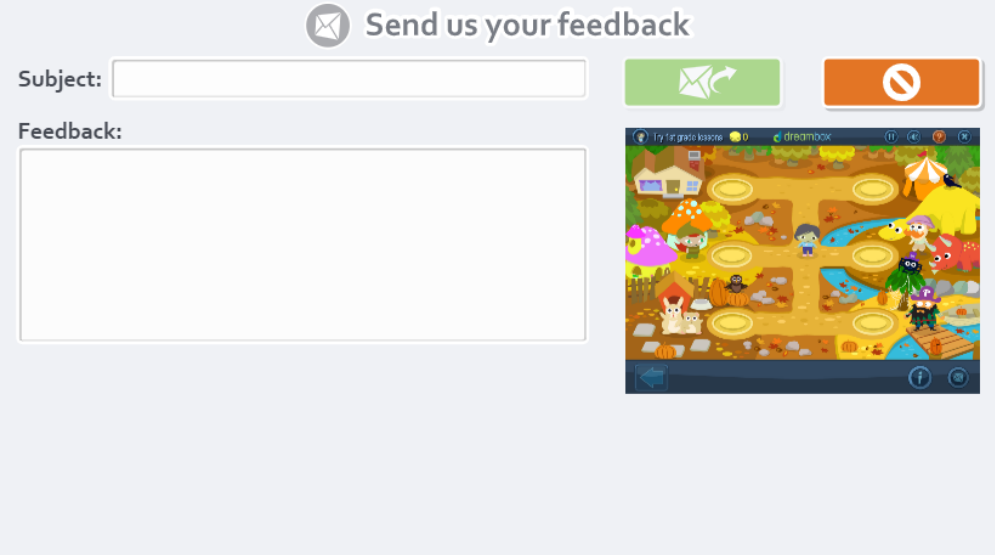


Figure 2.1.6.5 User can send feedback to the author of the website.

Figure 2.1.6.6 Skip button is provided for the purpose of jump directly to the next page.

Weaknesses

The video that play without provide any text, it is difficult for children to listen and clearly understand as shown in Fig.2.1.6.7 below. It is a main problem without provide any text at the below of the video because most of the children unable to focus and quickly understand the information that show in the video. The website did not provide any lecture note

or quiz for user to do some revision before start the exercises. Additionally, the system loading is too slow as shown in Fig. 2.1.6.8 below.

Figure 2.1.6.7 System without provide any description or information text.

Figure 2.1.6.8 System loading is too lagging.

2.1.7 FunBrain Website (Poptropica Worldwide, 1992)

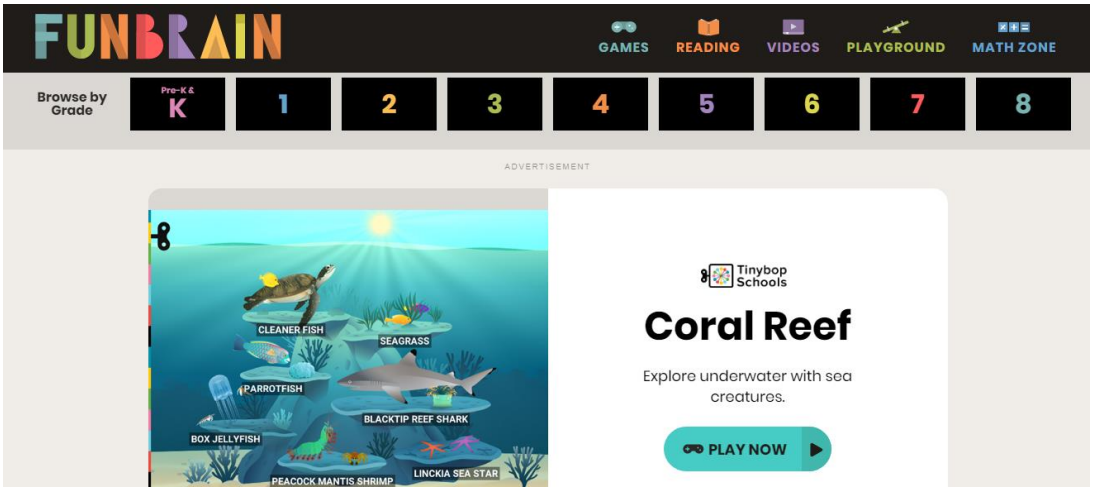


Figure 2.1.7.1 Main page of Fun Brain website.

FunBrain website contain the edutainment material such as addition, multiplication, divide, decimals, subtraction and problem-solving method. “Gamification of different learning environments may constitute a powerful tool for the acquisition of knowledge, and might enhance important skills such as problem-solving, collaboration, and communication” (Dicheva et al, 2015). “Gamification aids in building communities, where participants share tips and celebrate accomplishments on a whole class level, not only academic high-achievers” (Faiella et al, 2015). This website is best suitable and widely access by primary level student especially seven to ten years old student.

Strength

The system provides many and different type of lecture note or video lesson as shown in Fig.2.1.7.2 below. User can get more understanding of the mathematics knowledge and it provide multiple solving method for user to choose which method is the easiest and suitable for memorizing and understanding. The system contains the interaction between user and the system as shown in Fig. 2.1.7.3 below. Creative interaction is for student to stay focus and give some response. The design of the user interface is creative and colourful that can easily attract the attention of student as shown in Fig.2.1.7.4 below. The design of the system includes various combination of the graphics and animation element such as cartoon. The background music also provide to avoid or prevent user from getting boring of the lesson. Additionally, the system contains different level for user to choose which is best suitable for

them to do some additional exercise. Student can do some basic mathematics practice and increase mathematics solving skills.

Figure 2.1.7.2 System provide lot of learning method.

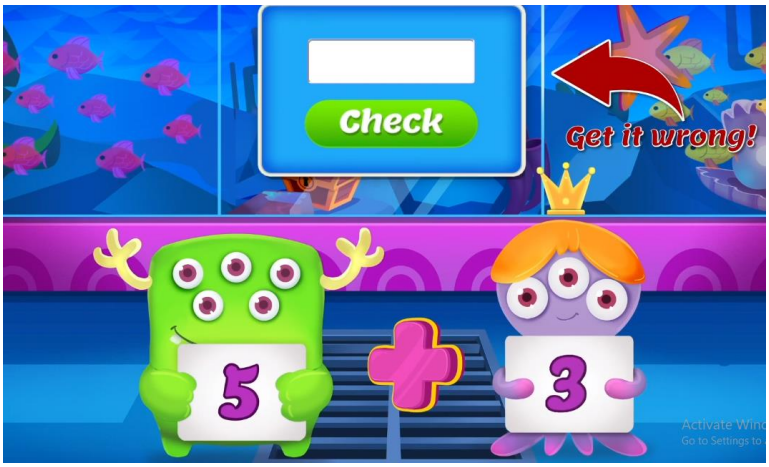


Figure 2.1.7.3 Interaction between user and the system.

Figure 2.1.7.4 Design of user interface is creative with colourful.

Weaknesses

FunBrain website require longer time use to load and launch to the next page as shown in the Fig.2.1.7.5 and Fig.2.1.7.6 below. User need to wait the system load and it spend more than one minutes. Moreover, the system lack of button such as playback button, sound button and back button. When user want to back the previous page, user need to refresh the page again. Next, it did not provide any explanation or solution if user answer wrongly. The system only provides the explanation in the audio or video way, the website did not provide any step by step solution. The system did not provide any games for user to play, it just contains video lesson and some tutorial questions. User can communicate with other players or chatting feature as user can only start the games individually.

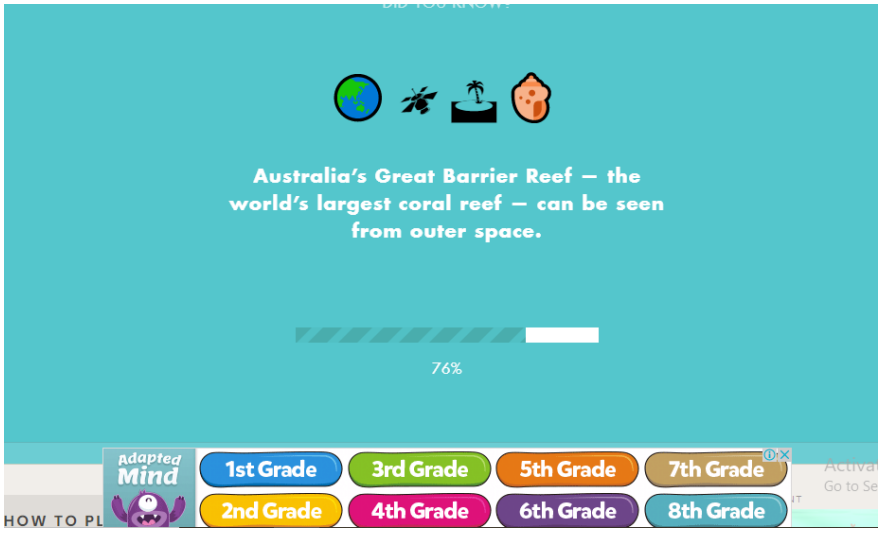


Figure 2.1.7.5 System need to spend some time to launch.

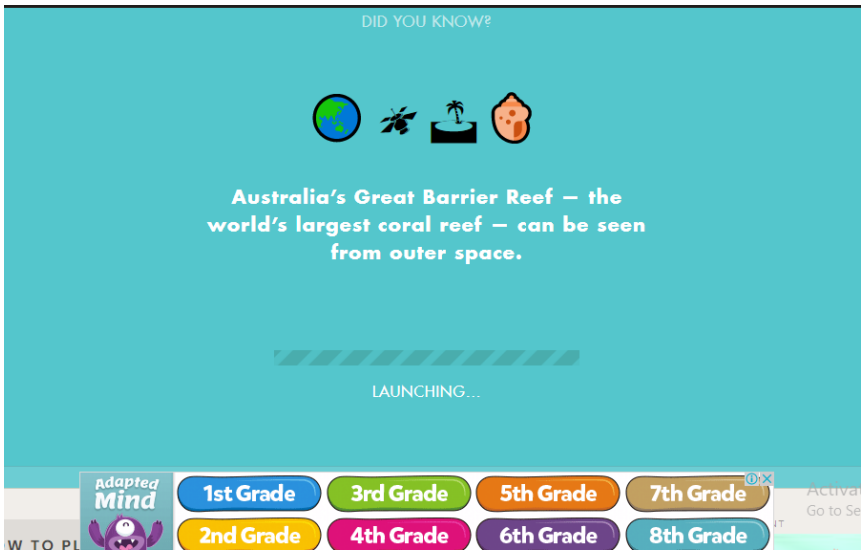


Figure 2.1.7.6 System need to spend some time to load.

2.1.8 Absurd Math Website (Michael Cain, 2003)

Figure 2.1.8.1 Main page of Absurd Math website.

Absurd Math is a website edutainment platform for primary level until junior high student which range from ten to 15 years old. “Gamification of learning environments may constitute a powerful tool for the acquisition of knowledge, and might enhance important skills such as problem-solving, collaboration, and communication” (Dicheva et al, 2015). “Gamification might be quite beneficial and help students in achieve better outcomes when certain elements are present in edutainment platform” (Garland, 2015).

Strength

If user is not able to answer the questions in few seconds, then it will deduct one life points where all the users start with six life points. This website is focus more on base learning. It also can help for knowledge acquisition and problem solving. The design of the website is consistent and have button to replay the game, go back to the main page and control the sound volume. Moreover, user can get hand-on experimental learning and improve the interactive learning methods. Each of the games encompass in the system require a certain degree of

mathematical knowledge in alphabetical order to succeed. The games include in the absurd math include geometry and probability chapter.

Weaknesses

The weakness of this game-based learning module is the design and flow of the question is the same. When user try to do the quiz in the second time, user can able to memorize the answer. The flow of the module is in a static way. The design of the system is not creative enough and lack of animation and graphics provide. When user answer wrongly, the system did not provide any button that provide any description or information of the solving skills. Also, some of the page that user enter is too messy as shown in Fig.2.1.8.2 below. The system also lacks of some button such as home button, skip button, replay, button or sound button.

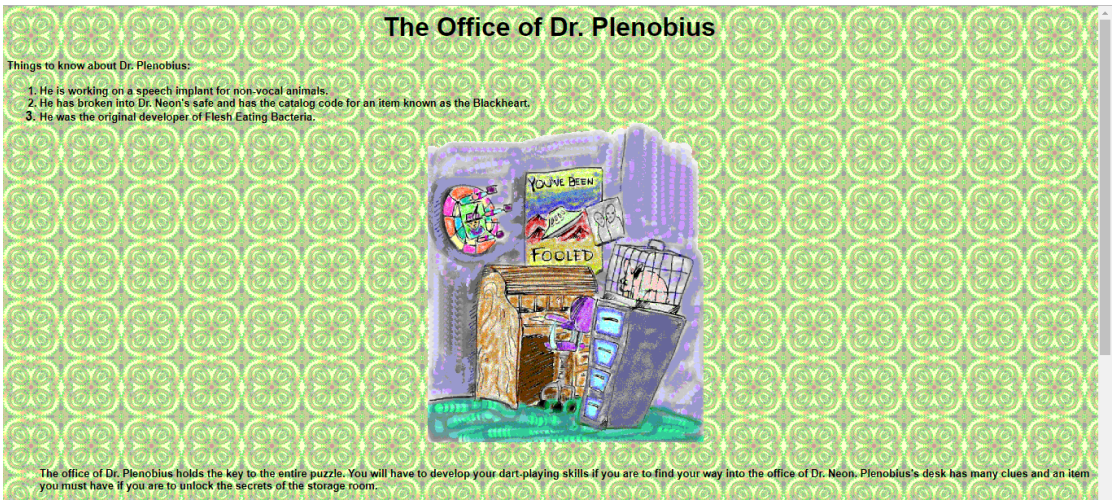


Figure 2.1.8.2 UI of Absurd Math website is too messy.

2.1.9 Using Edutainment to Facilitate Mathematical Thinking and Learning Journal (Ruby & Joyce, 2016)

The main purpose method that allow student to use multiple algebraic procedures to represent the connection between fix and changeable proportions and resolve the difficulty in common place. Wrong learning method and solving skills is one of the facts that lead and cause to huge number of student drop or fail the mathematics subject. Come out and combine different technology tools and problem-solving method is encourage to decrease the failure rate in mathematics subject and reduce the percentage of student dropout. “Students are doing something including discovering, processing and applying new information” (Van De Bogart, 2009). Edutainment can help to inspire the interest of students and develop a culture of education that makes learning more accessible to all students. Critical thinking consists as one of the studying methods and estimating skill or technique (Paul and Elder, 2010). “Creative mathematical thinking combines logical and divergent thinking based in problem solving approaches and solutions that are unique” (Siswono, 2011).

Nowadays, most of the students use modern technologies such as social network and internet to communicate with other people in daily life. But sometime occur that teacher may not know students’ ideas and which path they get or gather the information and knowledge. Edutainment can make learning experience more qualitative and user can learn something during the play time. Teacher and student should pay more focus and find the suitable method to increase the knowledge of mathematics subject instead of only rely on the improvement of digital technology. Traditional learning method can replace with the modern technology learning system such as edutainment learning method should be promoted and generalization to everyone. “Teaching, supported by technological means, offers a lot of possibilities for education: technology can facilitate the learning of concepts and materials, it helps to solve difficult problems and contribute to the development of cognitive abilities” (Jonassen, Howland, Marra & Crismond, 2008). The educational will not change if only depend on the digital technology, many other learning methods need to excavate.

2.2 Critical Remarks of Previous Works

2.2.1 Comparison Features between Different Platform

Table 2.2.1.1 Compare the features between all multiple platforms.

		Audio	Video	Graphics / Images	Animation	Text
2.1.1	CK-12 application (Neeru Khosla & Murugan Pal, 2018)					✓
2.1.2	MathPlayground Website (Colleen King, 2002)	✓	✓			
2.1.3	Buzzmath Application (Claude Laverdure, 2003)			✓		✓
2.1.4	Playkids application platform (Breno Masi & Eduardo Lins Henrique, 2013)				✓	
2.1.5	Math for kids application (n.a. , n.d.)					✓
2.1.6	Dreambox Website (Lou Gray & Ben Silvka, 2006)	✓			✓	
2.1.7	FunBrain Website (Poptropica Worldwide, 1992)				✓	
2.1.8	Absurd Math Website (Michael Cain, 2003)					✓

Table 2.2.1.2 Compare the features between all different platforms.

System/ Application/ Website	User Interface Design		
	Interactivity	**Informative**	**Usability**
2.1.1 CK-12 application (Neeru Khosla & Murugan Pal, 2018)	3	4	2
2.1.2 MathPlayground Website (Colleen King, 2002)	4	3	3
2.1.3 Buzzmath Application (Claude Laverdure, 2003)	4	3	4
2.1.4 Playkids application platform (Breno Masi & Eduardo Lins Henrique, 2013)	5	4	4
2.1.5 Math for kids application (n.a. , n.d.)	3	4	3
2.1.6 Dreambox Website (Lou Gray & Ben Silvka, 2006)	4	2	4
2.1.7 FunBrain Website (Poptropica Worldwide, 1992)	4	3	3
2.1.8 Absurd Math Website (Michael Cain, 2003)	2	4	4

2.2.2 Compare Proposed Study with Previous Work

Audio is the button sound or background music of the application. It is one of the functions to add or attract the attention, interest and sentiment of the presentation. Video is something that contains more detailed and additional information, explanation and further briefing of the Mathematic questions. It will clearly show every step-by-step procedure of the solving method with some detailed explanation of the question. User can increase their communication skill, listening skill to choose and change the ways to improve their knowledge of the mathematics subject. Educational video can also be easily grab user attention and interest. User can take down some notes by jotting down all the important points during the process of learning. Graphics contain some colorful and attractive pictures without movement. Animation is some picture that will move to attract user interest. Two type of the animation graphics is 2D animation and 3D animation. The main purpose is to increase the vision for user interface of the application. Text is one of the note text, method or explanation in word which use to explain the reason of the method or formula use to solve the following questions. Some of the formula will be given for user as a reference to solve the questions. Table 2.2.2.1 below shows the comparison between different platform with the FYP system that done in this semester.

Table 2.2.2.1 Compare the features between CK-12 application, Playkids application platform, Dreambox website, Funbrain Website platforms and FYP system.

	2.1.1 CK-12 application (Neeru Khosla & Murugan Pal, 2018)	2.1.4 Play Playkids application platform (Breno Masi & Eduardo Lins Henrique, 2013)	2.1.6 Dreambox Website (Lou Gray & Ben Silvka, 2006)	2.1.7 FuBrain Website (Poptropica Worldwide, 1992)	The Interactive Edutainment Platform for Primary Level Mathematics
Use for iPhone, iPad	✓	✓	✓		
Use for pc or laptop				✓	✓
Use for android	✓		✓	✓	

Lecture note	✓			✓	✓
Practical or exercise of the questions	✓	✓	✓	✓	✓
Video of the lecture note	✓		✓	✓	✓
Quiz or some test questions	✓		✓		✓
Games		✓	✓	✓	
Questions from different level, chapter and grade	✓		✓	✓	✓
Save or print function			✓		
Background music provided		✓	✓	✓	✓
Often pop out some advertisement		✓			
Require personal email or Facebook account		✓	✓		
Multiple language			✓		
Require download application first	✓	✓			✓
Use website to access			✓	✓	
2D animation or 3D animation		✓	✓	✓	✓

Based on *Table 2.2.2.1* above, the description for each parameter are as follows:

i. Use for iPhone, iPad- The system allow user to use iPhone or iPad to access.
ii. Use for android- The system only allow user to access the system using android device.
iii. Lecture note- The software system provides different level of lecture which same as hardware textbooks.
iv. Practical or exercise of the questions- The system provides multiple exercise questions for students to practice. It also provides the solution for each of the questions.
v. Video of the lecture note- Animation video is provided to attract interest of student of the mathematics subject.
vi. Quiz or some test questions-The system provide quiz for student to attend so they might know how is their result in this subject.
vii. Games- Multiple games that relate to mathematics subject is provided for user to choose.
viii. Questions from different level, chapter and grade- Different level, chapter and grade are arrange according to easier for user to choose for further practice.
ix. Save or print function- Either save or print graphics button is provided for student to download the picture that they attentiveness.
x. Background music provided- Background music is design to create a cheerful mood and reduce silent atmosphere of user.
xi. Often pop out some advertisement- The system frequently pops out an advertisement that promote something that are not related to the system.
xii. Require personal email or Facebook account- Student may need to login with personal email or Facebook account before access the platform.
xiii. Multiple language- Different language is provide for user to choose that they familiar the most.
xiv. Require download application first- User need to download and install the application software before access the platform.
xv. Use website to access- The system may require user to use internet and website browser to access the system.
xvi. 2D animation or animation- The system uses some colorful and attractive animation to point and grab student attention.

Chapter 3

System Design

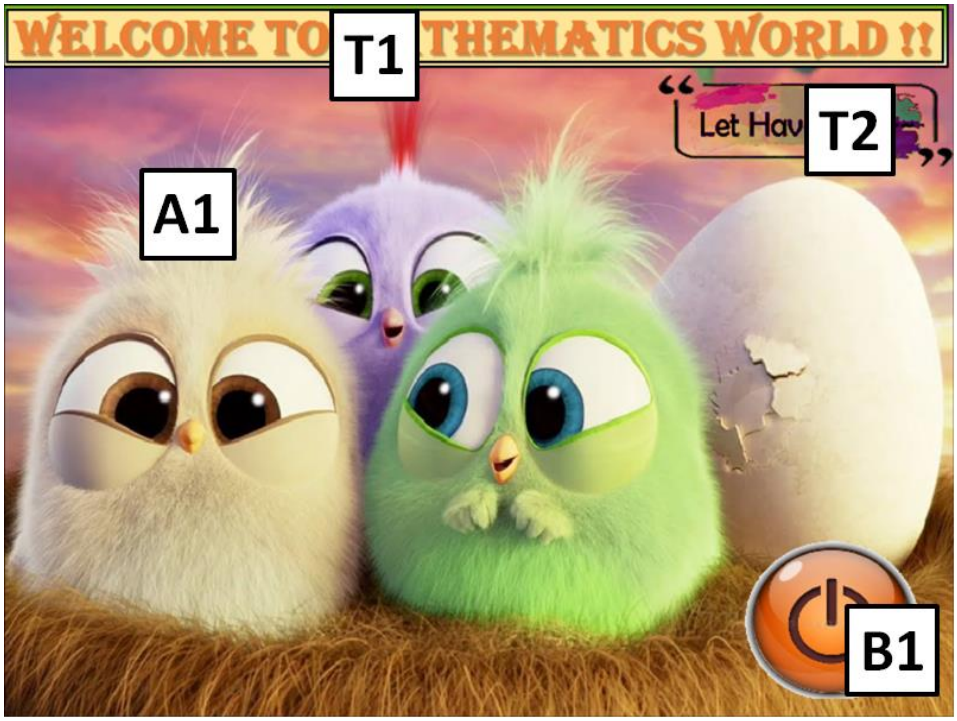
3.1 Storyboard Design and Flowchart

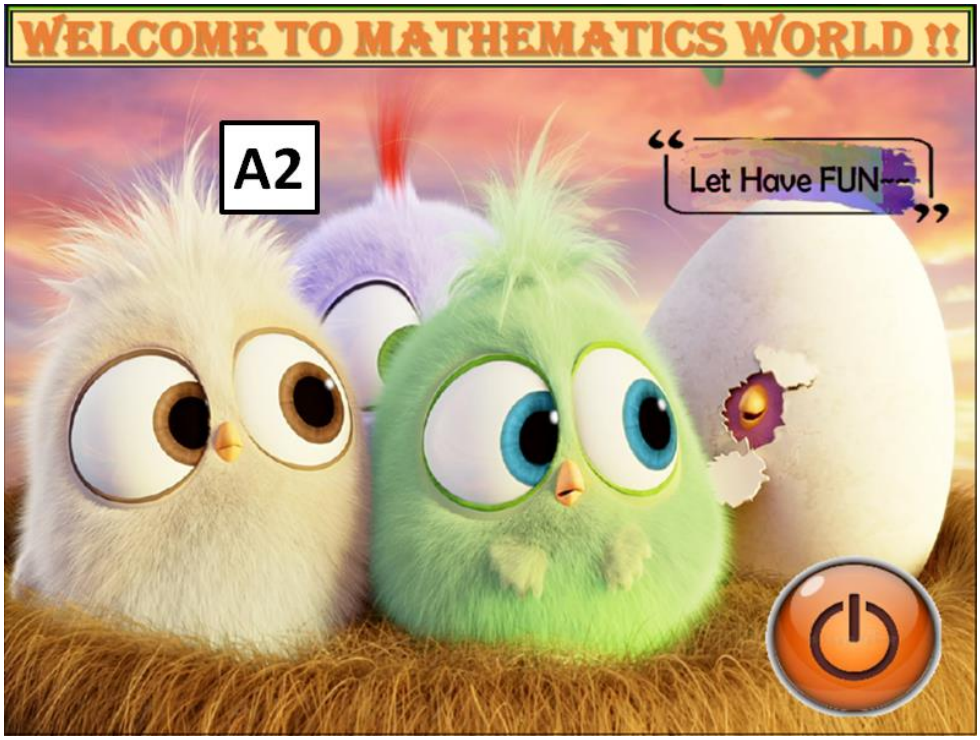
3.1.1 Splash Screen

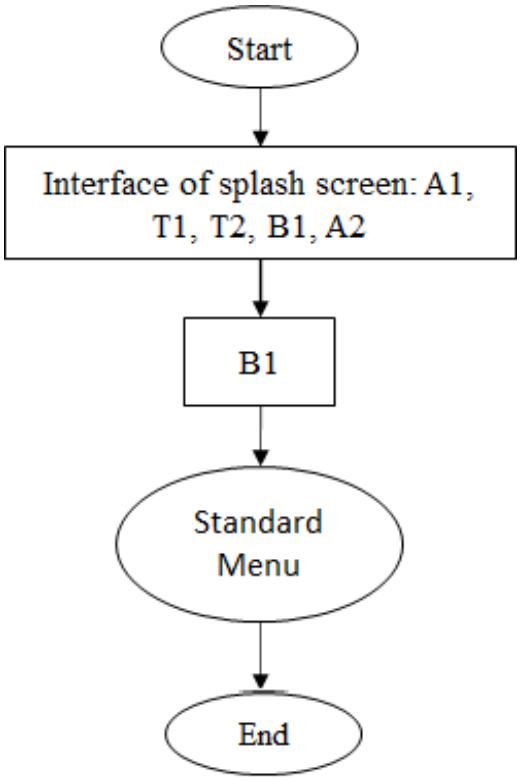
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 1

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





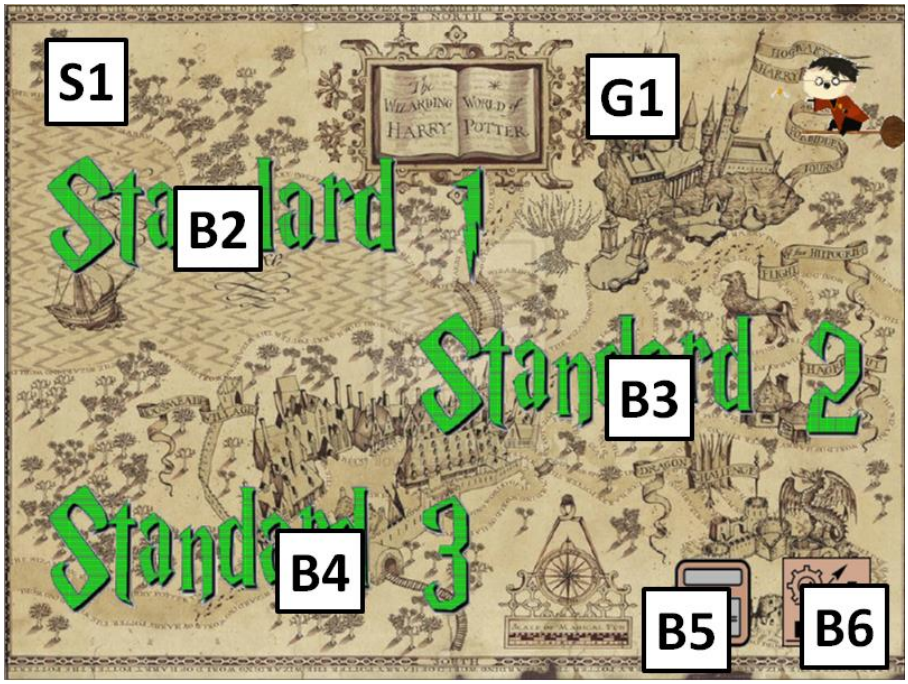
Flowchart	**Instruction**
	A1, T1, T2, B1 and A2 will first appear on the screen. A1 and A2 are the animation background image of the platform. B1 is a start button that allow user to click on it and it will jump to the next scene which is the standard menu. T1 is the text of "Welcome to Mathematics World". T2 is the text of "Let have Fun".

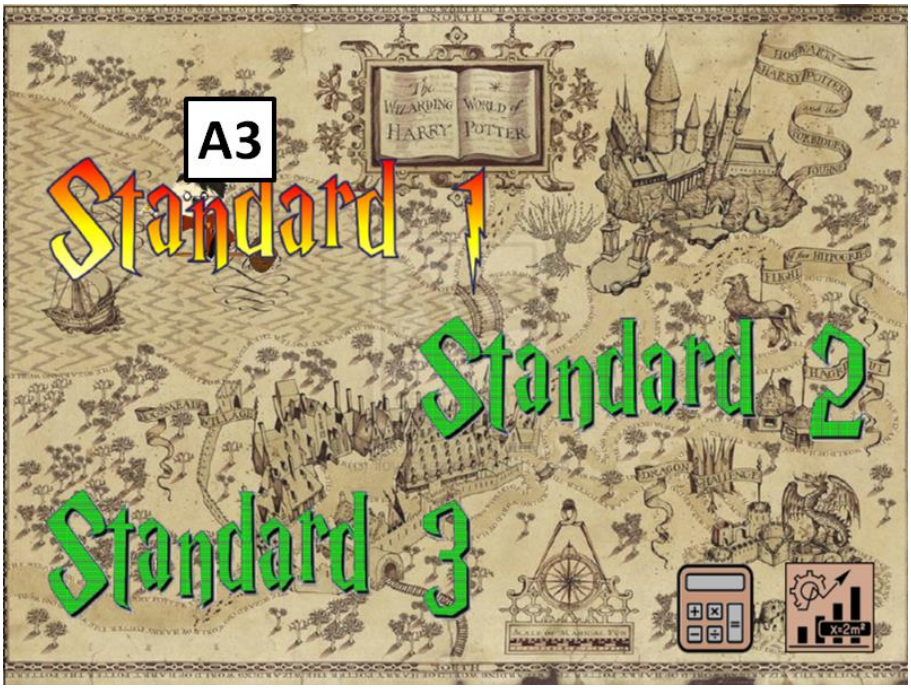
3.1.2 Standard Menu

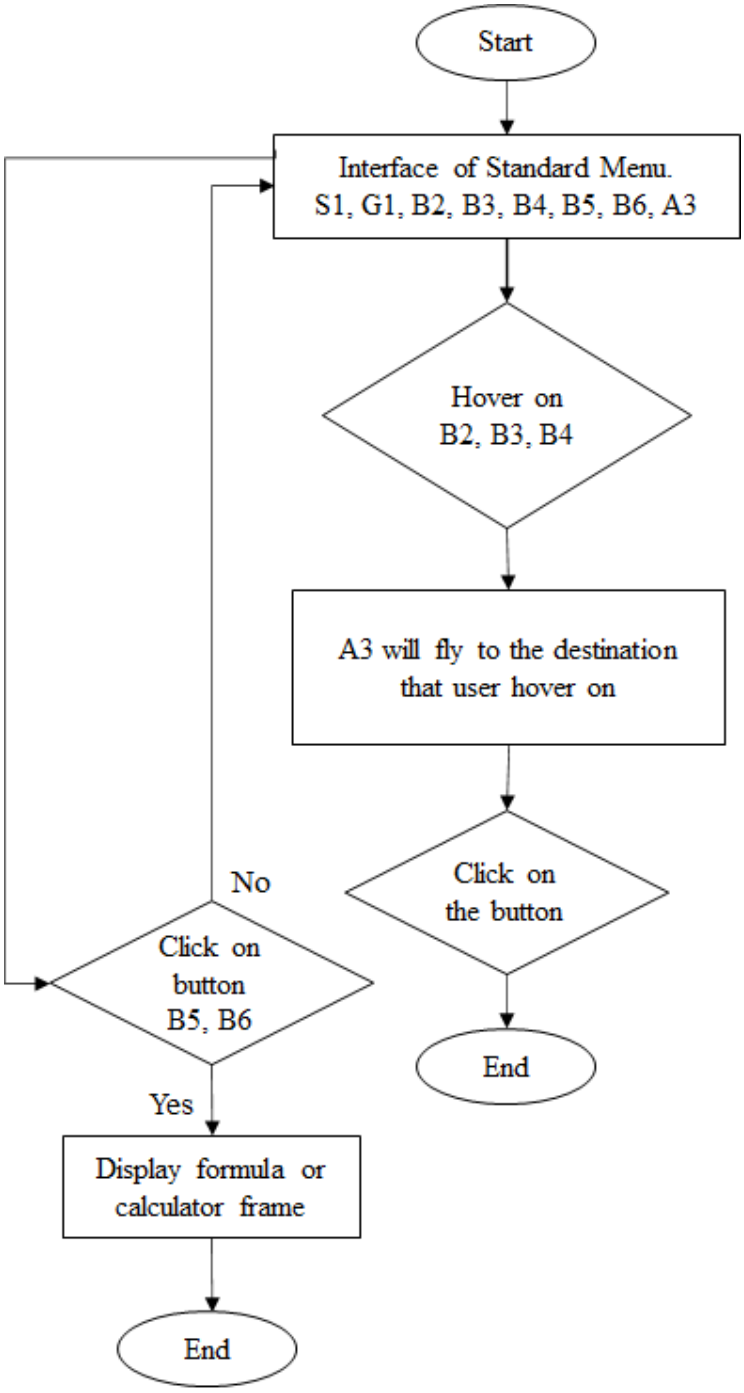
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 2

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





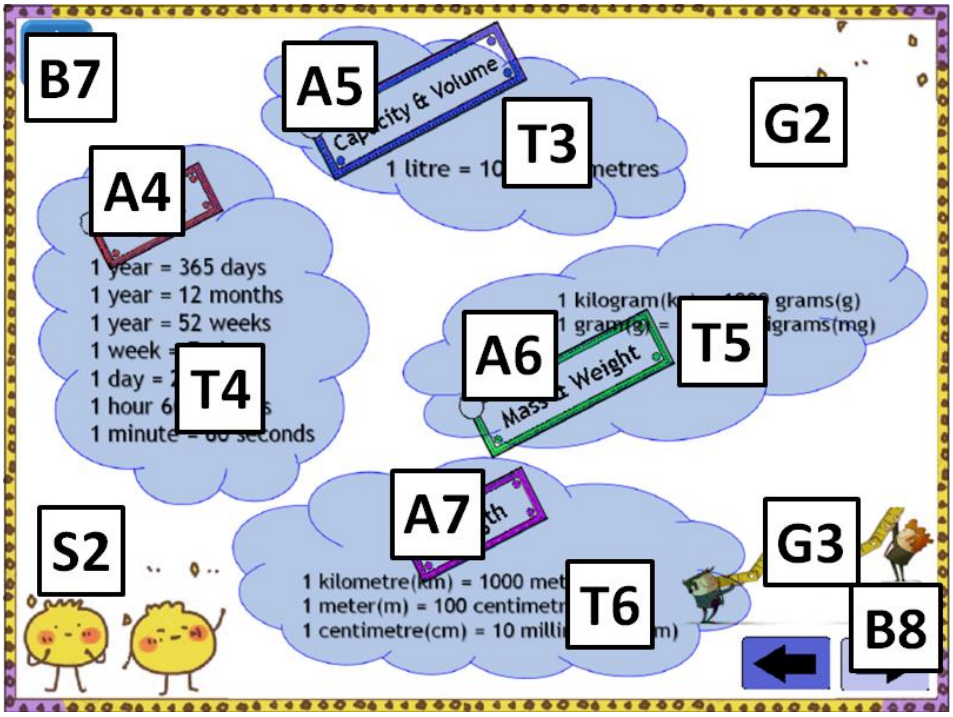
Flowchart	**Instruction**
	S1, G1, B2, B3, B4, B5, B6 and A3 will first appear on the screen. A3 is the animation graphics that may fly through and reach to the button when user drag either B2, B3 or B4. B2, B3 and B4 are the buttons that will link to the standard level screen when user clicks on it. B5 is the calculator button that will directly link the user to the online browser with the function of calculation. B6 is the button component that allows user to move toward page 1 and 2 formula interfaces. G1 is the background graphics of the standard menu page. S1 is the background music which plays by the system.

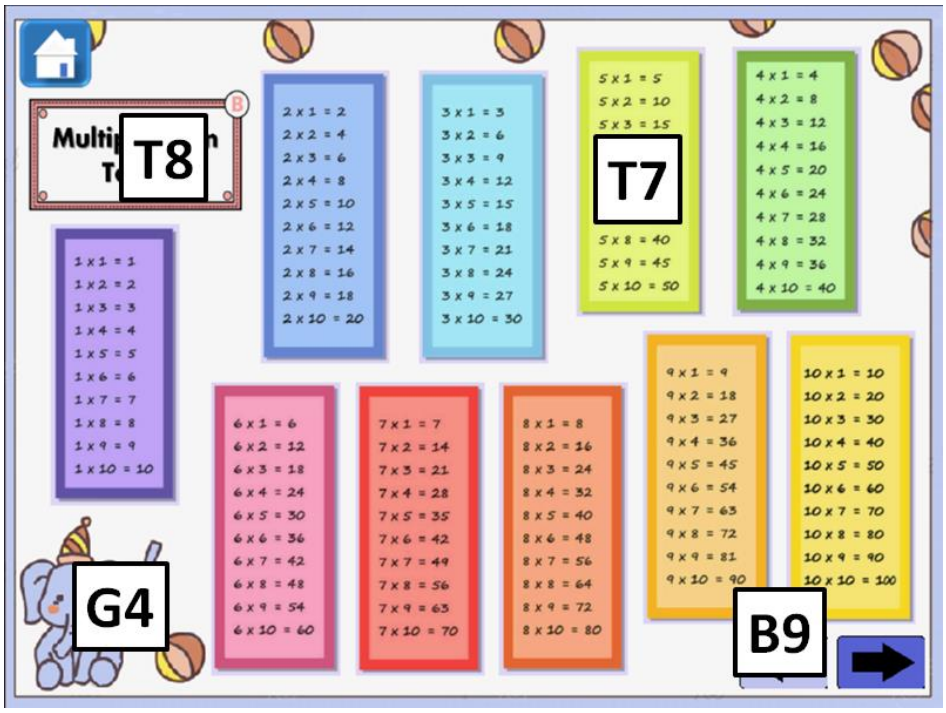
3.1.3 Formula

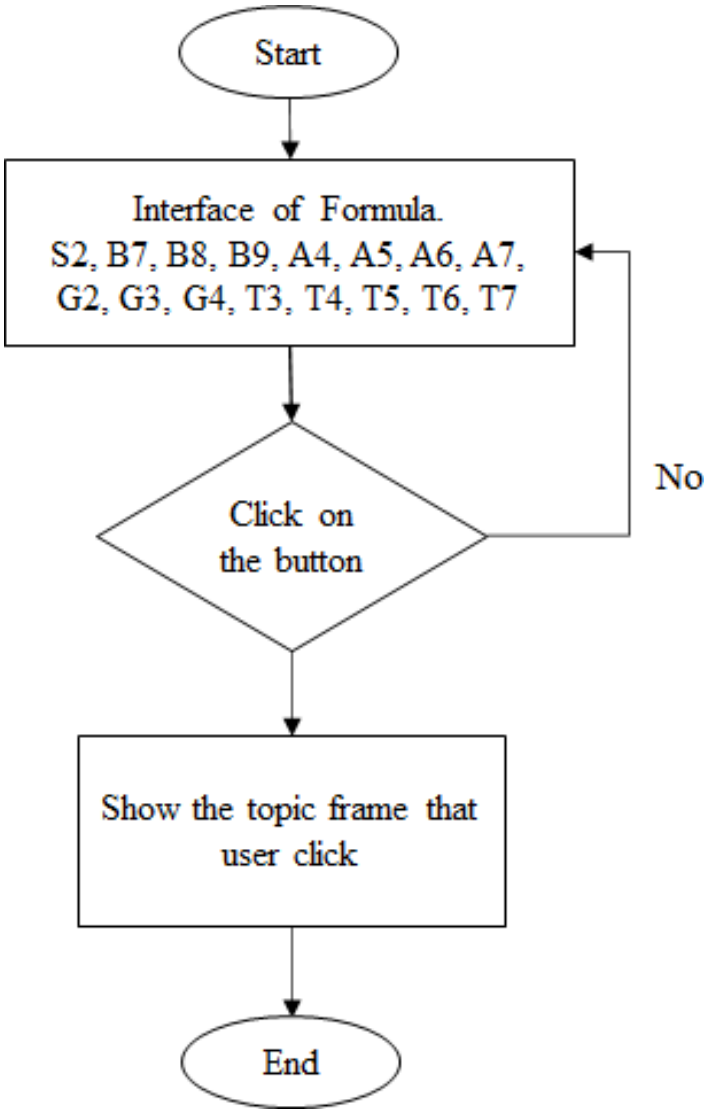
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 3

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





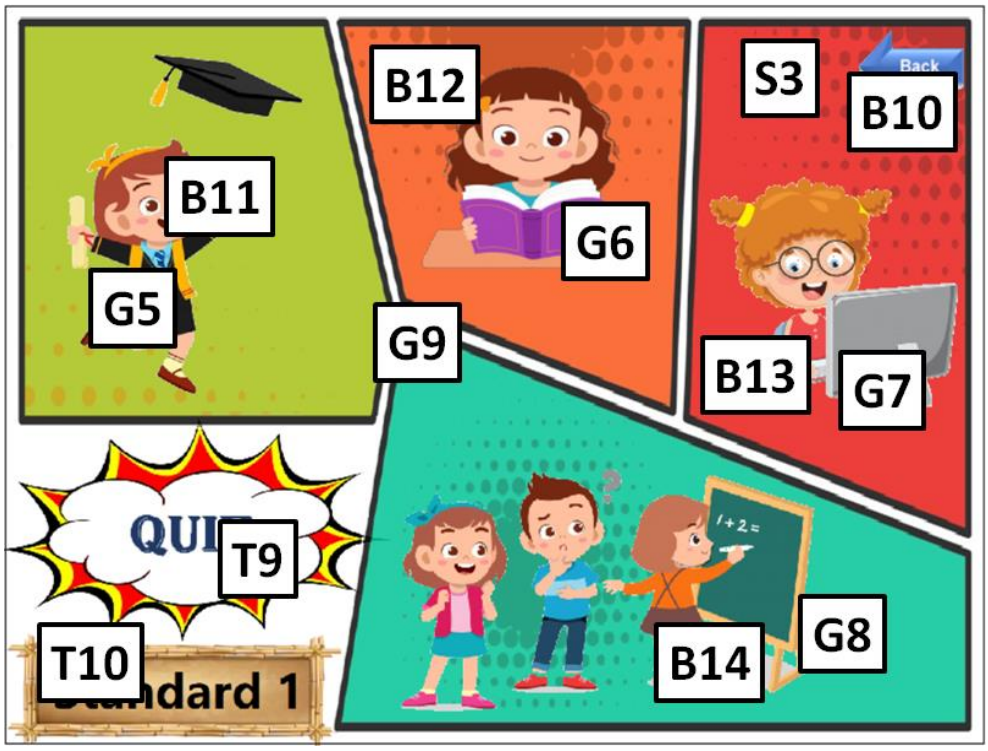
Flowchart	**Instruction**
	S2, B7, B8, B9, A4, A5, A6, A7, G2, G3, G4, T3, T4, T5, T6, T7 first can be seen on the screen. A4, A5, A6 and A7 are the title of the formula that swings left and right side automatically. B7 is the button that links to the Standard Menu page. B8 and B9 is the button that can link between the first and second screen of the formula. G2, G3 and G4 are the background image of 2 different pages that can be seen in the formula page. S2 is the background song of page 1 and 2 formula screens. T3, T4, T5, T6 and T7 are the text element which use to display mathematics formula details. T8 is the formula that displays in the second page of the formula screen.

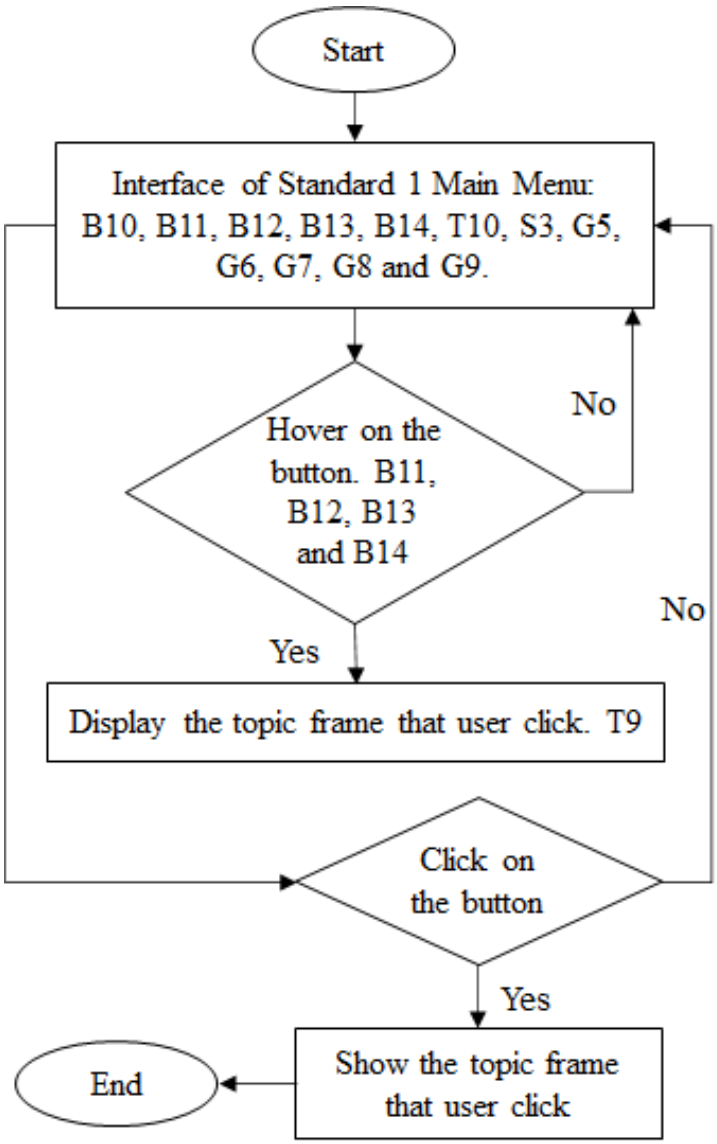
3.1.4 Standard 1 Menu Page

Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 4

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).



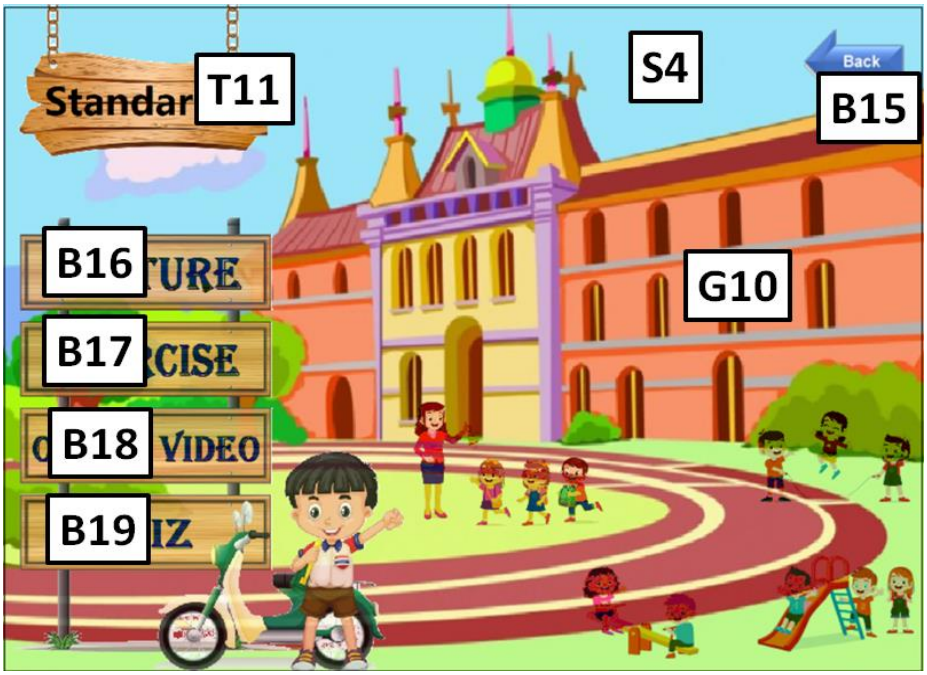
Flowchart	**Instruction**
	B10, B11, B12, B13, B4, T10, S3, G5, G6, G7, G8 and G9 firstly display on the standard 1 menu screen. B10 is the button element that back to the Standard Menu page. B11 is a button component that links to the quiz page. B12 is the button element that links to the note learning material. B13 is the button that links to the video page. B14 is the button element that links to the exercises page. G5, G6, G7 and G8 are the image use to represent different learning material can include in the system. S3 is the background sound music on the menu page. T9 is the text component that appears when user drag on the B11, B12, B13 and B14. T10 represents the level title of the standard level.

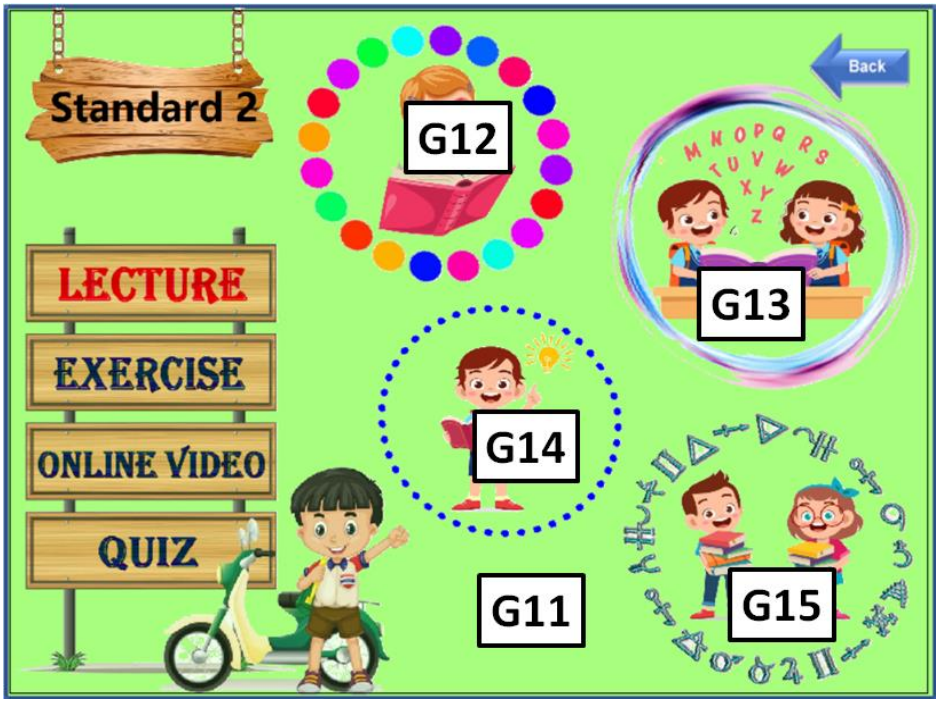
3.1.5 Standard 2 Menu Page

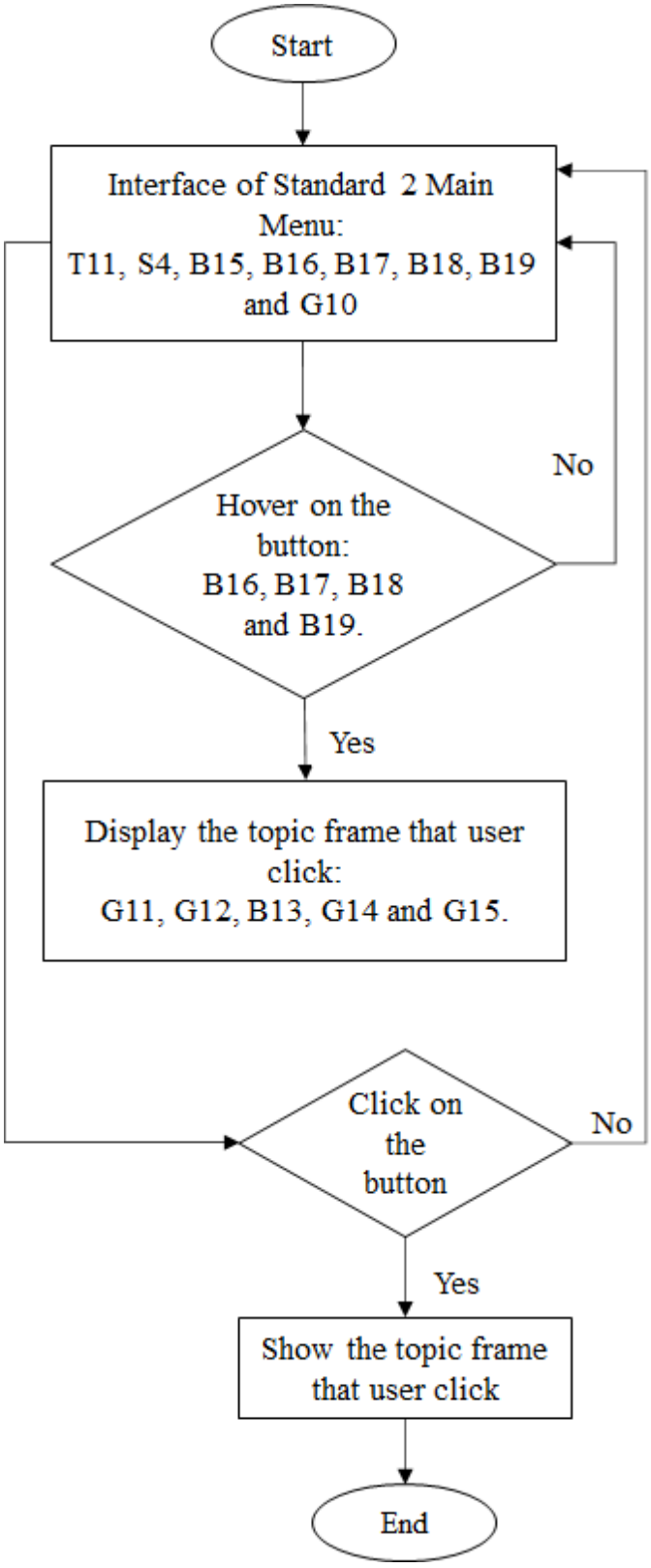
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 5

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





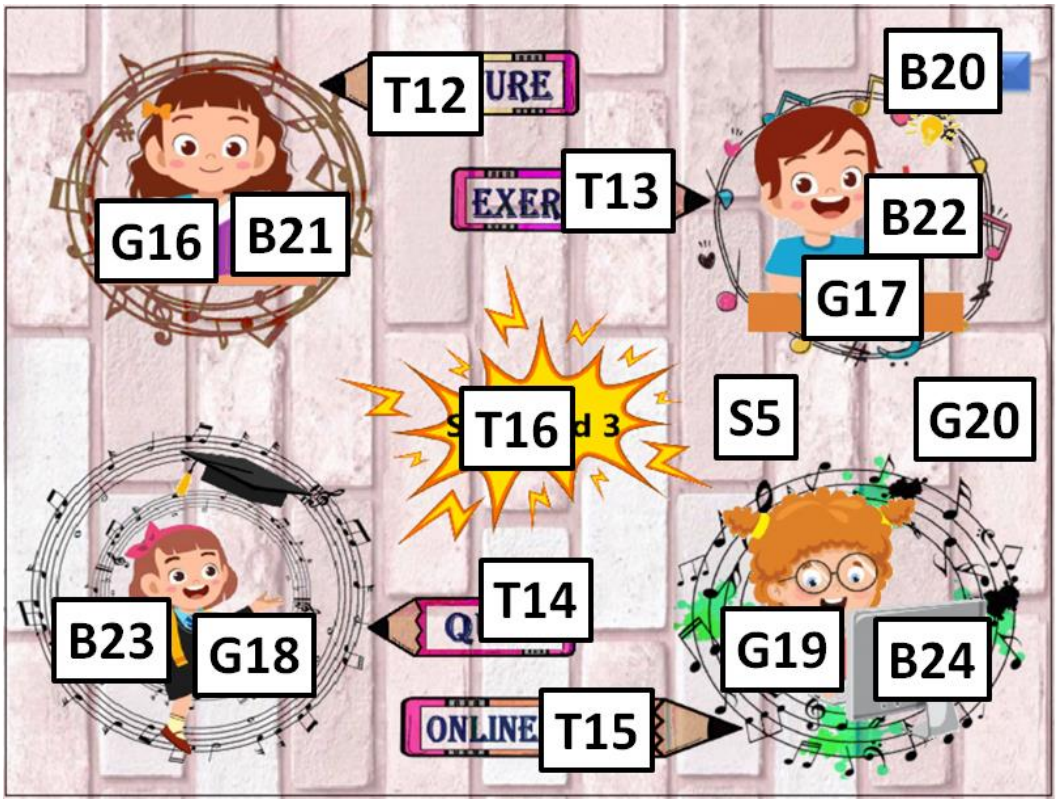
Flowchart	**Instruction**
	T11, S4, B15, B16, B17, B18, B19 and G10 first appear in the Standard 2 Menu Interface. B15 is the button that can link to the previous page which is Standard Menu screen. B16 is a button element that links to Standard 2 lecture page. B17 is a button element that links to Standard 2 tutorial page. B18 is a button element that links to Standard 2 online video page. B19 is a button element that links to Standard 2 quiz question. G10 and G11 are the background picture of the screen. G12, G13, G14 and g15 are the image use to represent the learning material that user cover on any button of B16, B7, B18 and B19. S4 is the background melody play on the page. T11 is the text component that represents the title of the level.

3.1.6 Standard 3 Menu Page

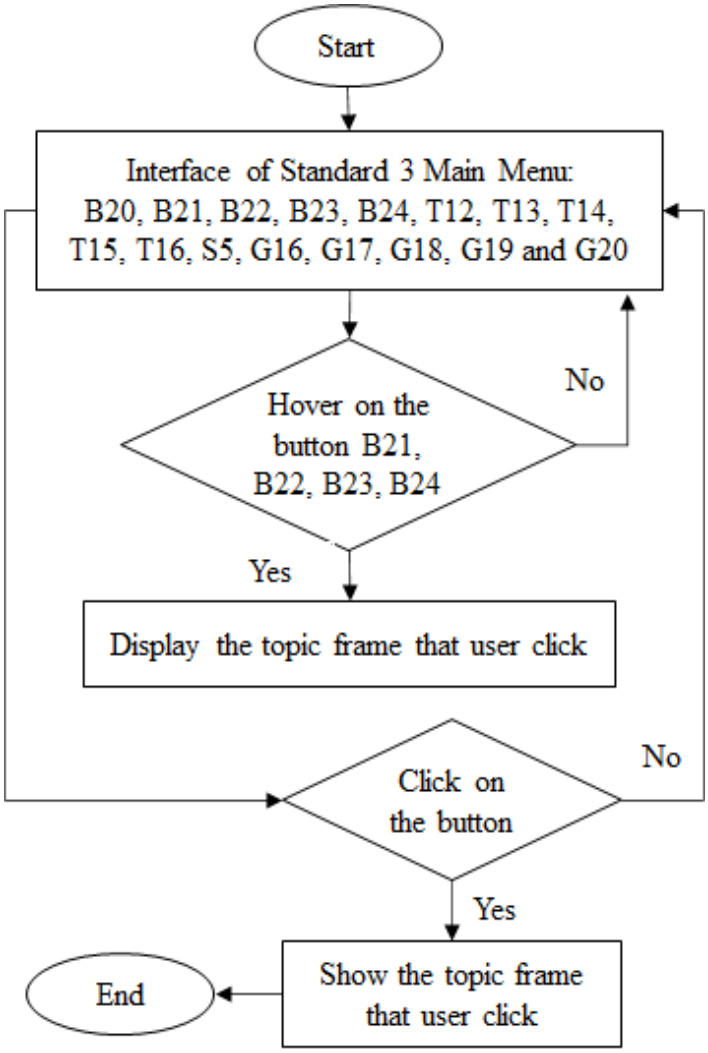
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 6

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).



Flowchart



Instruction

B20, B21, B22, B23, B24, T12, T13, T14, T15, T16, S5, G16, G17, G18, G19 and G20 firstly shown in the screen.

B20 is the button element that backs to the Standard Menu interface.

B21 is the button component that allows user to move forward to the lecture page.

B22 is the button component that moves to exercise page.

B23 is the button component that allows user to attend standard 3 quiz.

B24 is the button element that straight forward link to Standard 2 Video page.

G16, G17, G18 and G19 are the graphic display when user drag on either B21, B22, B23 or B24.

S5 is the background melody of Standard 3 Menu screen.

T12, T13, T14 and T15 are the title of the learning material.

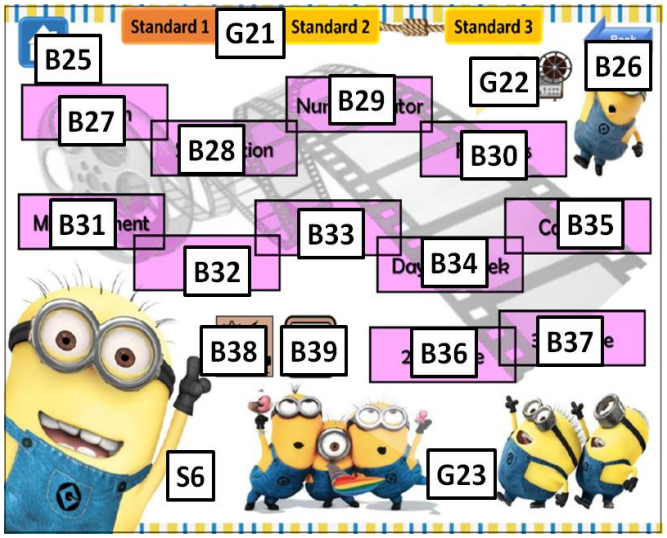
T16 is the text of “Standard 3”.

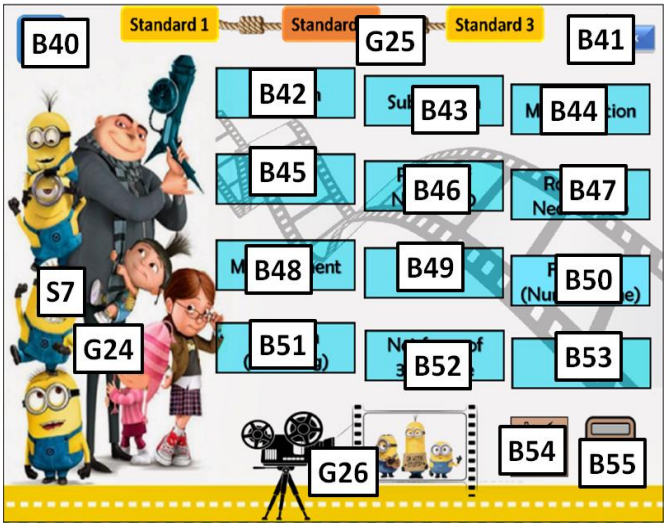
3.1.7 Standard 1, 2 and 3 Video Interface

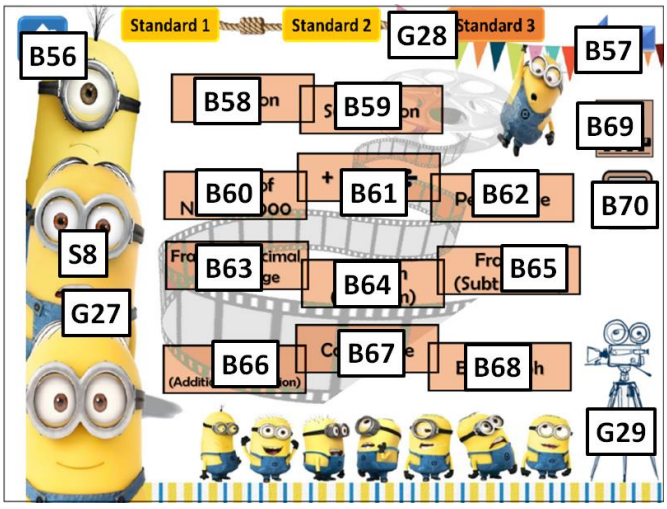
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 7

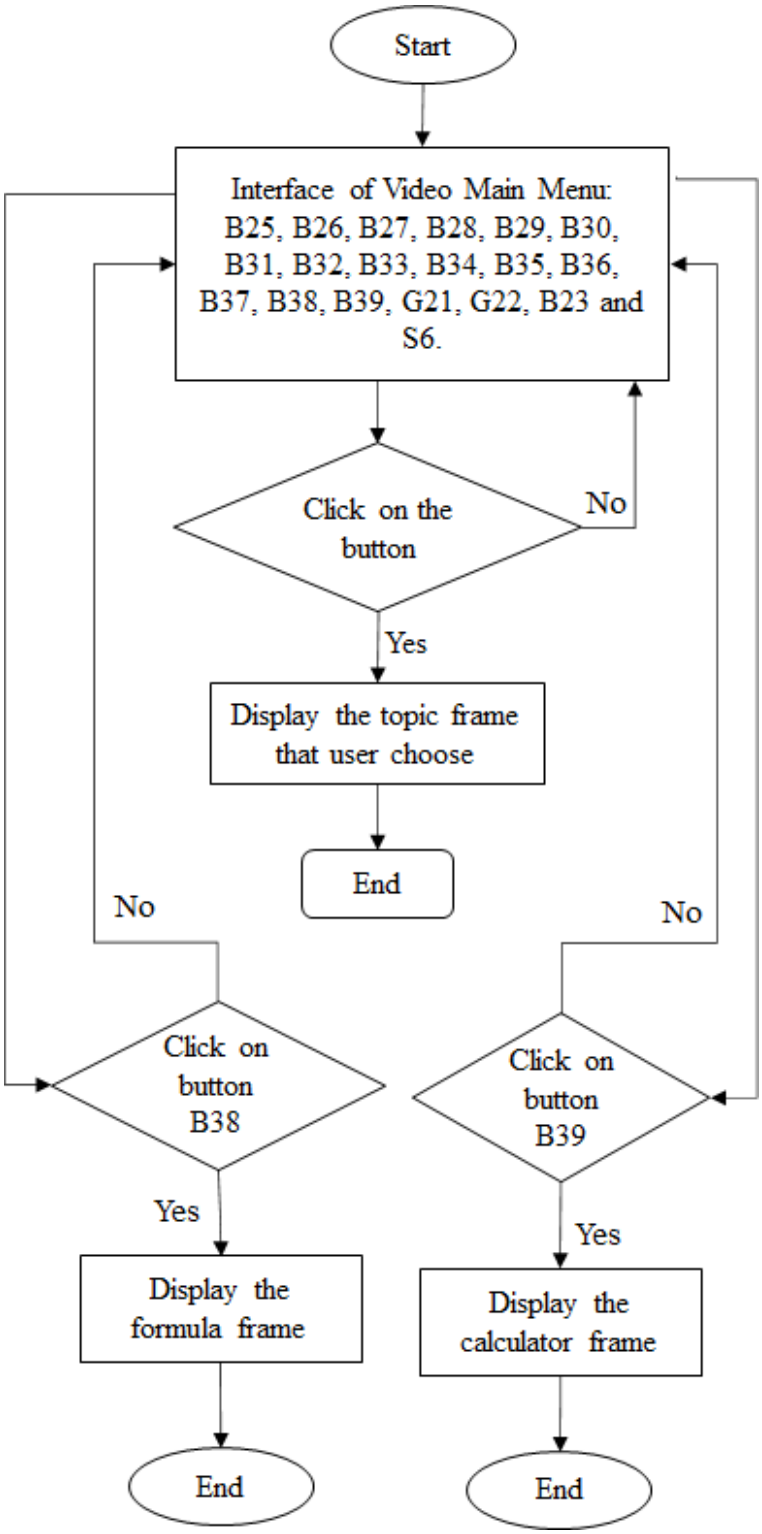
T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).







Flowchart



Instruction

B25, B26, B27, B28, B29, B30, B31, B32, B33, B34, B35, B36, B37, B38, B39, G21, G22, B23 and S6 display on the page of standard 1 video menu interface.

B25 is the button that links to the Standard Menu page.

B26 is the button element that directly to the standard 1 content menu page.

B27, B28, B29, B30, B31, B32, B33, B34, B35, B36 and B37 are the button element that let the user click on it and it will pop out the link of the video through online browser or the internet explorer.

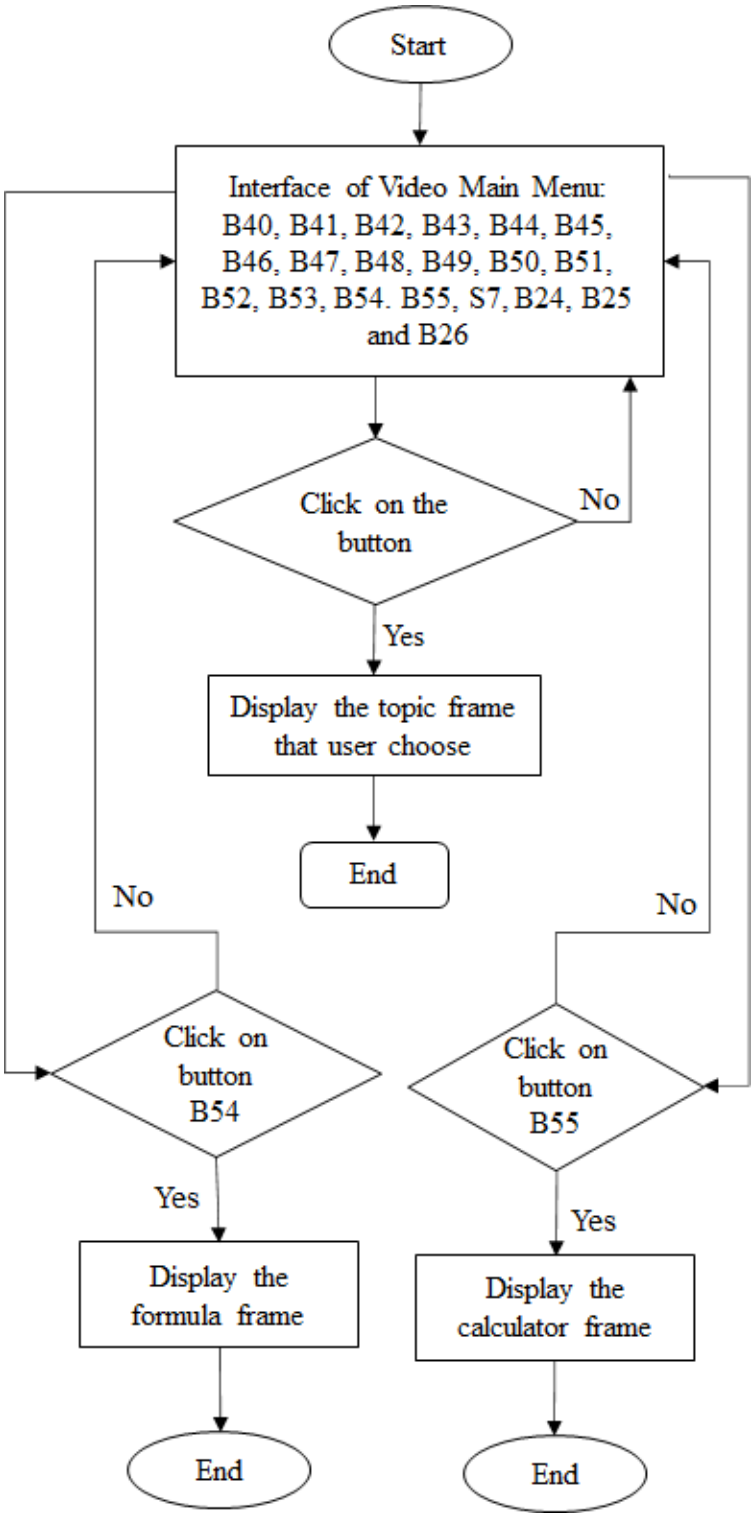
B38 is a button that let user go to the formula interface.

B39 is the button that used to represents calculator feature.

G21, G22 and G23 use as the background graphic of standard 1 video page.

S6 is the background music of the screen.

Flowchart



Instruction

B40, B41, B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52, B53, B54. B55, S7, B24, B25 and B26 represent the video page of standard 2.

B40 is the button that links back to the Standard Menu screen.

B41 is the button back to the previous screen which is standard 2 menu interface.

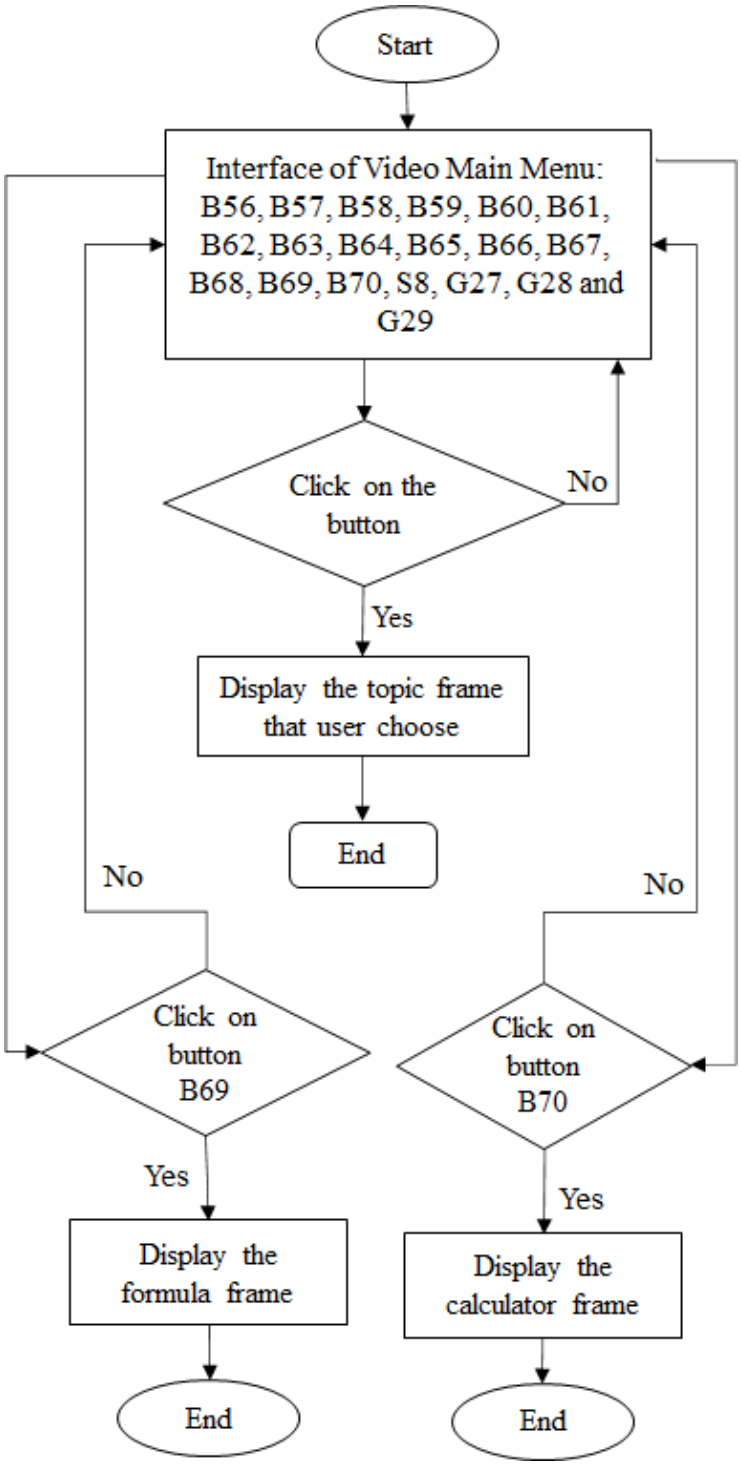
B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52 and B53 are the button element that allows user click on it and link to the perspective website through an internet connection.

B54 is linked to the formula pages.

B55 direct user to the online calculator.

G24, G25 and G26 are the graphics that uses as the background image of standard 2 video frame.

S7 is the background music of the standard 2 video screen.

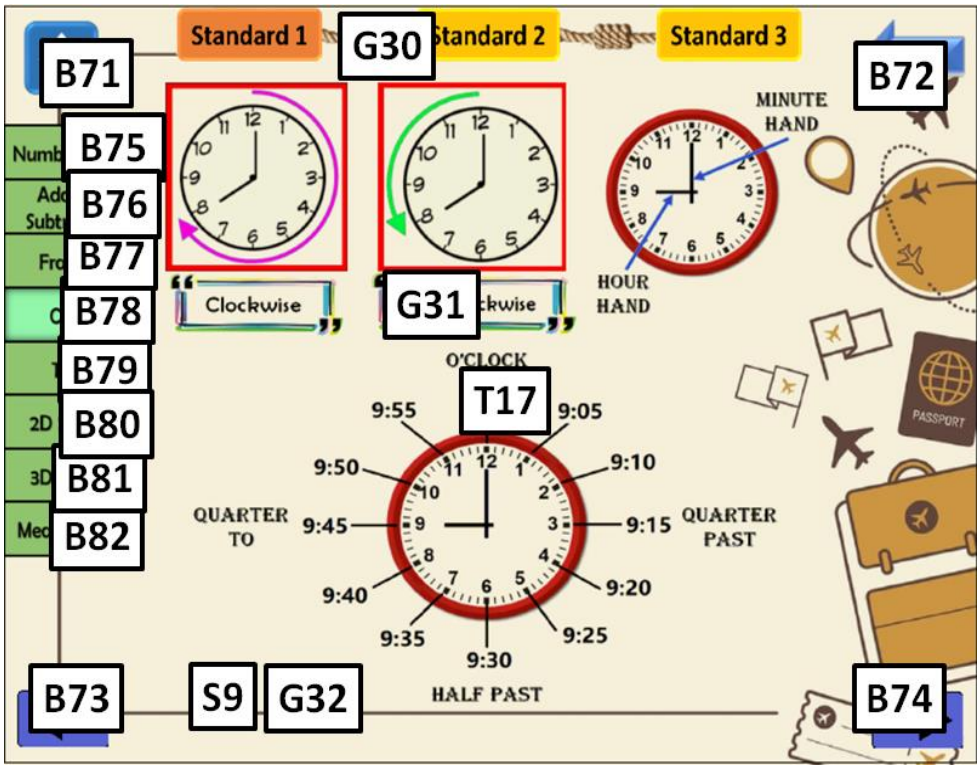
Flowchart	**Instruction**
	B56, B57, B58, B59, B60, B61, B62, B63, B64, B65, B66, B67, B68, B69, B70, S8, G27, G28 and G29 can be seen on the page of Standard 3 Video main menu screen. B56 is the button allow user to access the standard menu page whereas B57 is used as a function to the standard 3 content menu page. B58, B59, B60, B61, B62, B63, B64, B65, B66, B67 and B68 are the button component that direct user to the YouTube video online. B69 is a button that provides for the user which directly link to the formula page. B70 is the button element represents as a calculator button which allows user straightforward access online calculator. G27, G28 and G29 are the graphic s that use to attract user attention. S8 is the music that plays in standard 3 video page.

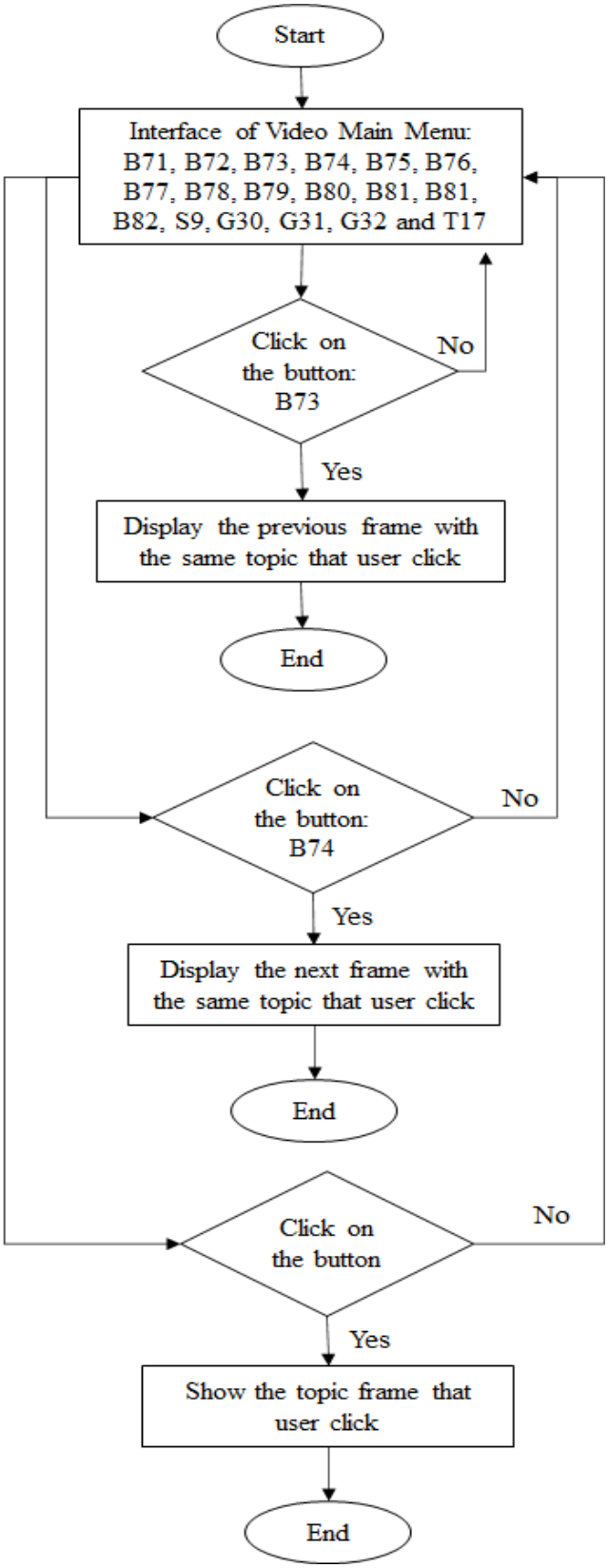
3.1.8 Standard 1 Lecture Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 8

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).



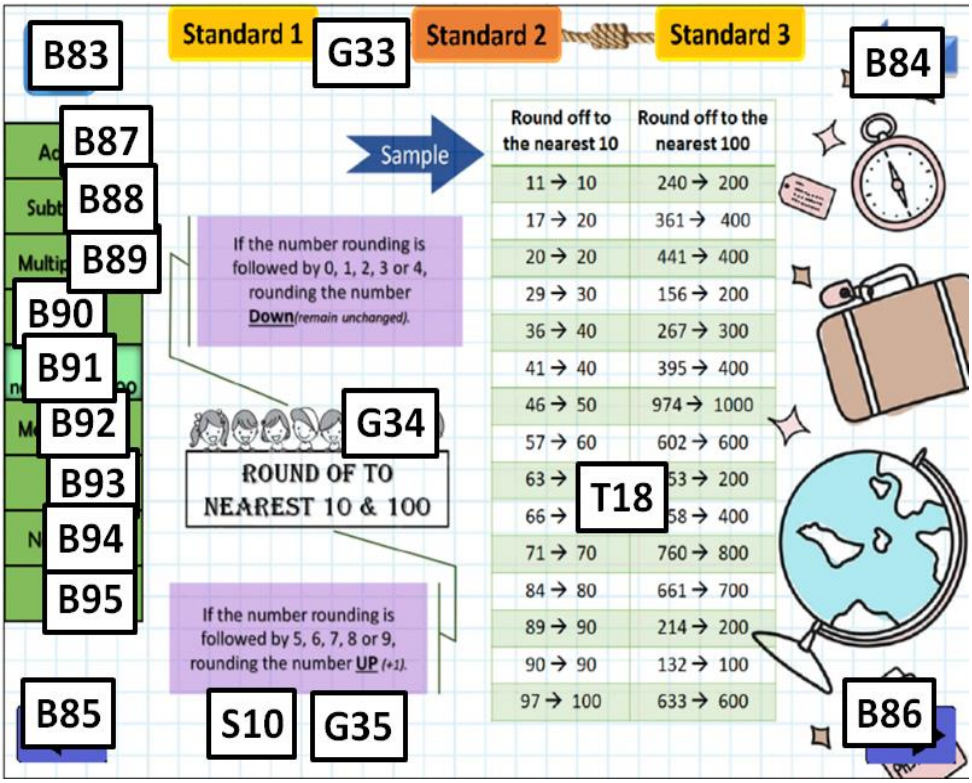
Flowchart	**Instruction**
	B71, B72, B73, B74, B75, B76, B77, B78, B79, B80, B81, B81, B82, S9, G30, G31, G32 and T17 first be seen on the screen. B71 is the button back to the standard menu module. B72 is the button use with the function of getting back to the standard 1 menu content page. B73 is the button allow user to access the upper page whereas B74 is used as a function to the coming frame within the same chapter. B75, B76, B77, B78, B79, B80, B81, B81 and B82 are the button that links among different chapter. G30 and G32 are the background graphics of the standard 1 lecture module interface. G31 is the image component that provides for user to attract user interest. S9 is the background music of Standard 1 Lecture page. T17 is the text element that represents the lecture note of the topic.

3.1.9 Standard 2 Lecture Interface

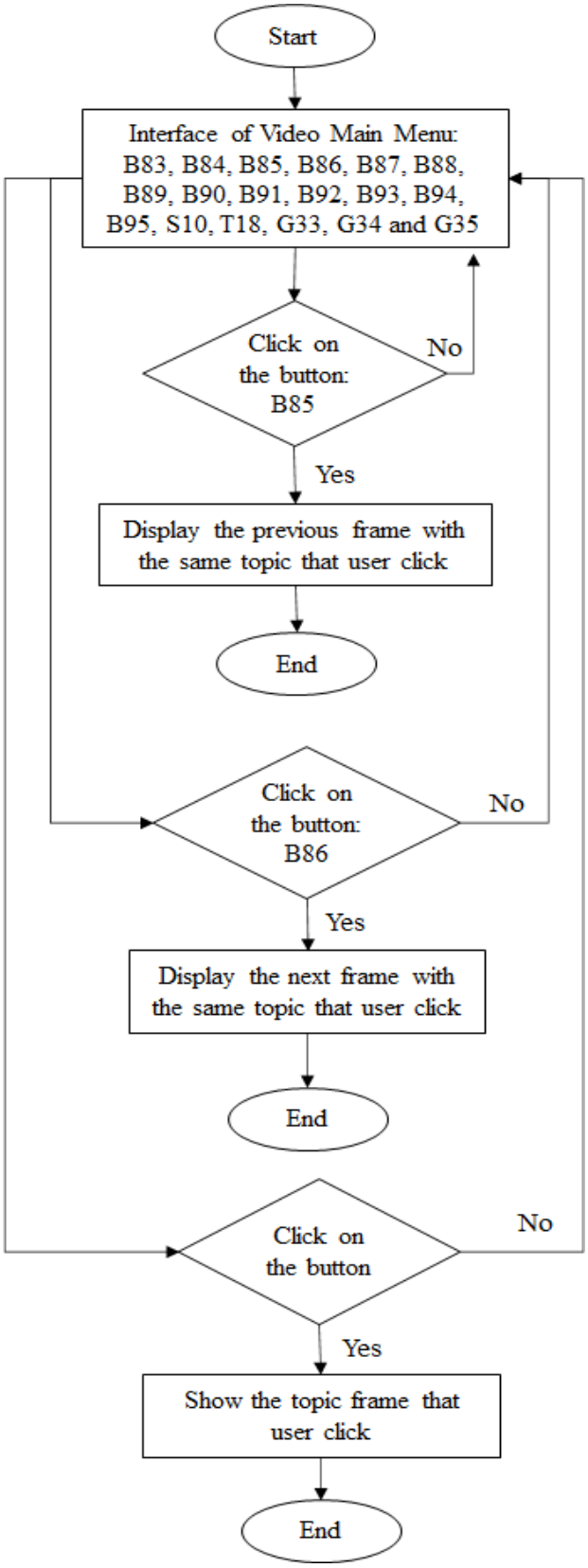
Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 9

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).



Flowchart



Instruction

B83, B84, B85, B86, B87, B88, B89, B90, B91, B92, B93, B94, B95, S10, T18, G33, G34 and G35 first be seen in the standard 2 lecture module.

B83 is a button use with the function of getting back to the standard content menu page.

B84 is a button back to the previous back which is the menu page of standard 2.

B85 is a button link to the upper module whereas B86 is linked to the inferior page.

B87, B88, B89, B90, B91, B92, B93, B94 and B95 are the button element that provides for user to link to the respective chapter of mathematics subject.

G33 and G35 is the background image of the screen.

G34 is the graphic element of a string image.

S10 is the background melody play in lecture frame of standard 2.

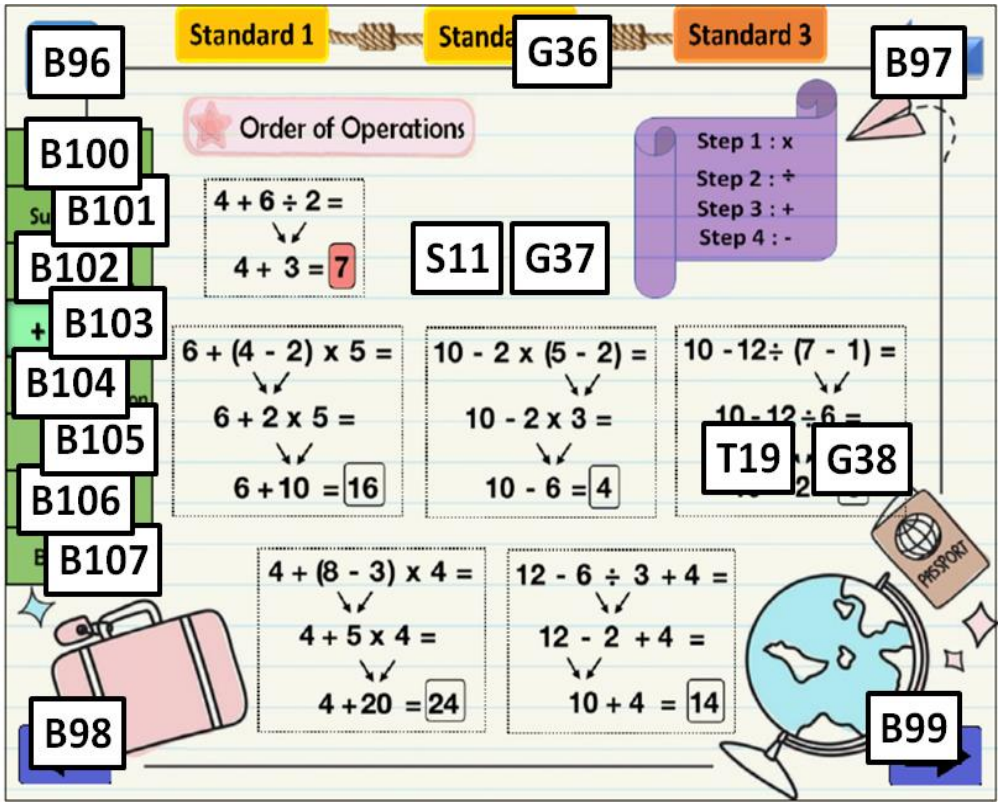
T18 is the text element of which use to provide a note for the user as a reference.

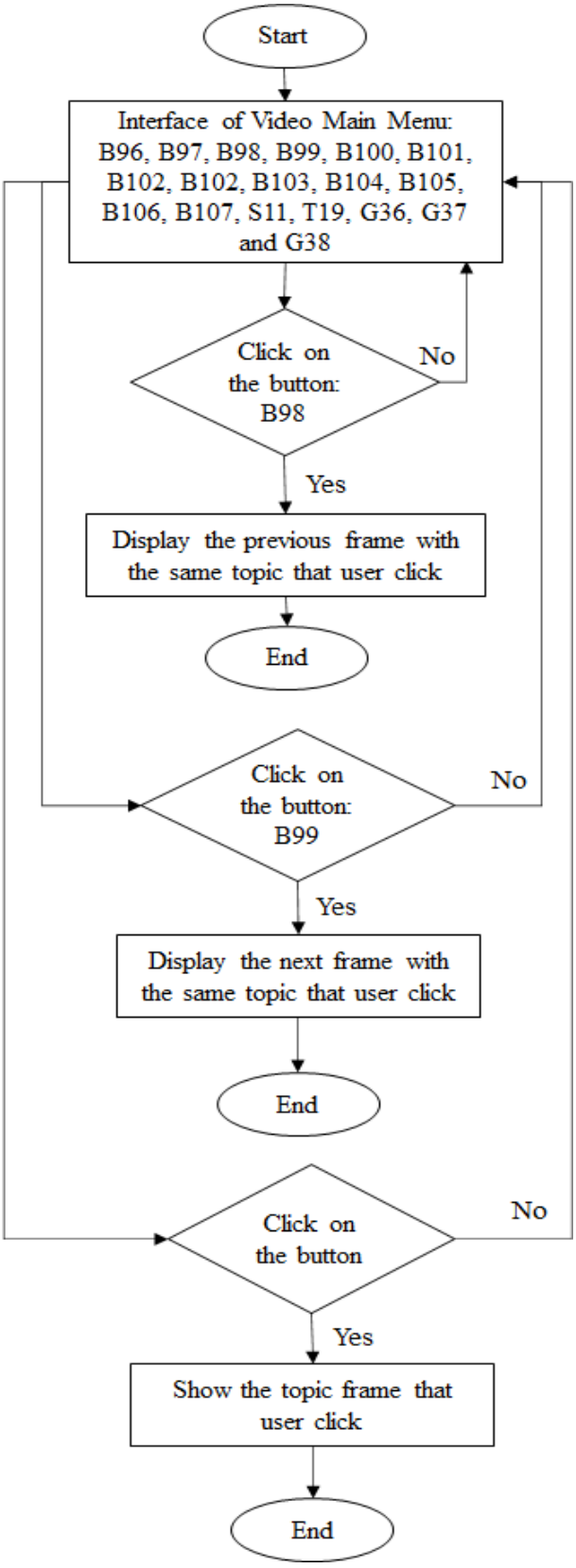
3.1.10 Standard 3 Lecture Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

Storyboards No: 10

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).



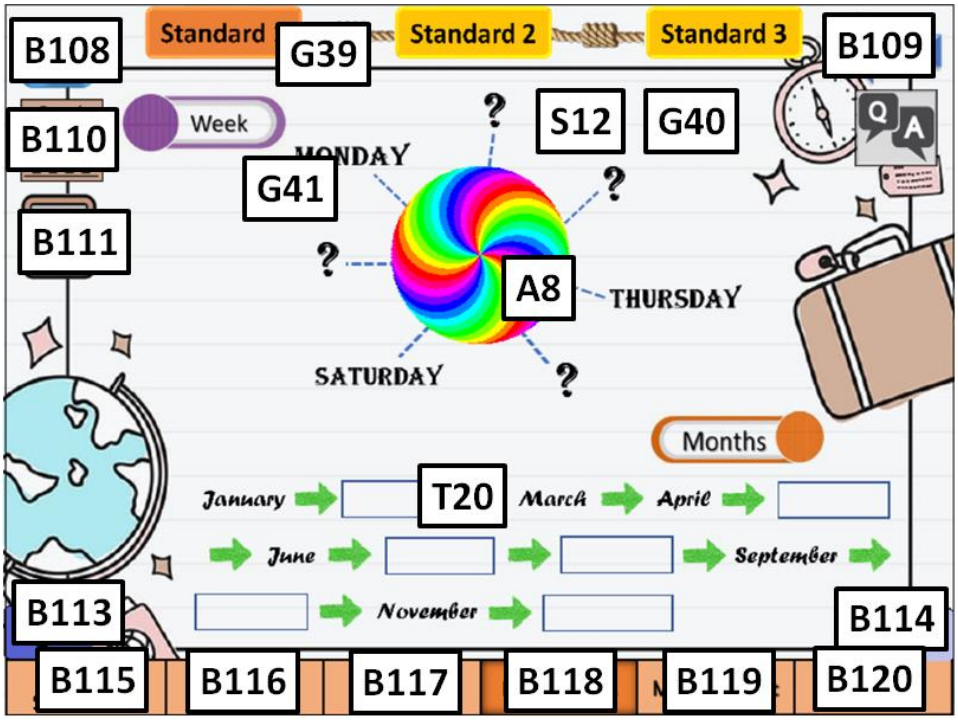
Flowchart	**Instruction**
	B96, B97, B98, B99, B100, B101, B102, B102, B103, B104, B105, B106, B107, S11, T19, G36, G37 and G38 first view in the sight of user. B96 and B97 are the button element. B96 can link user to the standard menu page whereas B97 link to the previous page which is lecture module of standard 3. B98 is the button element that links to the preceding page whereas B99 is the button that links to the following page. B100, B101, B102, B102, B103, B104, B105, B106 and B107 are the button component which represents different chapter within the standard 3 lecture chapter. G37 is the graphic element that uses as a wallpaper of the module. G36 and G38 are the image element that provides useful learning information that can attract user interest. S11 is the background music of the frame. T19 is a text element that represents the lecture note of the chapter.

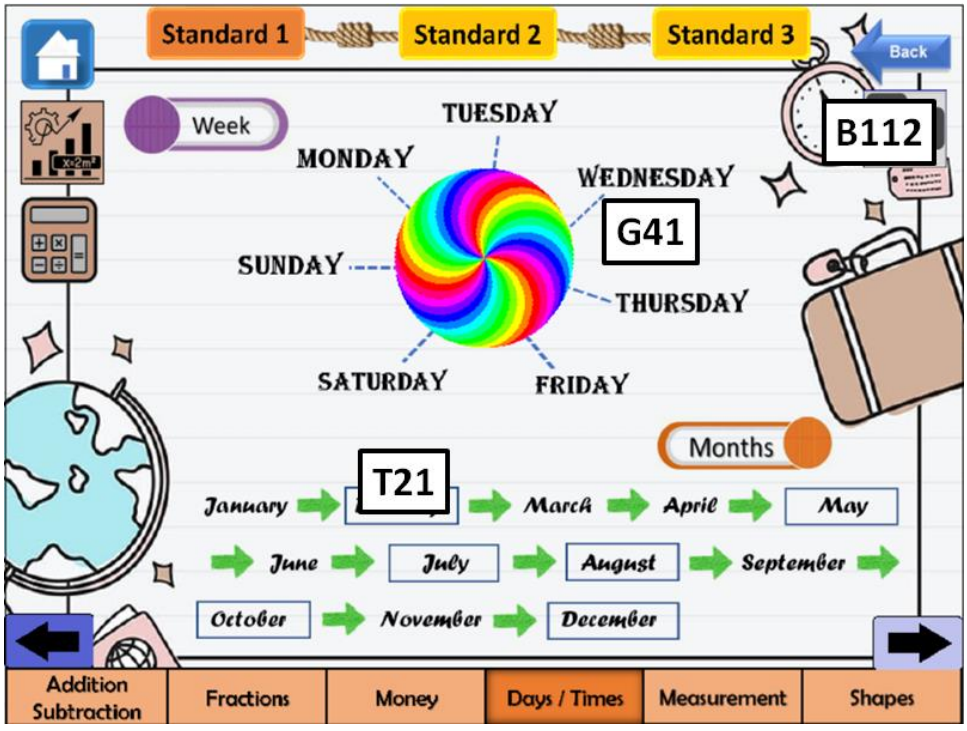
3.1.11 Standard 1 Exercise Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

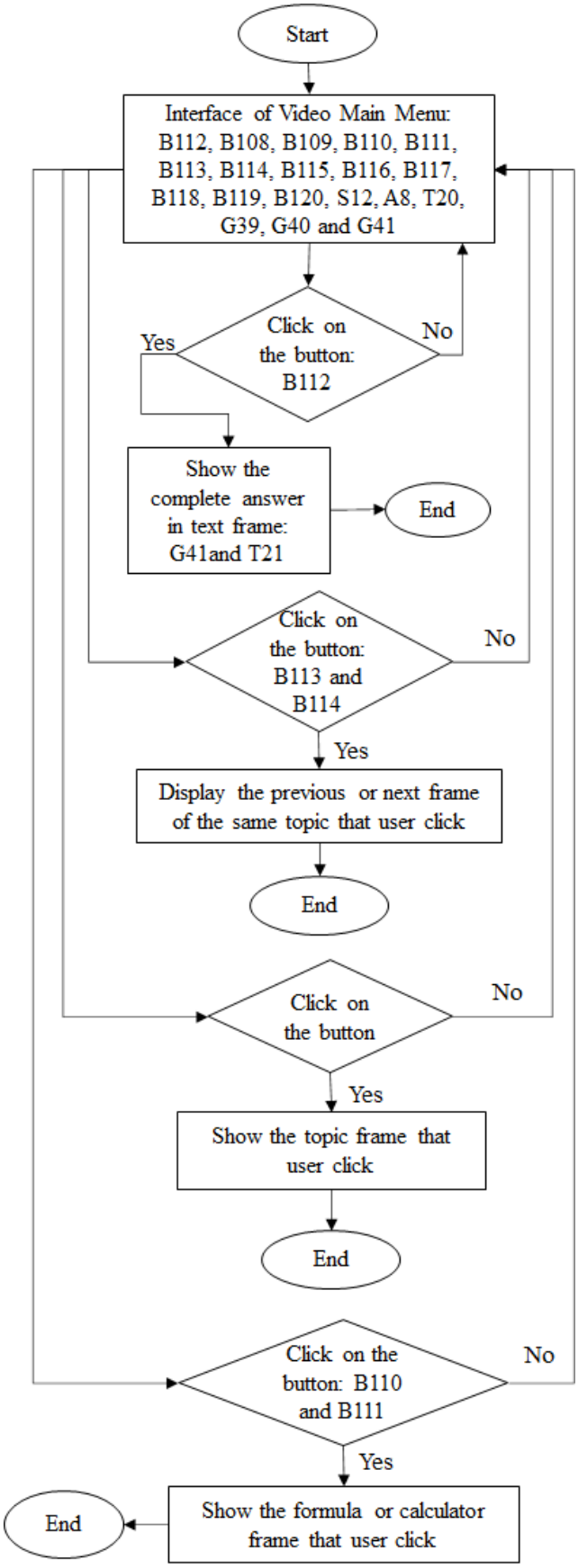
Storyboards No: 11

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





Flowchart



Instruction

B112, B108, B109, B110, B111, B113, B114, B115, B116, B117, B118, B119, B120, S12, A8, T20, G39, G40 and G41 will first view on the screen.

A8 is an animation element which plays the animation image and the background of the user interface.

B108 is the button that links to the standard menu module.

B109 is the button that links to the standard 1 content menu module.

B110 and B111 are the buttons that links either formula or calculator frame.

B112 is a button for user drag on it to get the complete answer each of the questions.

B113 is the button link to the upper frame whereas B114 link user to the next page within the same chapter.

B115, B116, B117, B118, B119 and B120 use to link user to the respective chapter in each of the level.

G39 and G40 are acting as the background wallpaper image of the screen.

G41 is an animation element which plays the animation image and the background of the user interface.

S12 is the sound element that uses as background music.

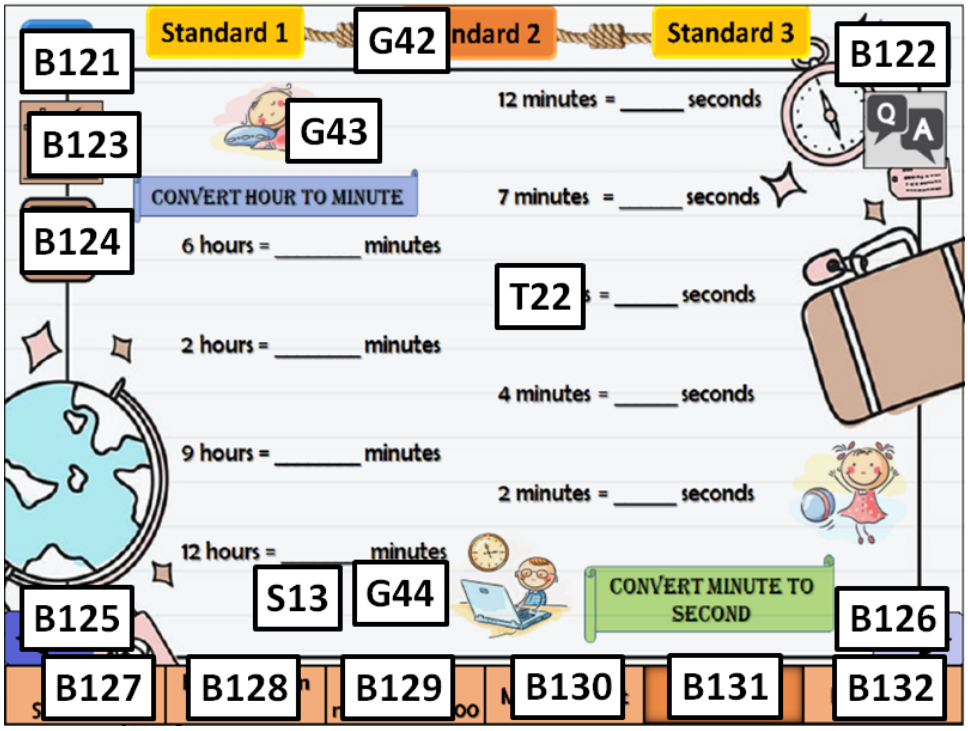
T20 and T21 are the text element represent the questions or answers in each of the chapters.

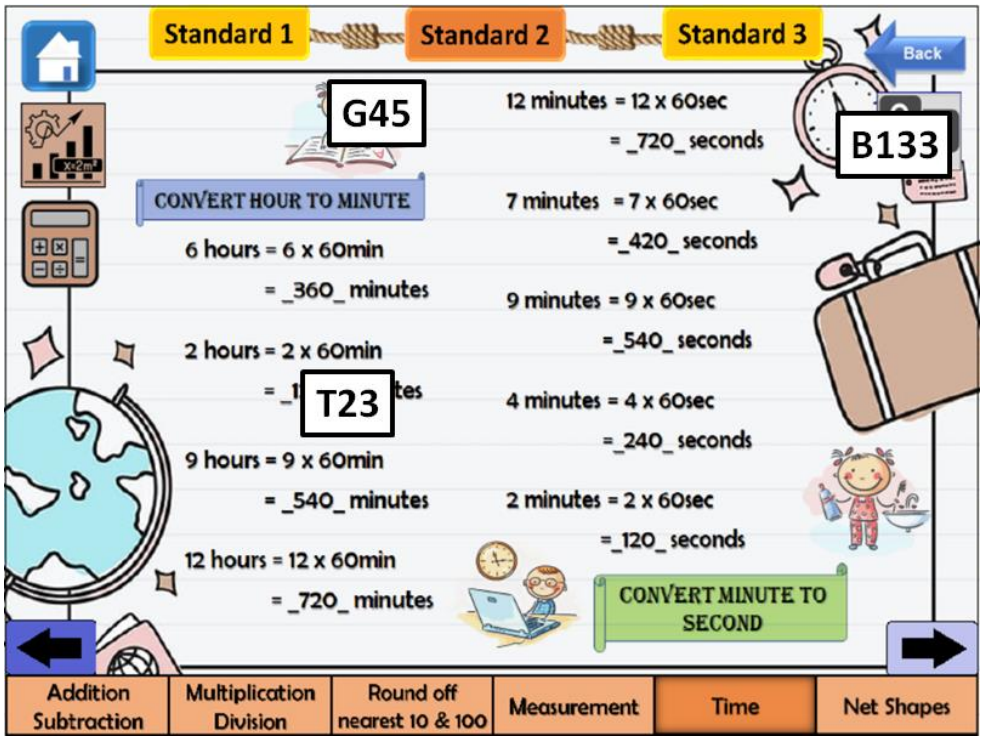
3.1.12 Standard 2 Exercise Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

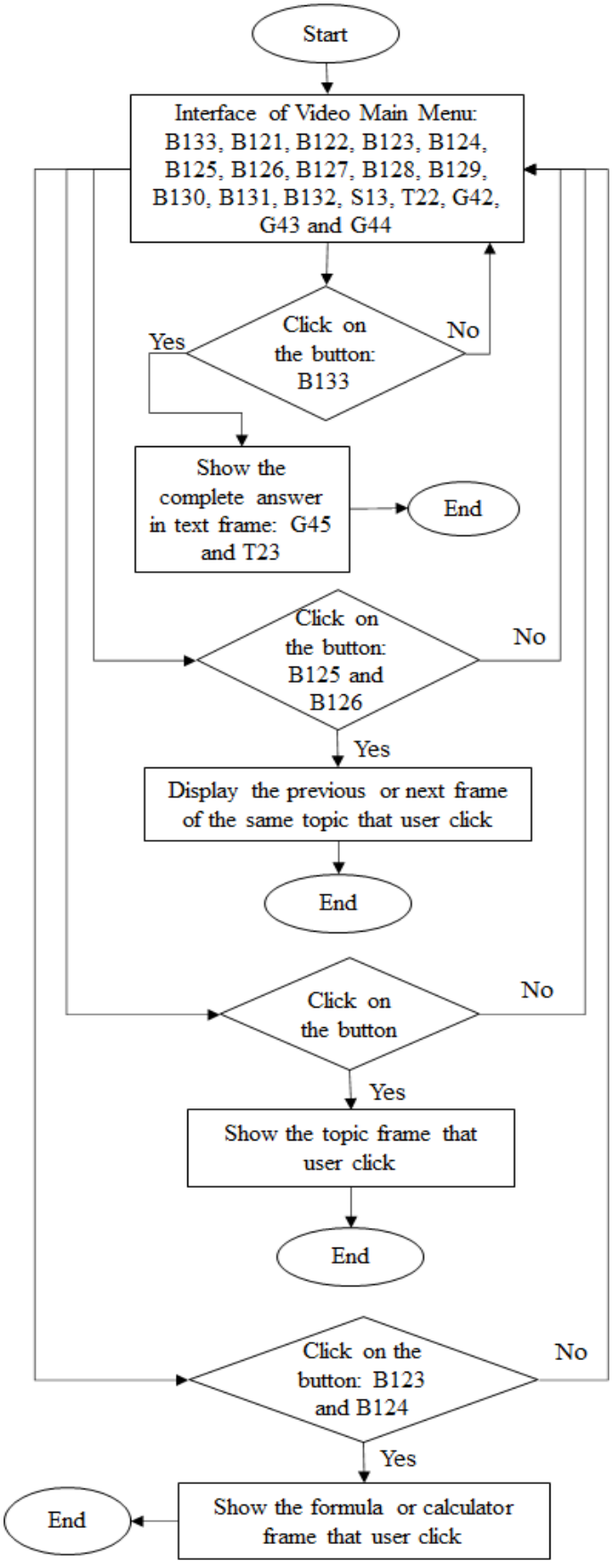
Storyboards No: 12

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





Flowchart



Instruction

B133, B121, B122, B123, B124, B125, B126, B127, B128, B129, B130, B131, B132, S13, T22, G42, G43 and G44 first appear on the screen.

B121 is a button that links user to standard menu page whereas B122 is a button back to the menu page of standard 2.

B123 and B124 are the buttons provide for user as to link to the formula or calculator frame.

B125 is the button that direct user back to the upper frame.

B126 is a button represent as a next page button that links to the next module.

B127, B128, B129, B130, B131 and B132 are the button which instruct user to the respective chapter.

B133 is a check button that direct user to examine for the correct answer of the question.

G42 and G44 are the background image of the exercise module of standard 2.

G43 and G45 is the graphic component that follows to change mutually when user drag on the B133.

S13 is a music element that uses as background melody of standard 2 exercise module.

T22 the text element which provides mathematics questions in each of the chapters.

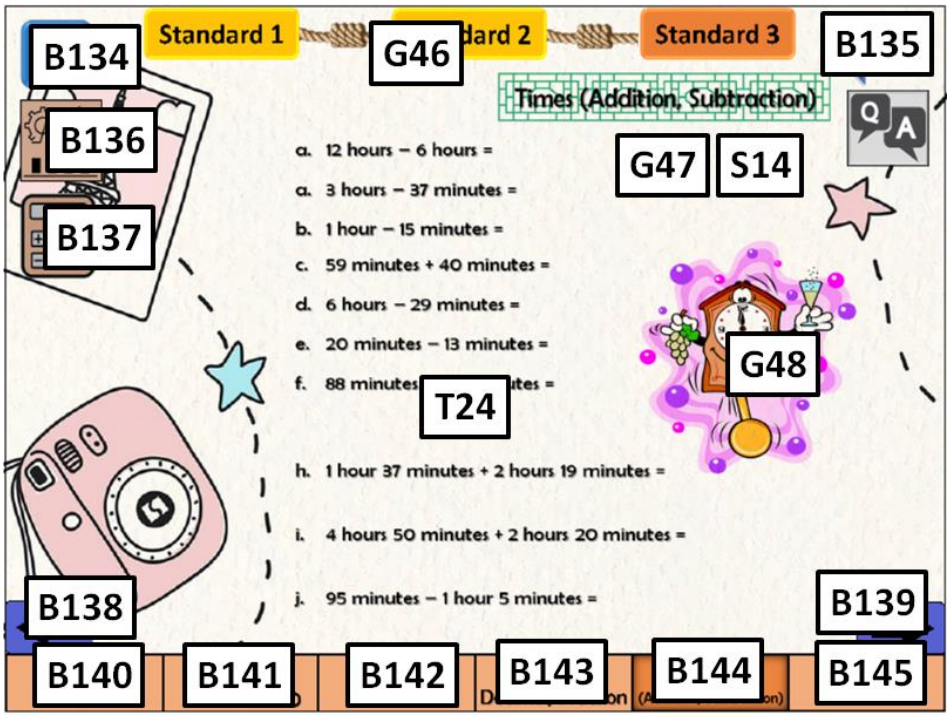
T23 is the text element that contains questions and answers which will only occur when user drag on the B133.

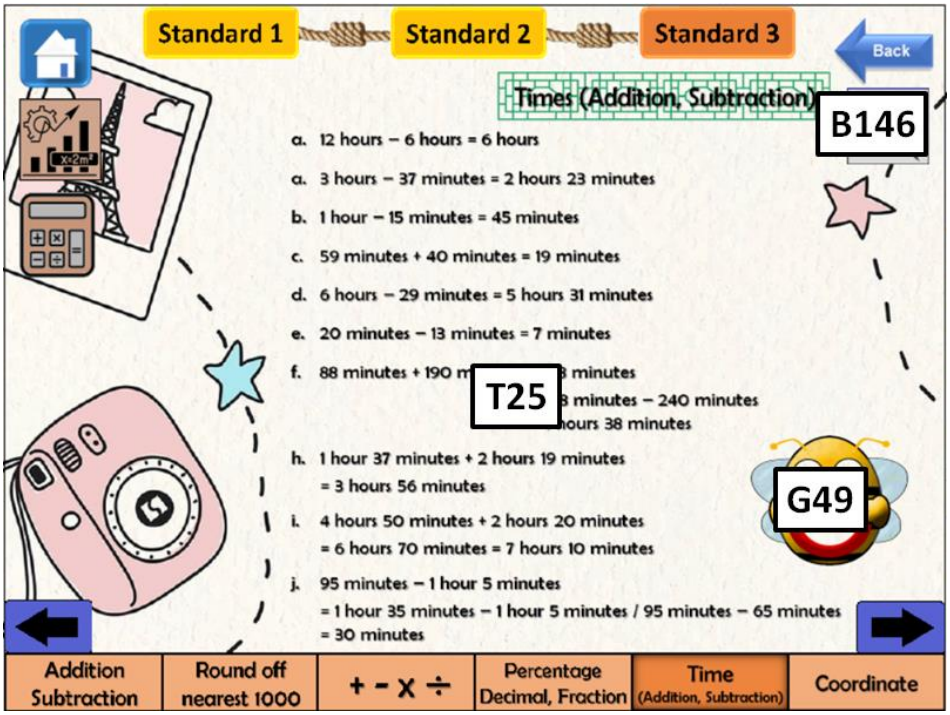
3.1.13 Standard 3 Exercise Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

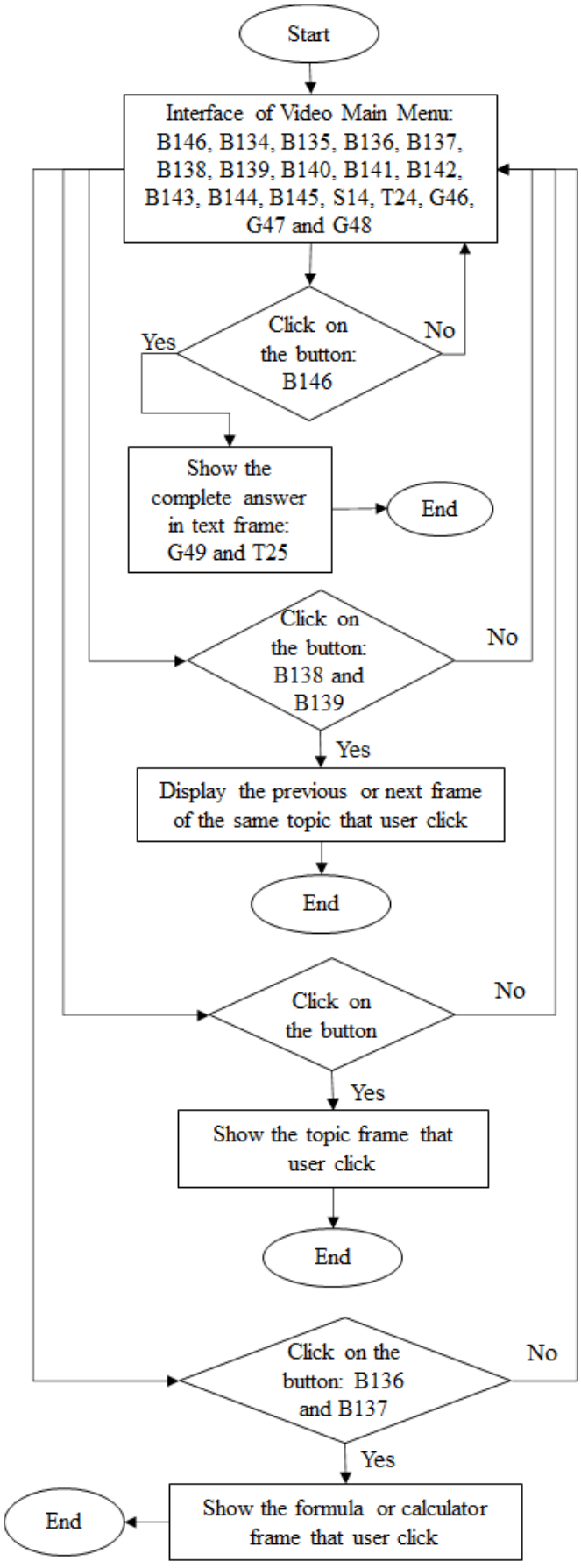
Storyboards No: 13

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





Flowchart



Instruction

B146, B134, B135, B136, B137, B138, B139, B140, B141, B142, B143, B144, B145, S14, T24, G46, G47 and G48 first be seen on the screen.

B34 is the button that backs to the standard menu page. B

B135 is the button back to the previous frame which is an exercise frame of standard 3.

B136 and B137 are the button component that diametrically links to the formula page or online calculator.

B138 and B139 is the button that links to the previous or outcoming page of the system.

B140, B141, B142, B143, B144 and B145 are the button which guide user to different chapter individually.

B146 is a check button that provides and allow the user to inspect for the proper answer for each the questions.

G46 and G47 are the background image of the standard 3 exercise module.

G48 and G49 are the graphics that include in the module.

S14 is the music element that plays as background music.

T24 is the questions that can be found in each of the different chapters.

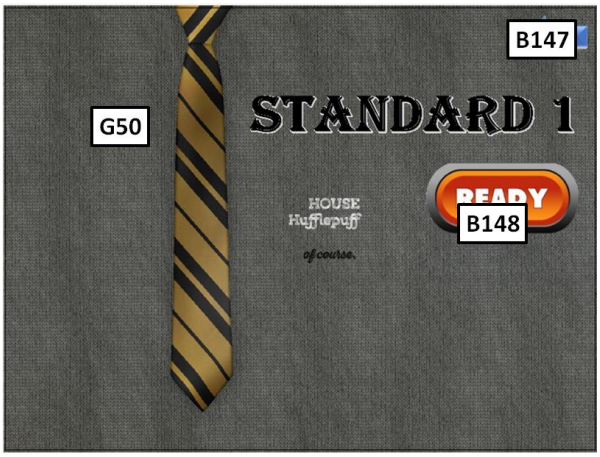
T25 is the text element that provide user with the answer when use drag on B146 for further solving method.

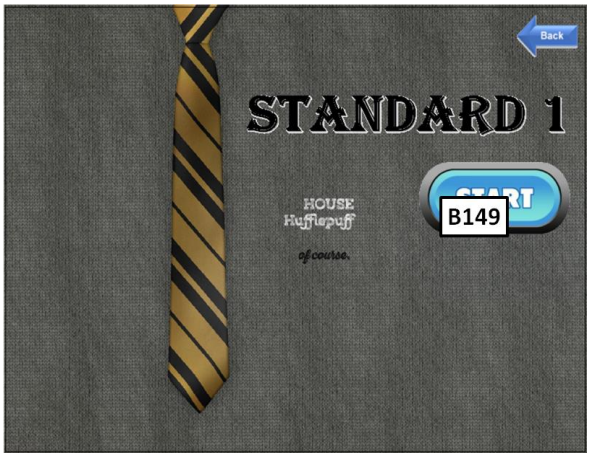
3.1.14 Standard 1, 2 and 3 Start Quiz Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

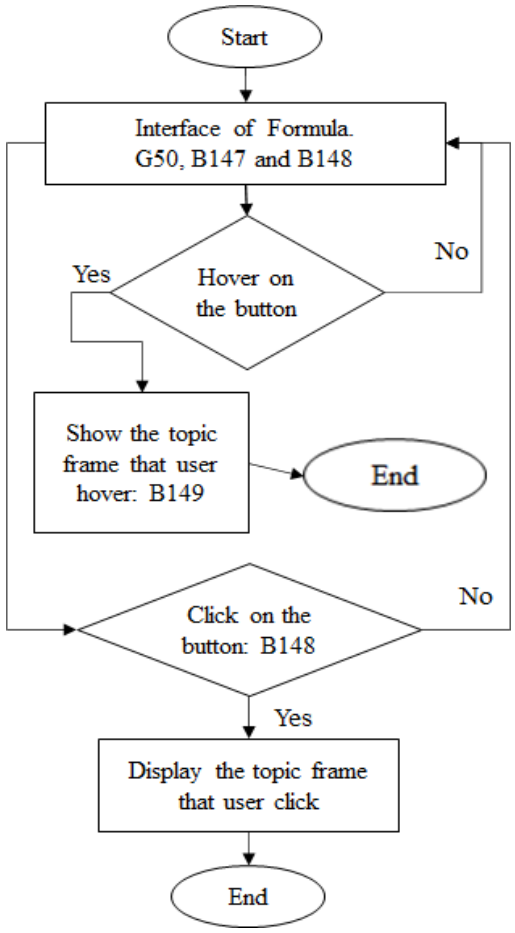
Storyboards No: 14

T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).





Flowchart



Instruction

G50, B147 and B148 are firstly shown in the screen when user click on the quiz button that can be found in three different standard menu content frames.

B147 is the button element that represents as a back function to the standard content menu page.

B148 is the button element that requires user click on it to access the map quiz page before attend the quiz session.

B149 is the button that will only occur when user drag on the B148.

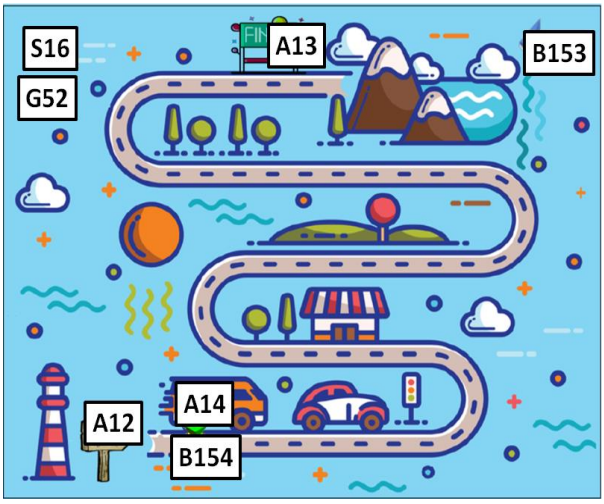
G50 is the background image of the quiz's splash screen.

3.1.15 Standard 1, 2 and 3 Quiz Interface

Title: The Interactive Edutainment Platform for Primary Level Mathematics

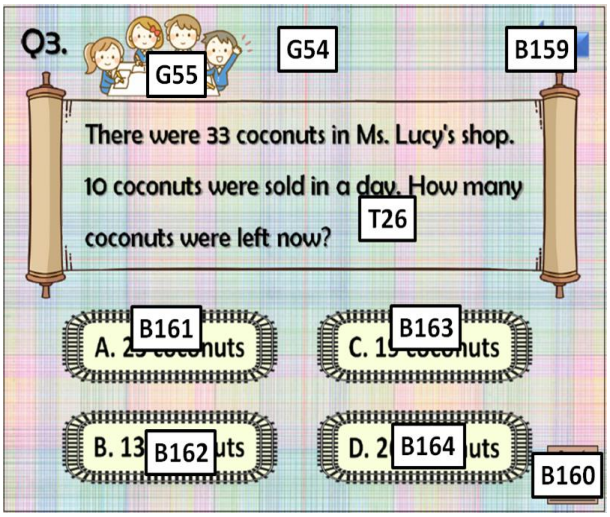
Storyboards No: 15

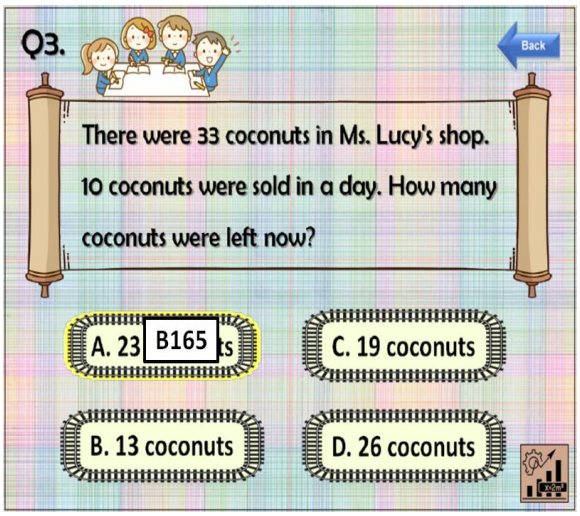
T: (Text), **G:** (Graphics), **S:** (Audio), **V:** (Video), **A:** (Animation), **B:** (Button).

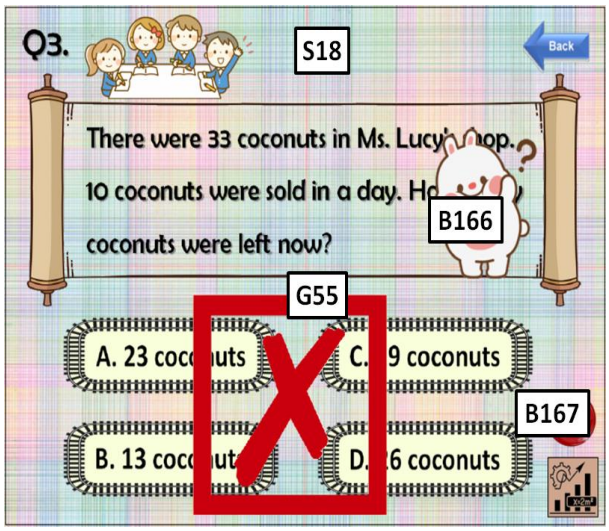


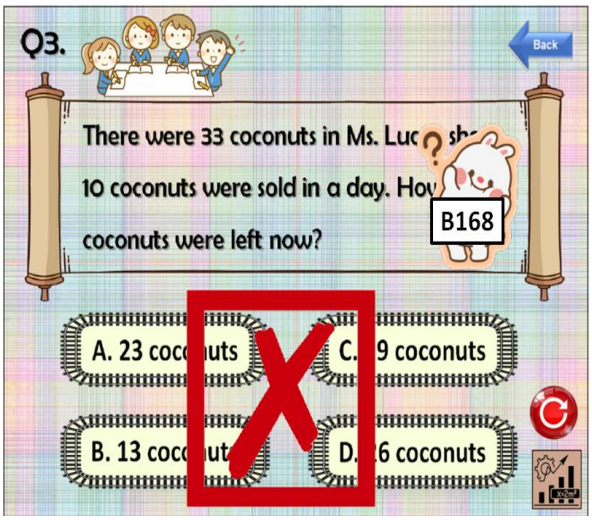

G53
S17
B156
A17
A16
A18
B157
COFFEE
THEATER
SUPERMARKET


Back
FINISH
COFFEE
THEATER
SUPERMARKET
A19
B158
GO!

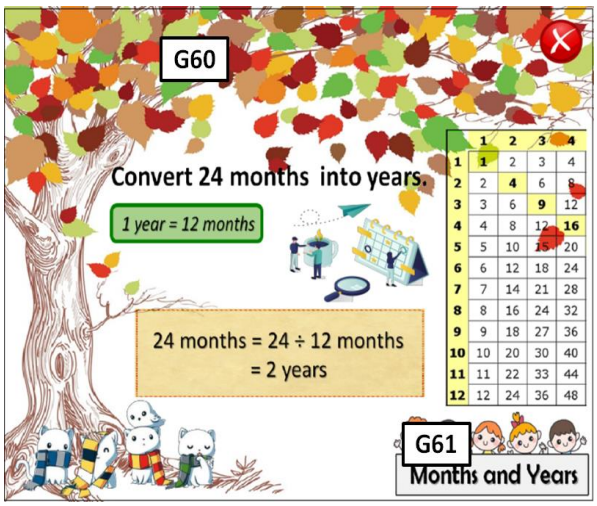

Q3.
G55
G54
B159
There were 33 coconuts in Ms. Lucy's shop.
10 coconuts were sold in a day. How many
coconuts were left now?
T26
B161
B163
B162
B164
B160

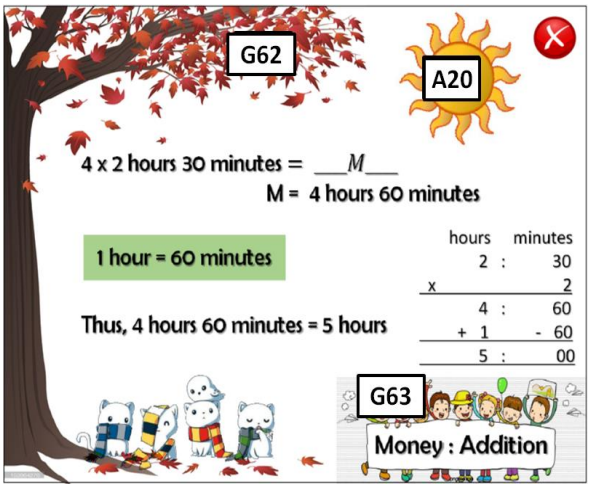

Q3.
Back
There were 33 coconuts in Ms. Lucy's shop.
10 coconuts were sold in a day. How many
coconuts were left now?
B165
C. 19 coconuts
B. 13 coconuts
D. 26 coconuts

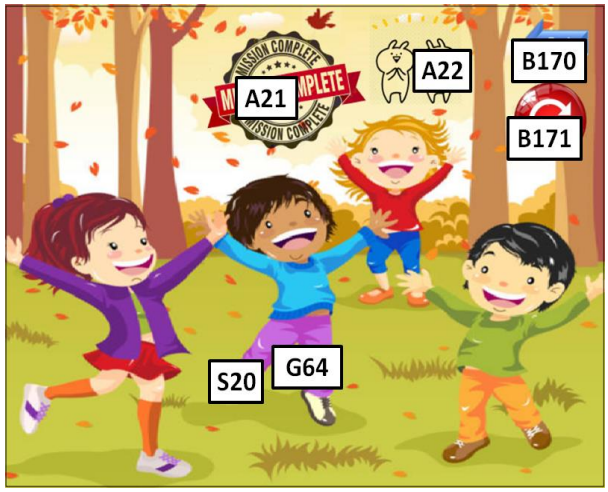

Q3.
S18
Back
B166
G55
B167

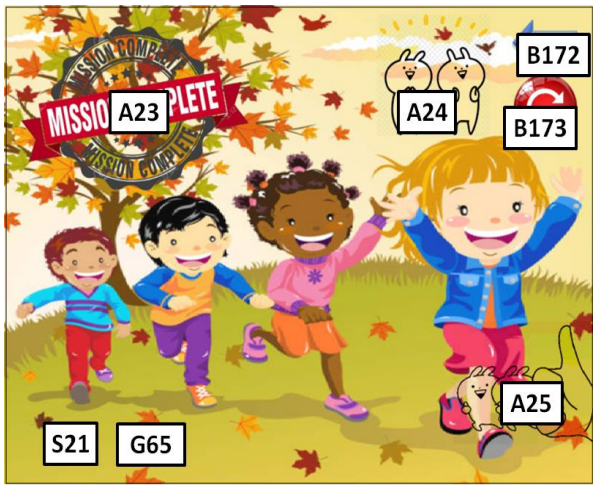

Q3.
Back
B168


S19
G58
B169
There were 33 coconuts in Ms. Lucy's shop. 10 coconuts were sold in a do
T27
w many coconuts were left now?
33 coconuts – 10 coconuts
= 23 coconuts
G57
G56
G59
btrac
T28


G60
Convert 24 months into years.
1 year = 12 months
24 months = 24 ÷ 12 months
= 2 years
G61
Months and Years

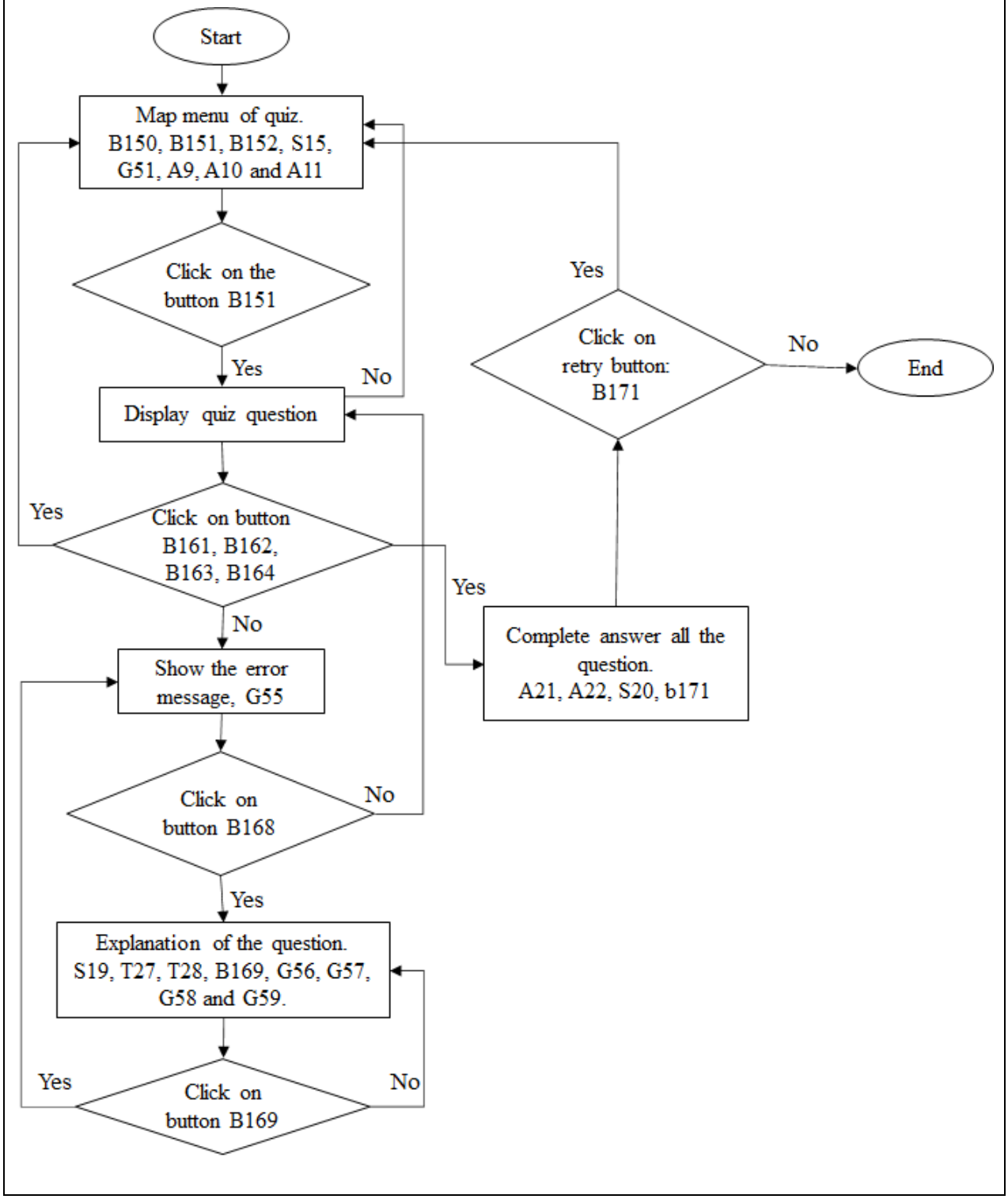

G62
A20
4 x 2 hours 30 minutes = ___M___
M = 4 hours 60 minutes
1 hour = 60 minutes
hours minutes
2 : 30
x 2
4 : 60
+ 1 - 60
5 : 00
Thus, 4 hours 60 minutes = 5 hours
G63
Money : Addition


A21
A22
B170
B171
S20
G64

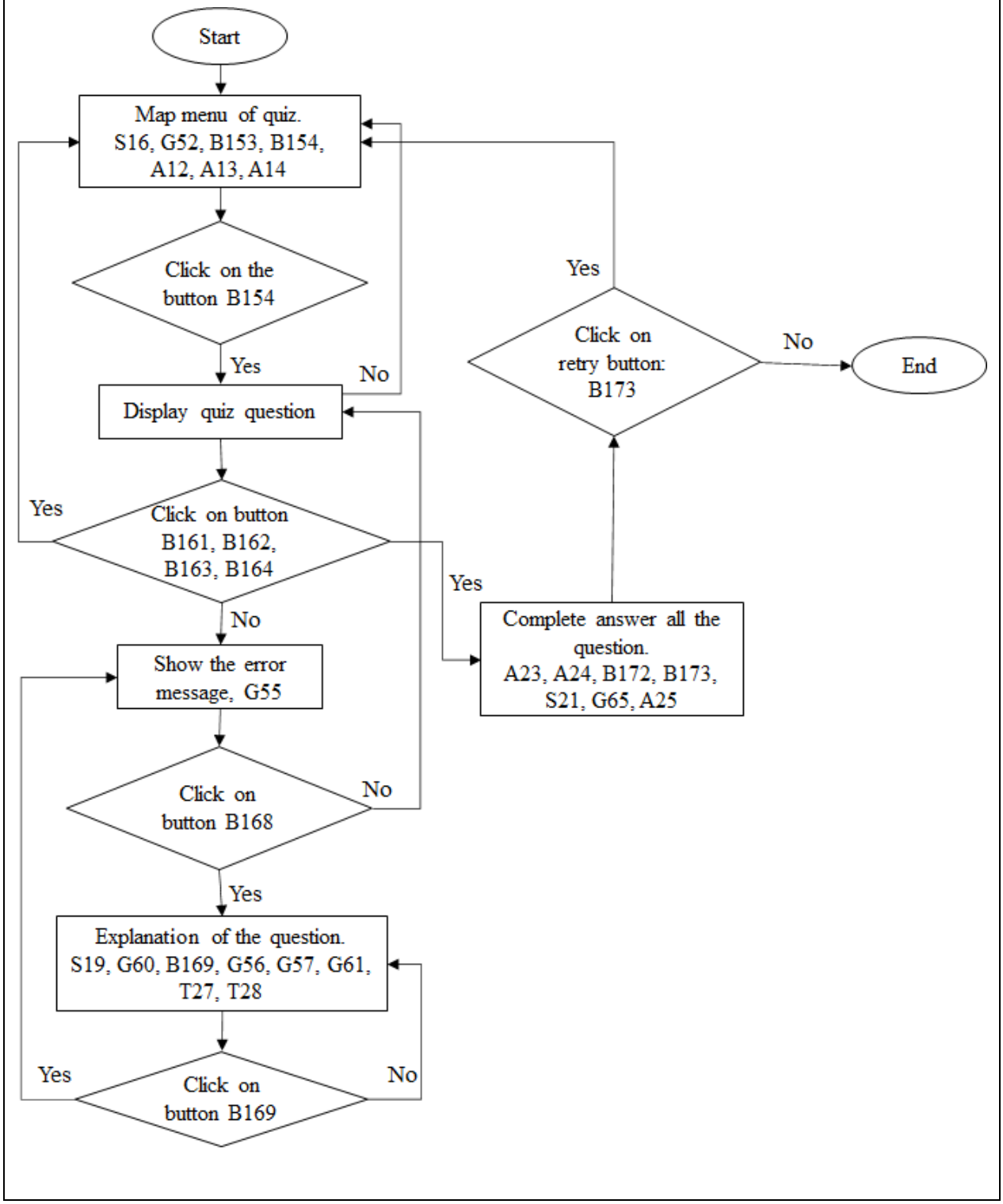

A23
B172
A24
B173
A25
S21
G65


S22
G66
A26
A27
B174
B175
A28
A29

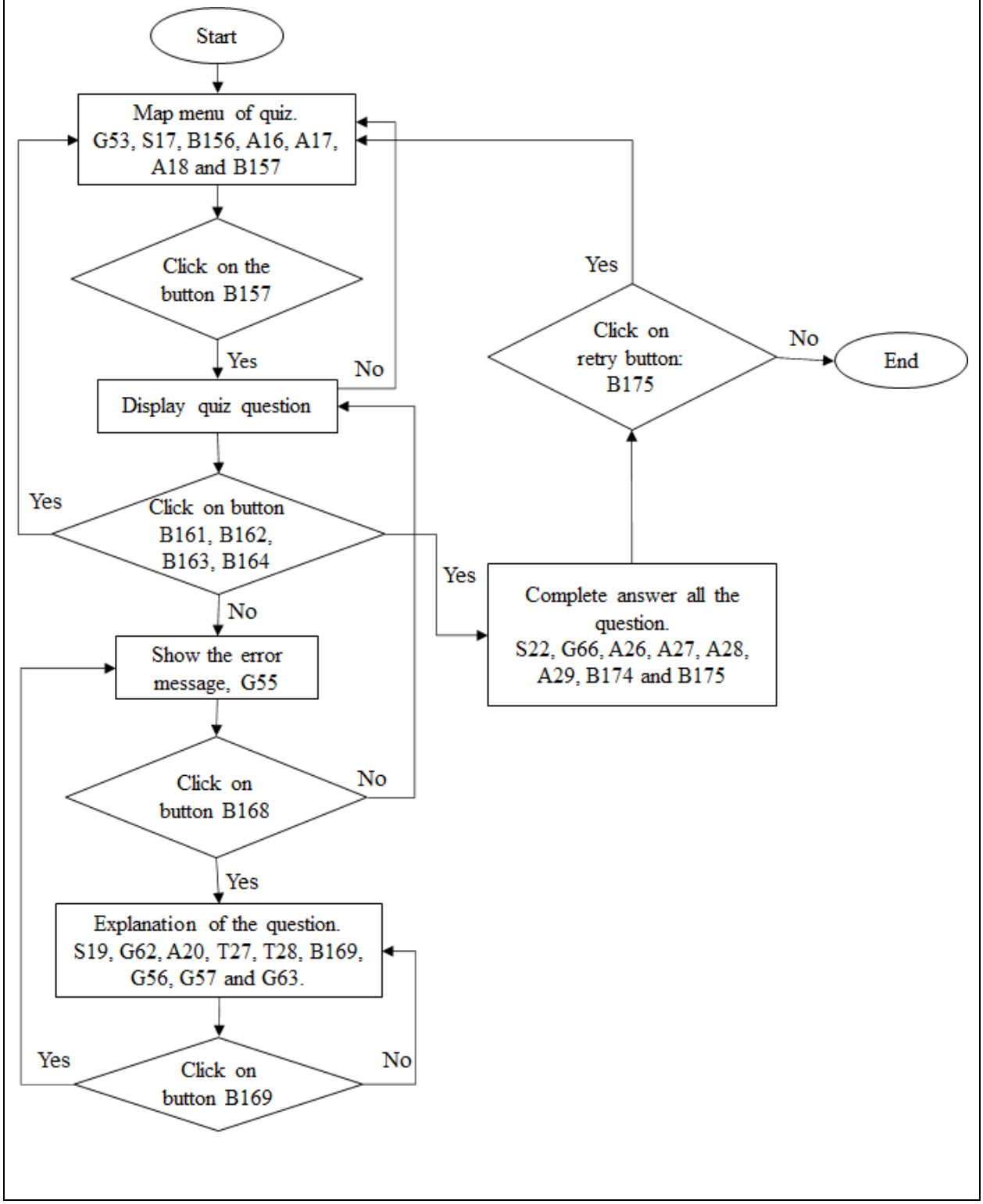
Flowchart (Standard 1 quiz module)



Flowchart (Standard 2 quiz module)



Flowchart (Standard 3 quiz module)



Instruction

- B150, B151, B152, S15, G51, A9, A10 and A11 firstly shown in Standard 1 Quiz Map page.
- S16, G52, B153, B154, A12, A13, A14 first display in the sight of user in quiz map module of standard 2.
- G53, S17, B156, A16, A17, A18 and B157 can be seen in the quiz map of standard 3.

- A9, A10, A12, A13, A16 and A17 are the animation graphics that attract user attention and shown which direction and where is the first or last question.
- A11, A14, A15 A18 and A19 are the animation element with a pointer shape that point on the question to guide user where is the following question and button to click and displays the sequence of the question.
- A20 is the animation as the background of the frame.
- A21, A23 and A26 are the animation graphics that represent the completed question of the following level.
- A22, A24, A25, A27, A28 and A29 is the animation image which will be seen in the last frame of the quiz section.

- B150, B153, B156, B159, B170, B172 and B174 are the button element which allows user straight forward back to the content page either standard 1, standard 2 or standard 3.
- B151, B152, B154, B155, B157 and B158 are the button element that allow user to click which link to the interrelated question.
- B160 is the button that allows user to access formula as a reference.
- B161, B162, B163 and B164 are the button that allow user to choose one of the correct answers from the following selection given.
- B165 is a button element which will show when user drag on the button.
- B166 and B168 is the button that displays when user chooses the wrong answer. It will direct user to the explanation frame by providing step by step solving method for each of the questions.

- B167 is a cross button that allows user to choose again the answer if they answer wrong previously.
- B169 is the cross button that backs from explanation frame to the quiz question.
- B171, B173 and B175 are the buttons that allow user to redo all the questions again start from question one.

- G51, G52 and G53 are the image element that use to represents as the background image of the quiz module.
- G54 and G55 are the background graphics of the quiz question module that increase the mood of learning.
- G55 is the image element with the mean of incorrect answering of the question which will only pop out if user unable to choose the actual answer.
- G56, G58, G60 and G62 are the background graphics for the three different standards of quiz explanation modules.
- G57 is the image for the purpose of information with detail explanation
- G59, G61 and G63 are the frame image.
- G64, G65 and G66 are the wallpaper image of the quiz section.

- S15, S16 and S17 are the background music in three different quiz map modules.
- S18 is the error sound effect when user chooses the wrong answer.
- S19 is the background melody play in the quiz question explanation module.
- S20, S21 and S22 are the kids cheering sound effect when user accomplish all the quiz questions.

- T26 is the text component that use to show what is the information or question before choosing the actual answer.
- T27 is the T28 is the text component that represents which chapter of the question and solution procedure that user have learned previously.

Chapter 4

Methodologies

4.1 ADDIE Model

4.1.1 Stage 1: Analysis

Analysis phases is use to determine the objective goals and performance objectives. Data is collected to ensure a complete understanding before develop the system. It is also use to estimate the overall cost used to develop the platform. It is an important process to avoid duplication knowledge and useless information repetition. Developer able to identify the learning problems and learning environment after analyses the data collected.

4.1.2 Stage 2: Design

Design phase is use to develop a system's goal that come out with a set of strategic plans. It involves the process of create storyboard, design a friendly user interface and start to develop prototype based on feedback and command that received by respondents. The content and structure plan of the system should develop effectively based on the instruction.

4.1.3 Stage 3: Development

Development phase is the realistic creation work and put action into the new learning method based on the previous phase which is design such as instructive application software. Learning assessment and materials are generated by developer that may be involve in the system. Normally, it is use to set up both analyse and design phase.

4.1.4 Stage 4: Implementation

This phase is use to create the subject detail according the plan and rule that set up design phase after collect feedback and command of user. Developer responsibility to integrate technologies and tester in charge of debugging and repair the system.

4.1.5 Stage 5: Evaluation

Evaluation plan in simple way to describe what needs to evaluate and what kind of detail need to generate and what ways or method used to generate and collect the information. Besides, evaluate consist of four stages which is planning, implementation, completion and reporting. Through the evaluation plan process, it can improve a better design and demonstrate the program impact. When the system module is done create, the next step is testing. The test part will conduct in two different way which is through the both questionnaire survey and benchmarking with other existing systems. The purpose for the testing step is to generate the opinion of user to increase to function and features of the module. Alpha testing is a software testing use to identify bugs before release the program to real users or introduce to public. Beta testing is a software testing in a real environment carry out real users.

For the questionnaire survey, the completed online platform will be distributed to respondents to do for the first testing and get some feedback, comment or any recommendation from them. It is important because this action will help to improve and solve the weaknesses after obtain the feedback by doing the survey to generate their opinion. Each respondent will be given a Google form to be filled in after try for using the digital heritage trail. Lastly, all the feedback of the survey will record and analyse. For the benchmarking part, it can conduct through the comparison with other similar application. It can commonly use to compare the user satisfaction, costs and quality of the application.

4.2 Reason choose ADDIE model

ADDIE model is the pre-planning that help to informative developer with a progressively guideline in structure a productive training and performance support tools. One of the reasons choose ADDIE model help to save time, cost, reduce error problem of development and encourage an effectual learning. The model consists of five phases such as analysis, design, development, implementation and evaluation as shown in Fig.4.2.1 below.

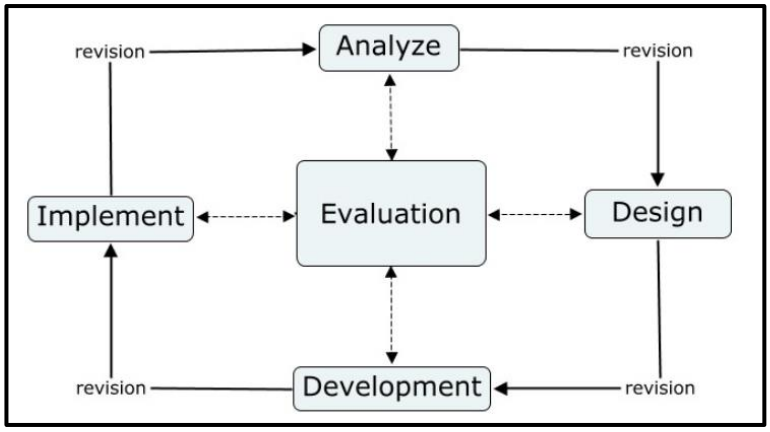


Figure 4.2.1 ADDIE model process.

Stage of execution plan are shown as Figure.4.2.2 below.

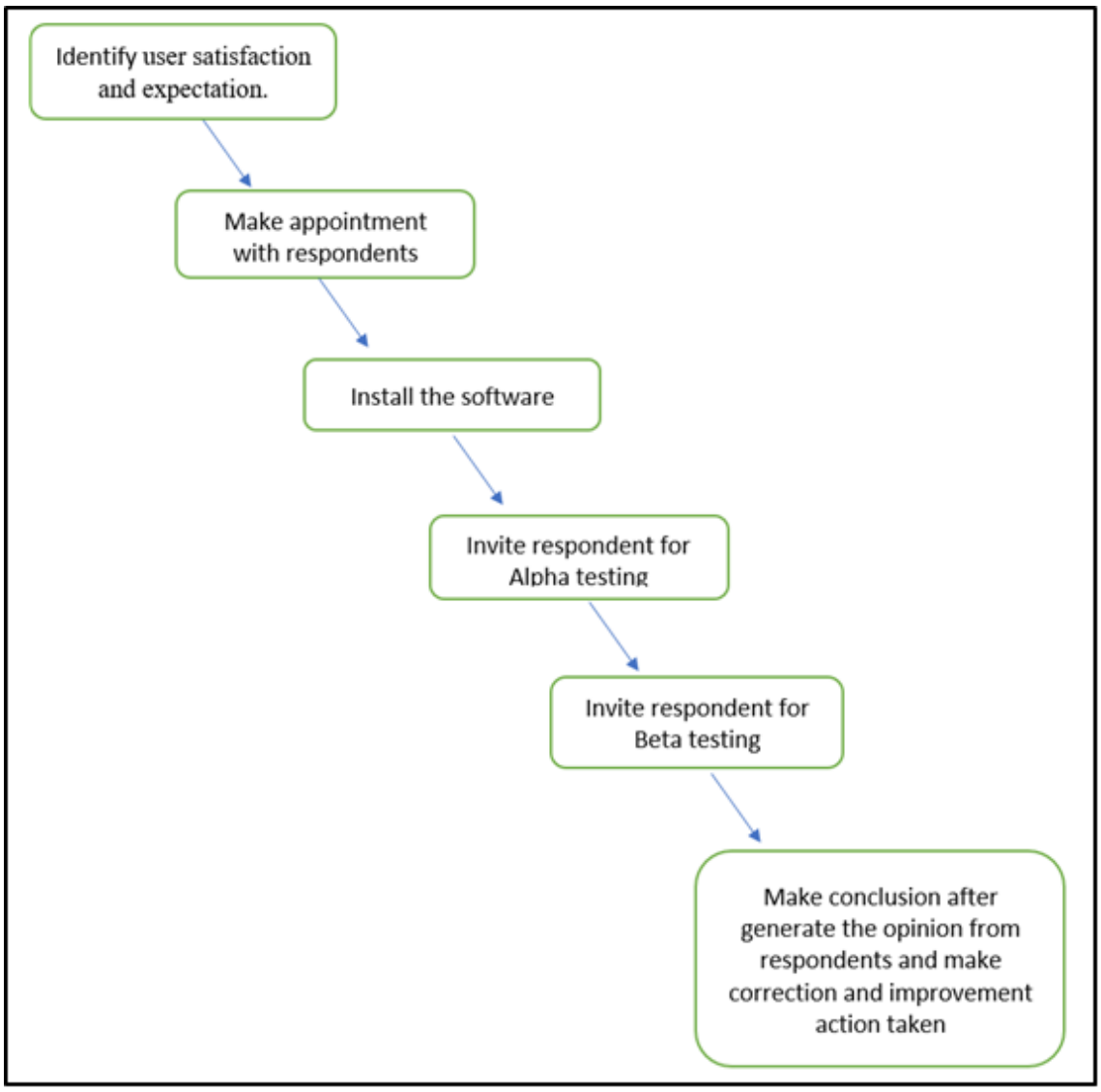


Figure 4.2.2 Stage of execution plan.

Chapter 5

Requirement Document and Specification

5.1 Timeline

5.1.1 Final Year Project I

Table 5.1.1.1 Timeline for FYP I

Title	Period
Abstract	1 day
1.0 Introduction 1.1 Problem Statement and Motivation 1.1.1 Problem Statement 1.1.2 Motivation 1.2 Project Scope 1.3 Project Objectives 1.4 Impact, significance and contribution 1.5 Background Information	2 days
2.0 Literature Review 2.1 Literature review 2.1.1 CK-12 application (Neeru Khosla & Murugan Pal, 2018) 2.1.2 MathPlayground Website (Colleen King, 2002) 2.1.3 Buzzmath Application (Claude Laverdure, 2003) 2.1.4 Playkids application platform (Breno Masi & Eduardo Lins Henrique , 2013) 2.1.5 Math for kids application (n.a. , n.d.) 2.1.6 Dreambox Website (Lou Gray & Ben Silvka, 2006) 2.1.7 FunBrain Website (Poptropica Worldwide, 1992) 2.1.8 Absurd Math Website (Michael Cain, 2003)	2 days

2.1.9 Using Edutainment to Facilitate Mathematical Thinking and Learning Journal (Ruby & Joyce, 2016)	
2.2 Fact finding	1 day
2.3 Data Collection	1 day
2.3.1 Survey and Questionnaire	1 day
2.4 Critical remark of previous works	1 day
3.0 Proposed Method/ Approach	
3.1 Design Specifications	1 day
3.1.1Methodologies	
3.1.2 General Work Procedures	
3.1.3 Tools to use	
3.1.4 User requirement	
3.1.5 System performance Definition	
3.1.6 Verification plan	
3.2 System Design	60 days
3.3 Implementation issues and challenges	2 days
3.4 Timeline	1 day
3.4.1 Gantt Chart	
3.4.2 Timeline	
3.4.3 Current and next semester	
4.0 Preliminary Work	1 day
5.0 Conclusion	1 day
Finalize Final Year Project 1 documentation	2 day
Prepare for Presentation slide	2 day

Table 5.1.1.2 Gantt Chart for Stage of Planning

Work Process \ Week	Duration (day)	Week 1 **20 Jan - 26 Jan**	Week 2 **27 Jan– 2 Feb**	Week 3 **3 Feb – 9 Feb**	Week 4 **10 Feb – 16 Feb**	Week 5 **17 Feb – 23 Feb**	Week 6 **24 Feb – 1 March**	Week 8 **2 March– 8 March**	Week 9 **9 March– 15 March**	Week 10 – Week 12 **16 March – 5 April**	Week 13 **6 April – 12 April**	Week 14 **13 April – 19 April**
Planning Timeline and Gantt Chart	1											
Chapter 1: Introduction	7											
Chapter 2: Literature Review	7											
Chapter 3: Proposed Method/ Approach	49											
Chapter 4: Preliminary Work	7											
Chapter 5: Conclusion	1											
Abstract	1											
Finalize Final Year Project 1 Documentation	2											
Prepare PowerPoint Presentation slide	2											

5.1.2 Final Year Project II

Table 5.1.2.1 Timeline of FYP II

Title	Period
Acknowledgement	1 day
1.0 Introduction 1.1 Problem Statement 1.2 Background and Motivation 1.2.1 Background Information 1.2.2 Motivation 1.2 Project Scope 1.3 Project Objectives 1.4 Impact, significance and contribution 1.5 Report Organization	2 day
2.0 Literature Review 2.1 Literature review 2.1.1 CK-12 application (Neeru Khosla & Murugan Pal, 2018) 2.1.2 MathPlayground Website (Colleen King, 2002) 2.1.3 Buzzmath Application (Claude Laverdure, 2003) 2.1.4 Playkids application platform (Breno Masi & Eduardo Lins Henrique , 2013) 2.1.5 Math for kids application (n.a. , n.d.) 2.1.6 Dreambox Website (Lou Gray & Ben Silvka, 2006) 2.1.7 FunBrain Website (Poptropica Worldwide, 1992) 2.1.8 Absurd Math Website (Michael Cain, 2003) 2.1.9 Using Edutainment to Facilitate Mathematical Thinking and Learning Journal (Ruby & Joyce, 2016) 2.2 Critical Remarks of Previous Works 2.2.1 Comparison Features between Different Platform 2.2.2 Compare Proposed Study with Previous Work	3 day 1 day

3.0 System Design 3.1 Storyboard Design and Flowchart	 10 days
4.0 Methodologies 4.1 ADDIE Model 4.2 Reason choose ADDIE Model	 1 day 1 day
5.0 Requirement Document and Specification 5.1 Timeline 5.2 Fact Finding 5.3 Data Collection 5.4 Tools 5.5 Requirement 5.6 System Performance 5.7 Verification Plan	 1 day 1 day 1 day 1 day 1 day 1 day 1 day
6.0 Implementation and Development 6.1 Pre-Authoring Process 6.2Post-Authoring Process	70 days 1 days
7.0 Testing	5 day
8.0 Conclusion	1 day
Finalize Final Year Project II documentation	3 day
Prepare for Presentation slide and video	3 day

Table 5.1.2.2 Gantt Chart for FYP II

	Duration (days)	Week 1 – 2 15 June – 28 June	Week 3 – 4 29 June – 12 July	Week 5 – 6 13 July – 26 July	Week 7 – 8 27 July – 9 August	Week 9 – 10 10 August– 25 August	Week 11 – 12 26 August – 6 September	Week 13 – 14 7 September – 19 September
Planning Timeline	1							
-Acknowledgement **-Chapter 1: Introduction**	2							
Chapter 2 **Literature Review**	2							
Chapter 3 **System Design**	10							
Chapter 4 **Methodologies**	1							
Chapter 5 **Requirement Document**	2							
Chapter 6 **Implementation and Development**	70							
Chapter 7 **Testing**	5							
Chapter 8 **Conclusion**	1							
FYP System	70							
Finalize FYP II Documentation	3							
-Presentation Slide -Record Video	3							

5.1.3 Planning for this semester

For this semester, the author decided to redo all the system and continue to make some further improvement for the development of a complete system and submit the report before the deadline. As for the development process, the author would start to think and come out with a new creation of the component such as user interface, audio, animation, video, text and graphics. Author is responsible to complete all the system completely especially quiz part of the three standards for the project. After the development of the prototype, the author requires to find some respondent which range between the age of seven to nine years old to test for the system. Online questionnaire survey may also need to distribute for respondents for the purpose to collect some good suggestion and comment. Participant comment can help to make some creative adjustment and ameliorate the performance of the system.

5.2 Fact Finding

Fact finding is one of the methods used to collect information from different sources with the techniques such as research and site visits, observe work environment, questionnaires, interviews, prototyping, joint requirement planning, existing documents, forms and databases. Developer can increase their knowledge before or while develop the system or application.

Primary data is the information collected by research. It includes surveys, interviews, direct observations conducted in the research and experiments. Furthermore, primary data is the data collection through specific tools such as questionnaire. Primary data collection is the document that has yet been published by human beings. The actions which include address the target issued and address for specific research issues.

Secondary data is the data that collected by other researchers for own purpose. We also can get the data and study the contents similar application from others people and do data comparison. The secondary data may obtain or get from different sources such as industry surveys, company reports, magazines or newspapers articles, literature, academic journals and many others. Secondary data can easily accessible and can immediately available. It provides necessary and crucial background or information that help to clarify or refine research problem. Moreover, secondary data sources provide research method or ways that is different and careful researcher to any potential difficulties problem.

5.3 Data Collection

Data collection is the process use to accumulate, collect and finally analyse important data or information from different sources. Each approach is implemented at different points in the research timeline (Whitney, Lind, Wahl, 1998). Data collection also known as fundamental concept which means that any other countless and different ways. It consists of two different method which include primary data collection and secondary data collection. A study pointed that 'quality assurance' and 'quality control' as two approaches that can preserve data integrity and ensure the scientific validity of study results (Craddick, Crawford, Redican, Rhodes, Rukenbrod, and Laws, 2003).

Furthermore, collect data digitally better because is spend lesser time and less money contribute compare with collecting paper survey data. Collect data digitally able to support huge amount of sample sizes to enhance the reliability of data and run in a same time, quicker response compares to paper survey and run automatically in the process of data collection. The term ethnography, when used as a verb, simply "means the collection of data that describe a culture" (Bernard, 1998). "Adequate citation of data sets is crucial to the encouragement of data sharing, to the integrity and cost-effectiveness of science and to easy access to the work of others" (Sieber & Trumbo, 1995). Data collection classified into two different ways which include primary data collection and secondary data collection.

Data quality is important to endure the data that generate is availability, timeless, validity, reliability, relevance, consistency and completeness condition. This presumes that the data is allow to use and access. Data that is validity and accurate can increase the performance and perform a high quality of project. It can increase the production of the project result speed and make more easier to solve problem if face any problem that is similar. A high-quality and efficiency data are the prerequisite for study and using big data and for assurance and contract with the value of the data (Cai and Li, 2015).

5.3.1 Survey and Questionnaire

Survey and questionnaires are the most common way and technique use to generate data. Bryman and Bell (2003) declare that mail or postal questionnaires are most popular forms of questionnaires. Survey is a research technique in which a sample is interviewed in some form or the behaviour of respondents is observed and described in some way (Zikmund &

Babin & Carr & Griffin, 2010). Survey method such as face-to-face interview or personal interview conducted at home, office or anywhere. The interviewer needs to ask the question and record the response of respondent. Through the interview process, interviewee able to collect deeper information and data. Face-to-face interview can help interviewer to directly ask interviewees to get additional information and ensure properly understand of the data that generate. Bernard (1995) generally defines participant observation as "getting close to people and making them feel comfortable enough with your presence so that you can observe and record information about their lives".

Questionnaire survey is important because this action will help to improve and solve the weaknesses after obtain the feedback by doing the survey to generate their opinion. Each respondent will be given a Google form to fill in after try used CK-12 online application. Lastly, all the feedback of the survey will record and analyse as shown in Fig.5.3.1(a), Fig.5.3.1(b), Fig.5.3.1(c), Fig.5.3.1(d), Fig.5.3.1(e) and Fig.5.3.1(f) below.

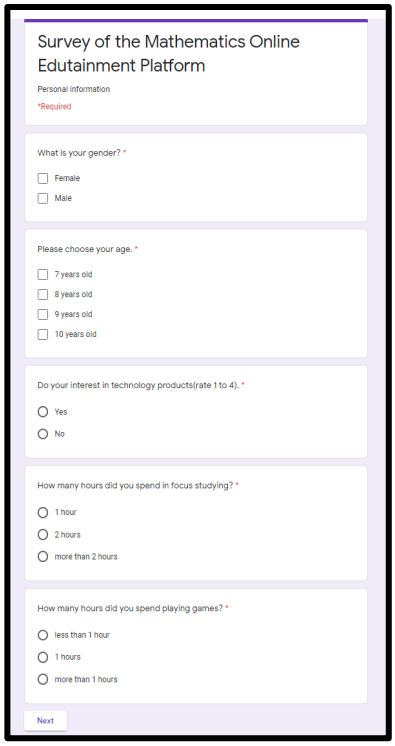


Fig.5.3.1(a) Survey 1.

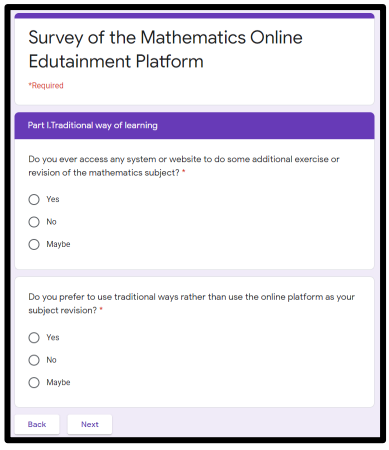


Fig.5.3.1(b) Survey 2.

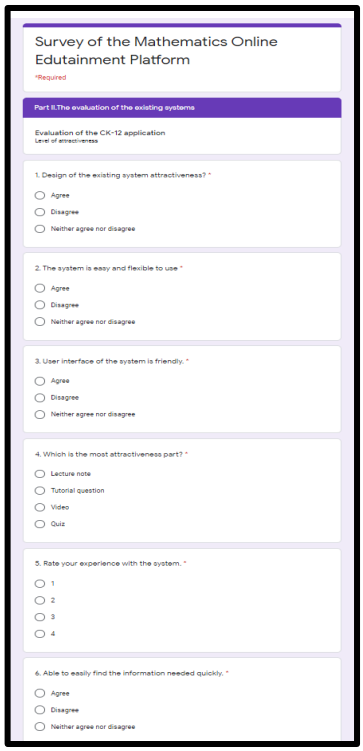


Fig.5.3.1(c)Survey 3.

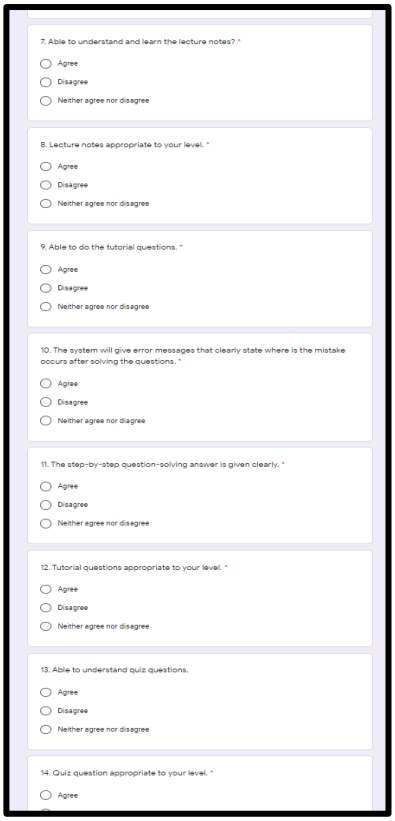


Fig.5.3.1(d) Survey 4.

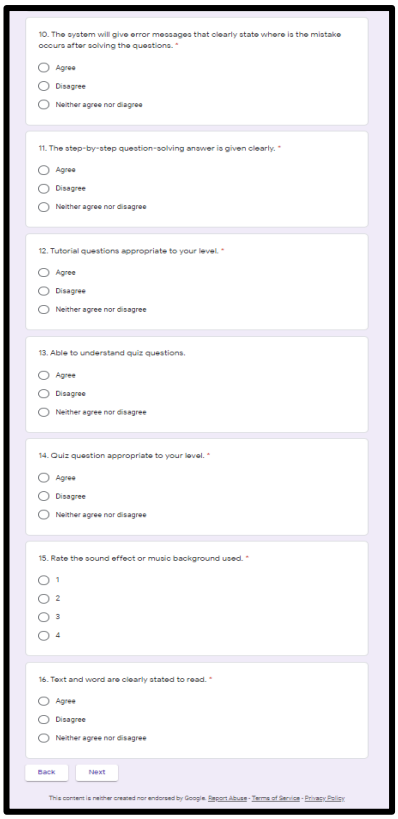


Fig.5.3.1(e) Survey 5.

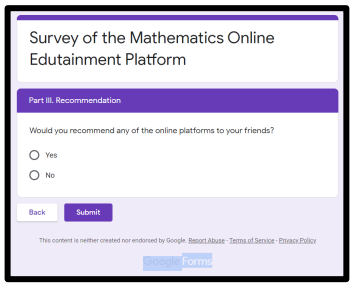


Fig.5.3.1(f) Survey 6.

Below is the result analysis that collected by 7 respondents between the age of 7 to 10.

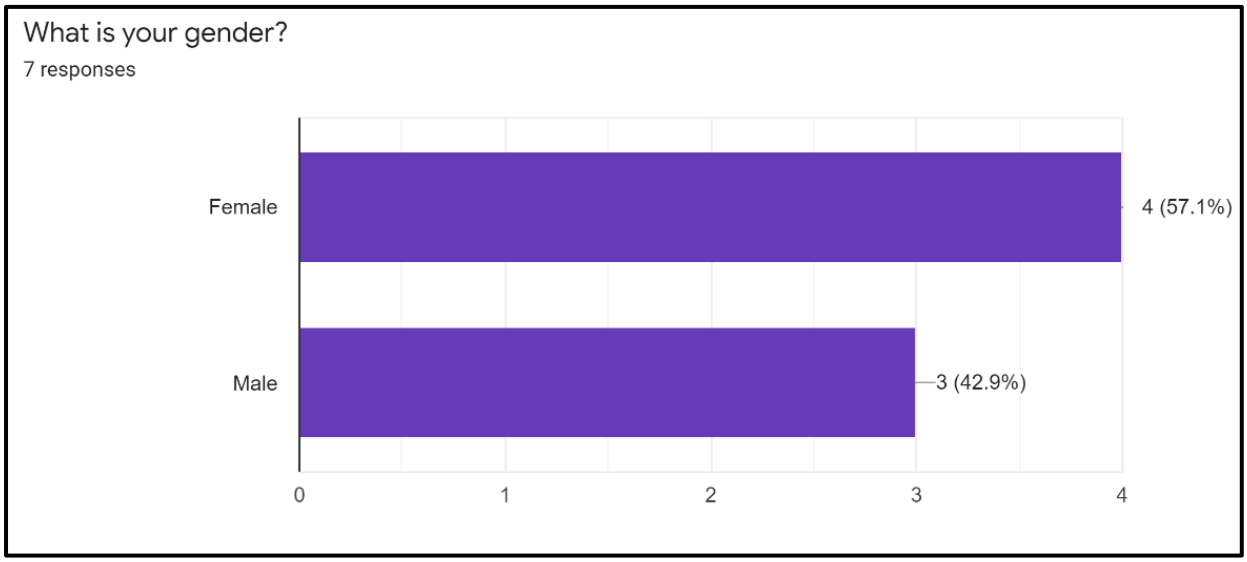


Figure 5.3.1.1 Respondent's gender.

Fig.5.3.1.1 above showed that 4 of the respondents are female and 3 of them is male out of 7 respondents.

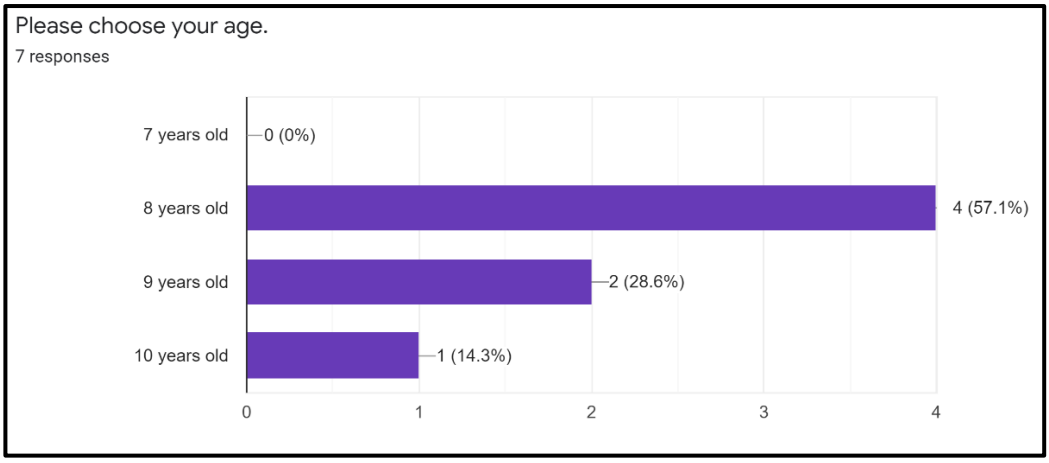


Figure 5.3.1.2 Respondent's age.

From the Fig.5.3.1.2 above stated that 4 of the respondents are 8 years old and 2 of the respondents is 9 years old. Only 1 out of 7 of the respondents is 10 years old.

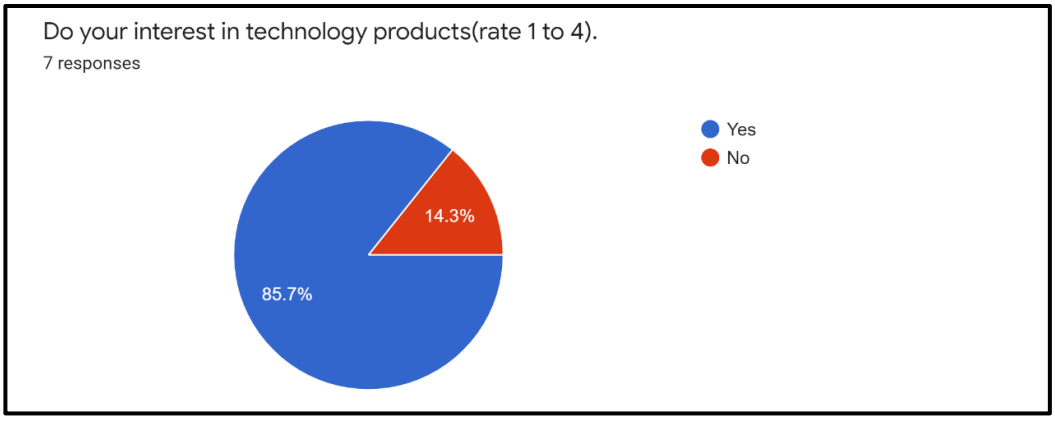


Figure 5.3.1.3 Interest in technology products.

Fig.5.3.1.3 showed that most of the respondents is interest in technology products. Only few of them is not interest in technology item.

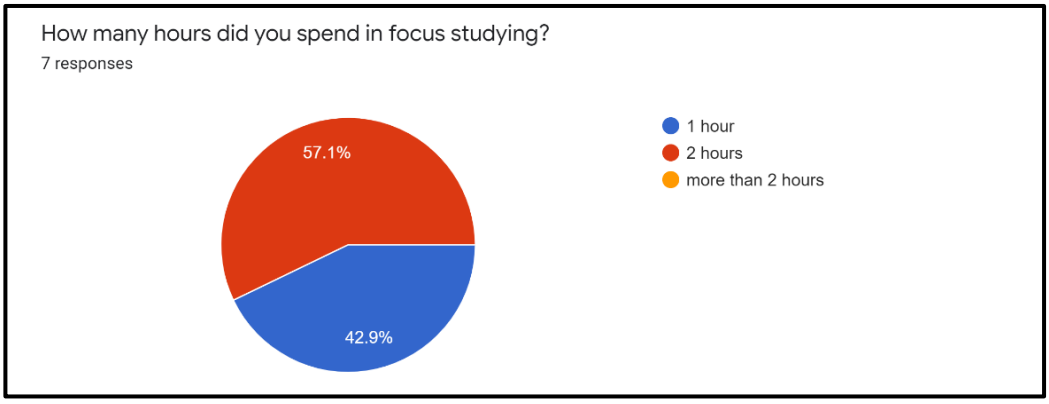


Figure 5.3.1.4 Hours spend in studying mathematics subject.

The pie chart above was showed that most of the respondents spend 2 hours to do their revision on the mathematics subject. Almost 42.9% of respondents spend only an hour in focus on studying on the subject as showed in Fig.5.3.1.4 above.

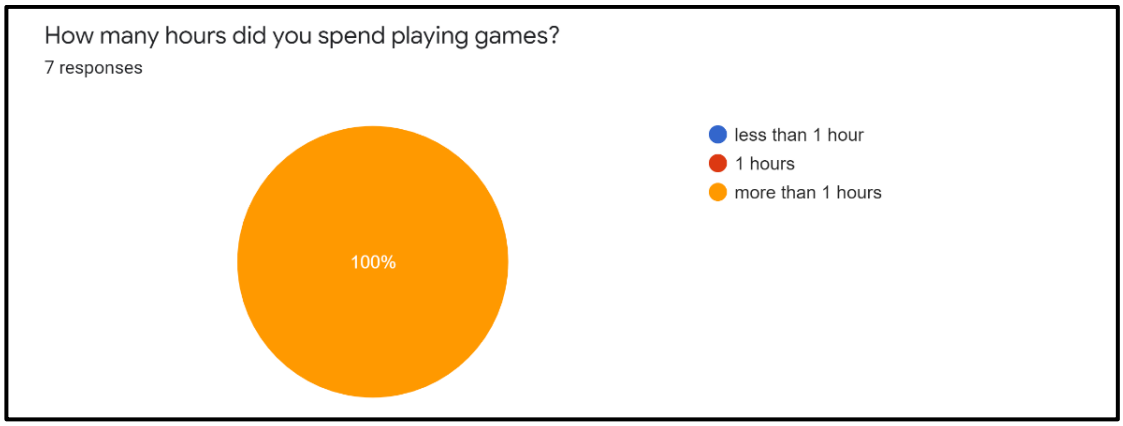


Figure 5.3.1.5 Hours spend in playing games.

From the Fig.5.3.1.5 above, the pie chart showed that all of the respondents spend more than 1 hours in playing games. This showed that games can be involved in the education method to attract the interest of user.

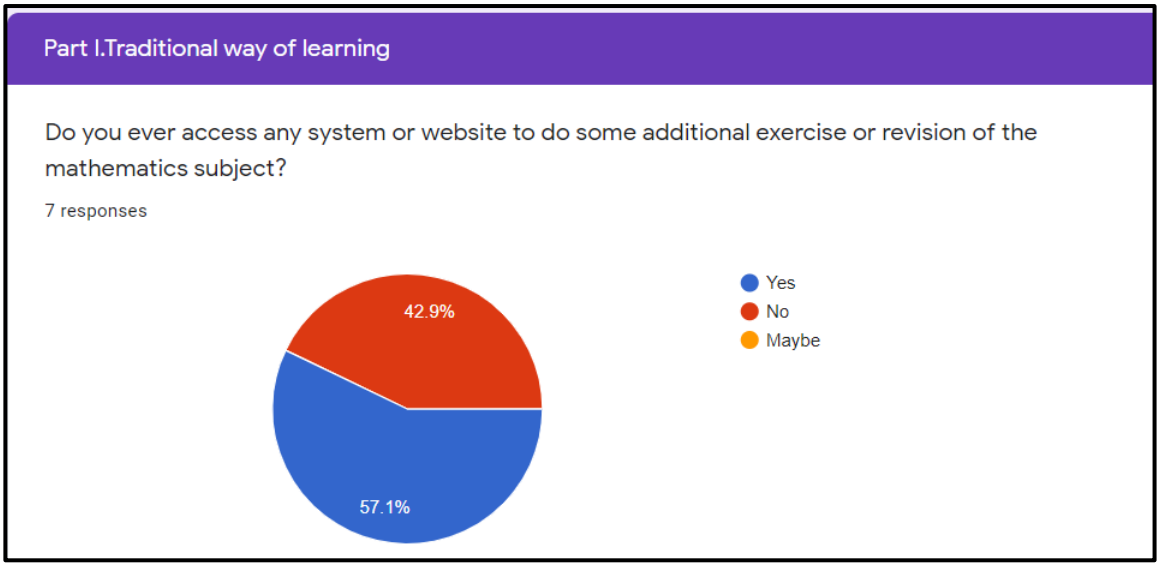


Figure 5.3.1.6 Pie chart of user use any online platform or website before.

This pie chart above showed that 57.1% of the respondents had use before and 42.9% of the respondents did not use any platform or website before. So, most of the user have try to access and use before as shown in Fig.5.3.1.6 above.

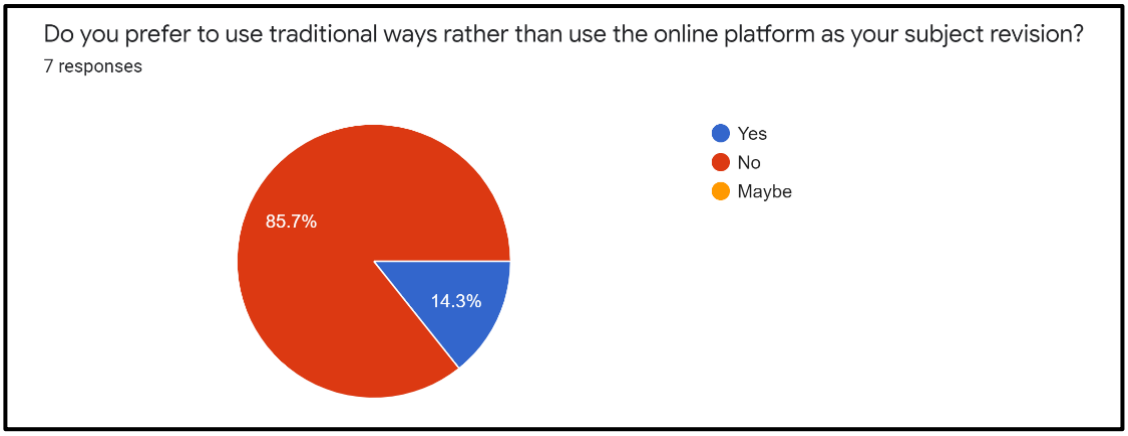


Figure 5.3.1.7 Pie chart showed that whether user choose to use traditional or technology way to do their revision.

From the Fig.5.3.1.7 above, 85.7% respondent prefer to use online platform and 14.3% of the respondents more comfortable in using traditional ways. So, normally most of the user are familiar with the usability of the online platform.

Below is the survey result of the evaluation of existing system.

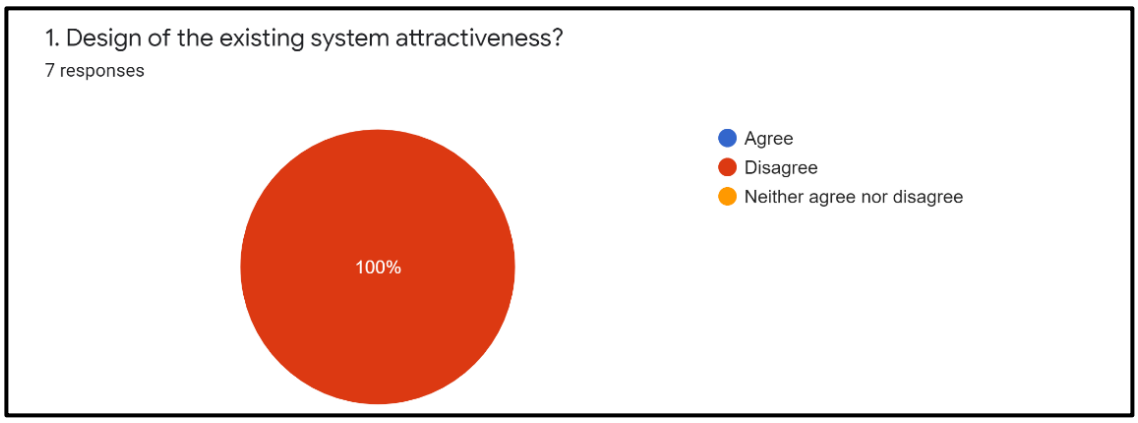


Figure 5.3.1.8 The attractiveness of existing system.

From the Fig.5.3.1.8 above, all of the respondents mentioned that the design of the existing system is not attractiveness enough to attract their interest. This can show that the design of the system is important to increase the interaction between user and the system.

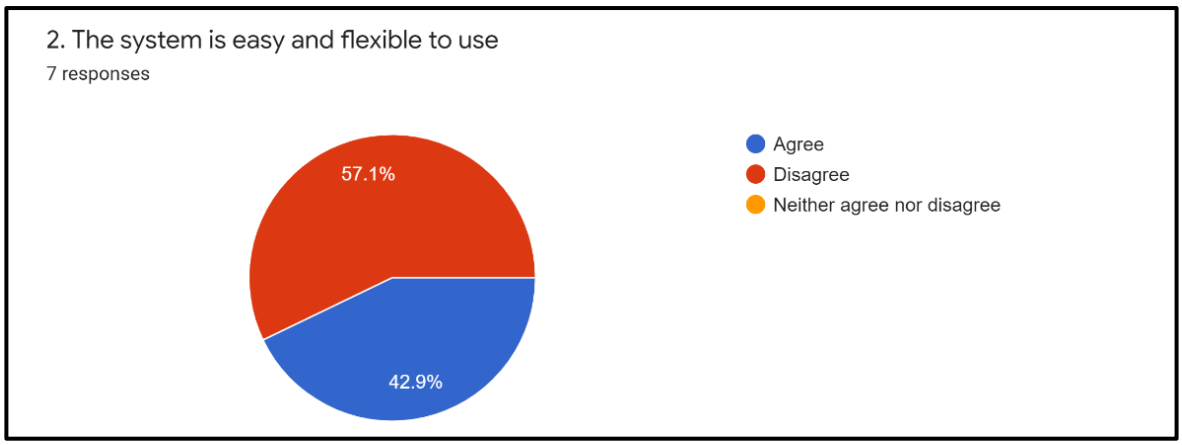


Figure 5.3.1.9 Flexibility use of the system.

The Fig.5.3.1.9 above showed that 42.9 respondents feel difficulty and not flexible in using the system whereas 57.1% respondents feel simple and flexible to use and access the system.

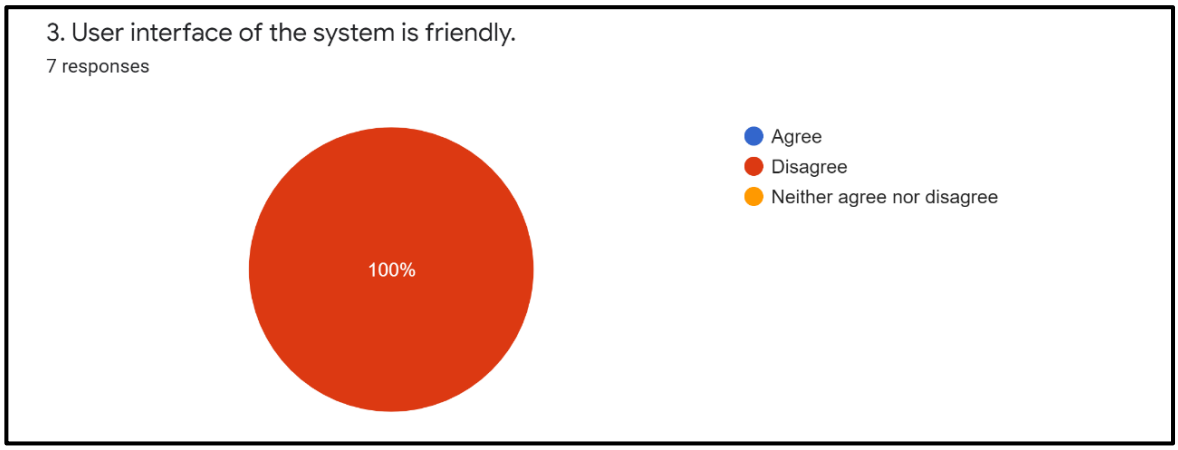


Figure 5.3.1.10 The level friendly of the user interface.

The pie chart above stated that all of the respondents feel that the user interface of the system is not friendly after used as showed in Fig.5.3.1.10 above.

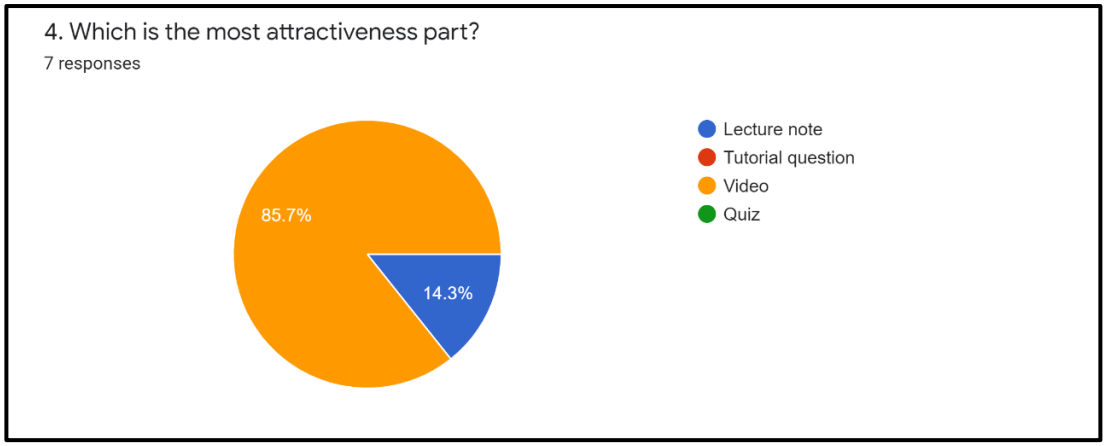


Figure 5.3.1.11 The pie chart showed which part choose by user as the most attractive section.

From the pie chart above, almost 85.7% of the respondents choose video is the most attractive part of the overall of the system whereas 14.3 respondents mentioned that lecture is the most attractive section. Conversely, none of the respondent choose quiz and tutorial question because it is not attractive enough and improvement is needed for those part as shown in Fig.5.3.1.11 above.

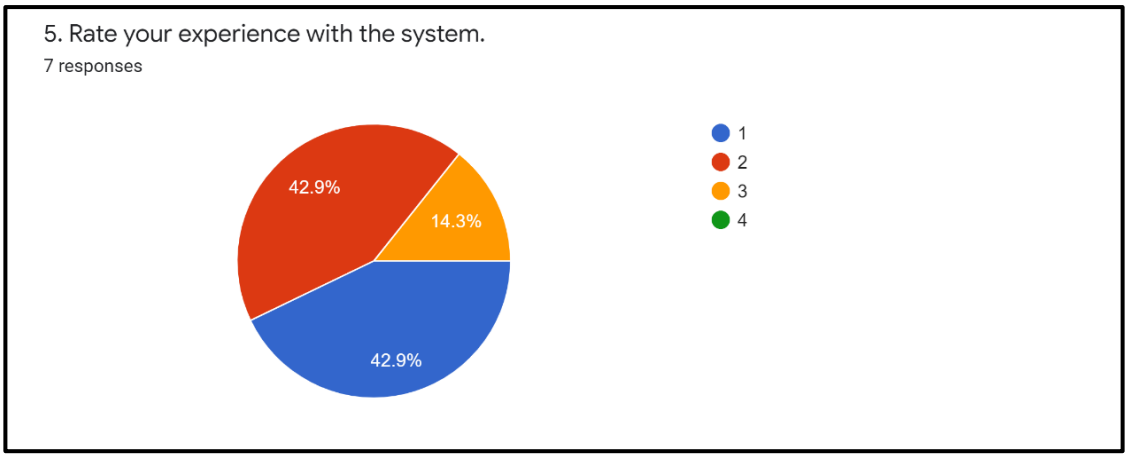


Figure 5.3.1.12 Rate experience after used the system.

Pie chart above showed that 42.9% of respondents choose rate 2 and rate 1 after go through the system. Besides, 14.3% respondents choose 3 after experience the system whereas none of the respondents choose rate 4 as shown in Fig.5.3.1.12 above. This showed that the system is not complete and satisfaction enough to most of the user.

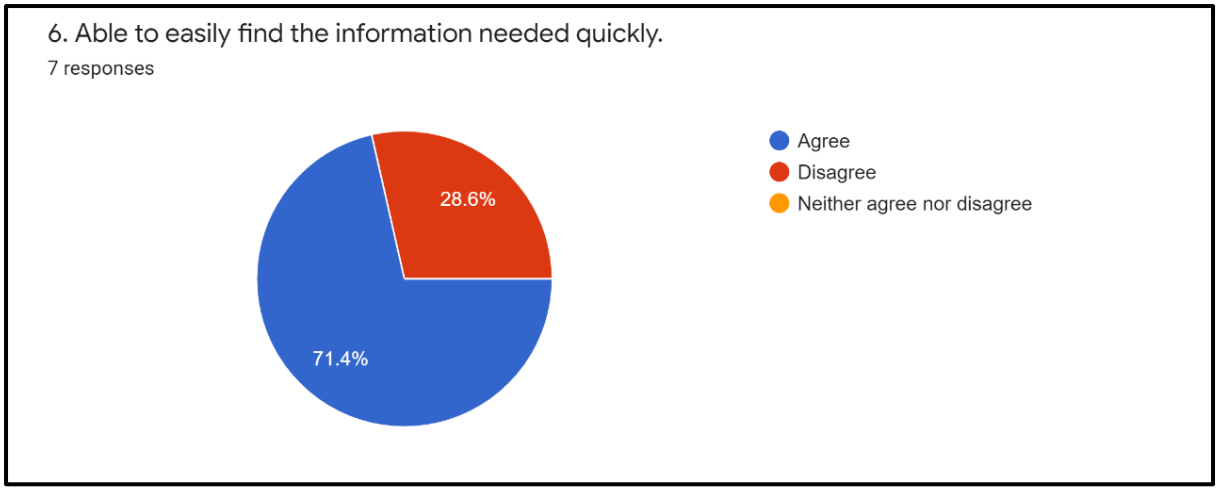


Figure 5.3.1.13 The pie chart showed that user agree that the system able to get information immediately.

From the pie chart above, 71.4% of the respondents agree that mathematics learning material can easily be found in the system. Whereas 28.6% of the respondents mentioned that they need to spend some time in searching the information as shown in the Fig.5.3.1.13 above.

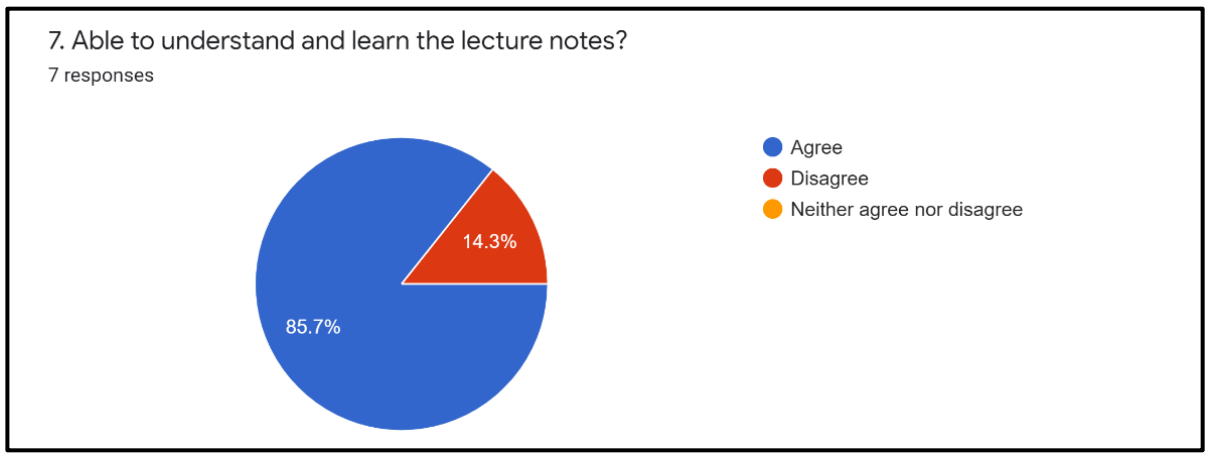


Figure 5.3.1.14 The pie chart showed that user able to understand the lecture note.

85.7% of the respondents agree that the lecture material such as notes and formula can be easily understood and learned. As Fig.5.3.1.14 showed above, 14.3% respondents not easily or may feel difficulty in understand the lectures notes that provided in the system.

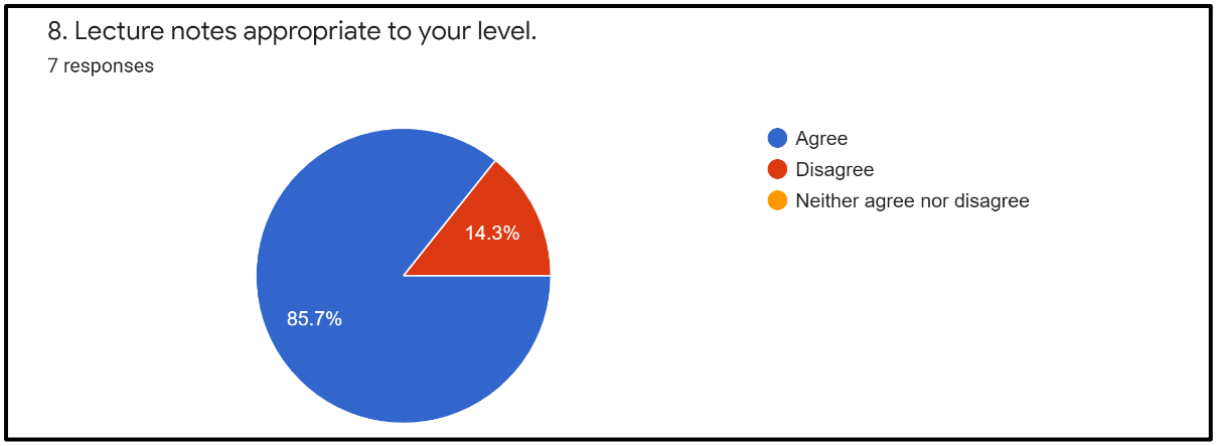


Figure 5.3.1.15 The pie chart showed that user agree that lecture notes is appropriate to their level.

Pie chart above showed that 85.7% of the respondents agree that the lecture notes are appropriate to their standard.14.3% of the respondents mentioned that the lecture that include in the system is not appropriate to their level as shown in Fig.5.3.1.15 above.

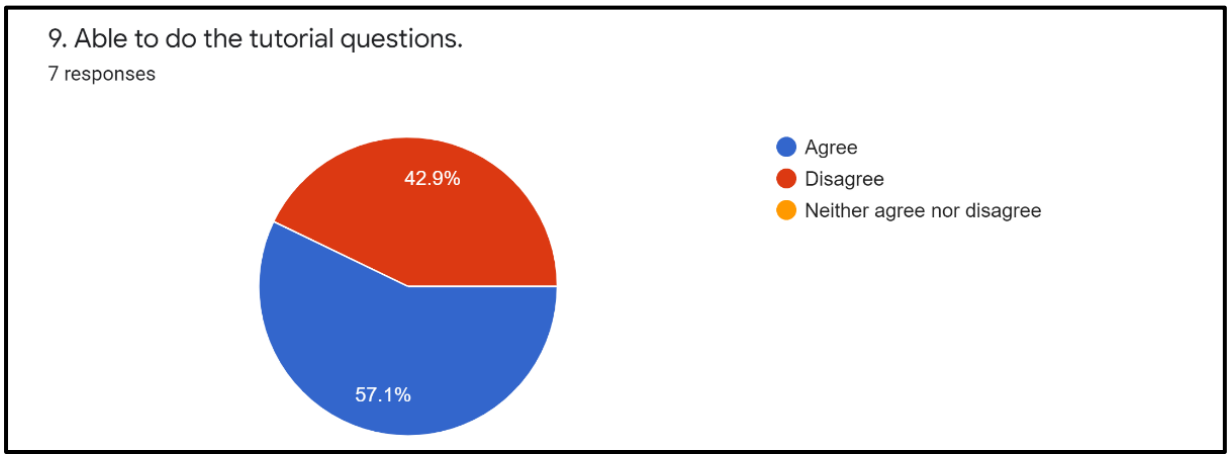


Figure 5.3.1.16 The pie chart showed that whether user capable to do tutorial questions.

As shown in Fig.5.3.1.16 above, 57.1% of the respondents stated that they are able to do and solve the questions. Besides, 42.9% of the respondents mentioned that they feel trouble in understanding and solving the question.

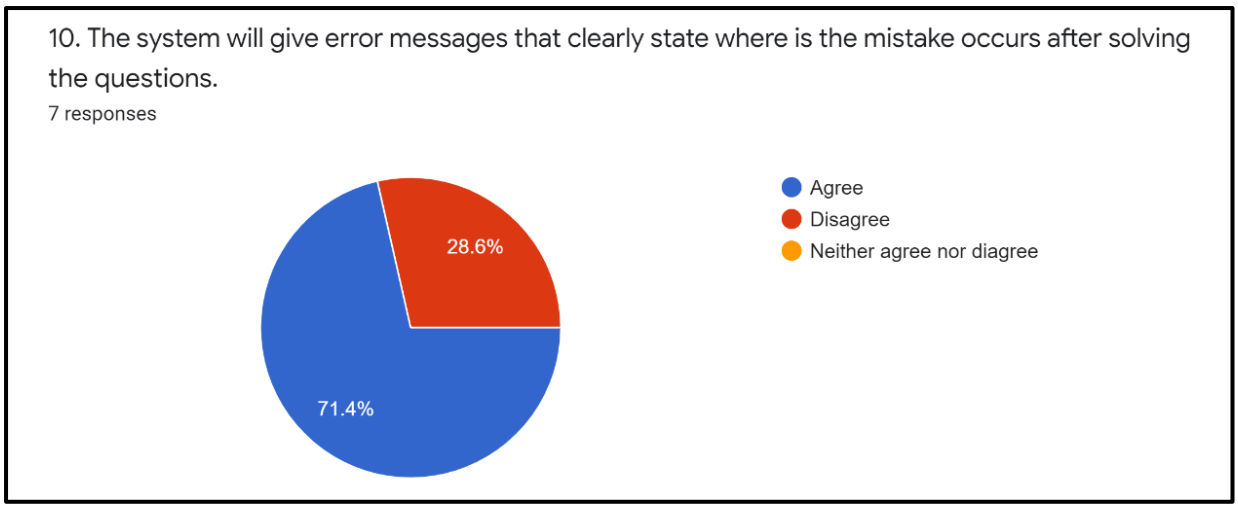


Figure 5.3.1.17 Pie chart showed whether the system will occur error messages.

From the pie chart above, most of the agree that the system will give an error messages when user do any mistake. 28.6% mentioned that the system did not probably display error messages that clearly display where is the mistake take place.

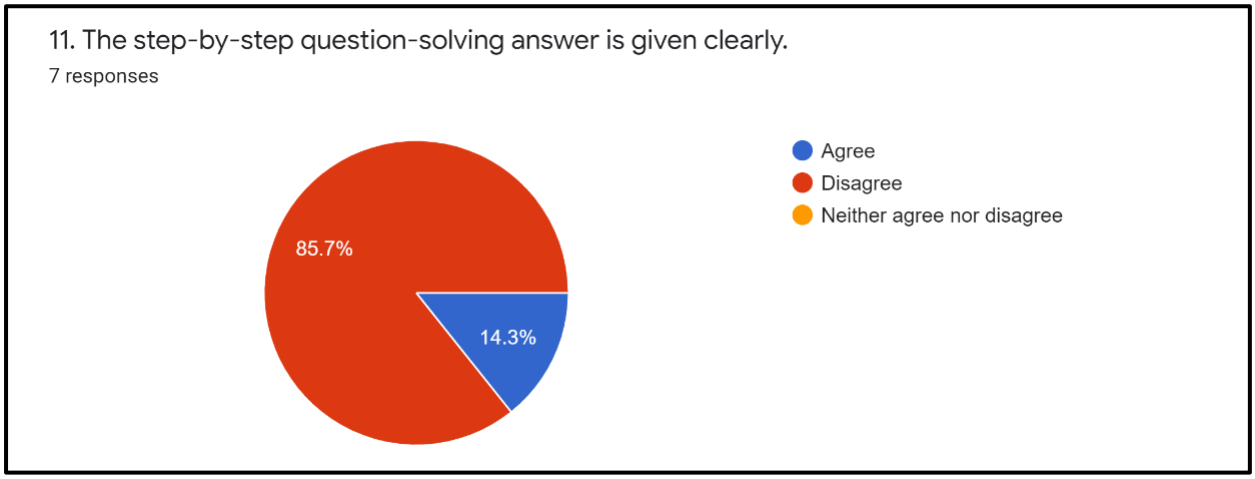


Figure 5.3.1.18 Pie chart showed that clearly solving step is stated.

As shown in the Fig.5.3.1.18 above, 85.7% of the respondents agree that solving method is provide in the system for each of the questions. 14.3% respondents mentioned that process to solve the questions is not clearly stated for every of the questions. This make them feel distress when facing particular questions.

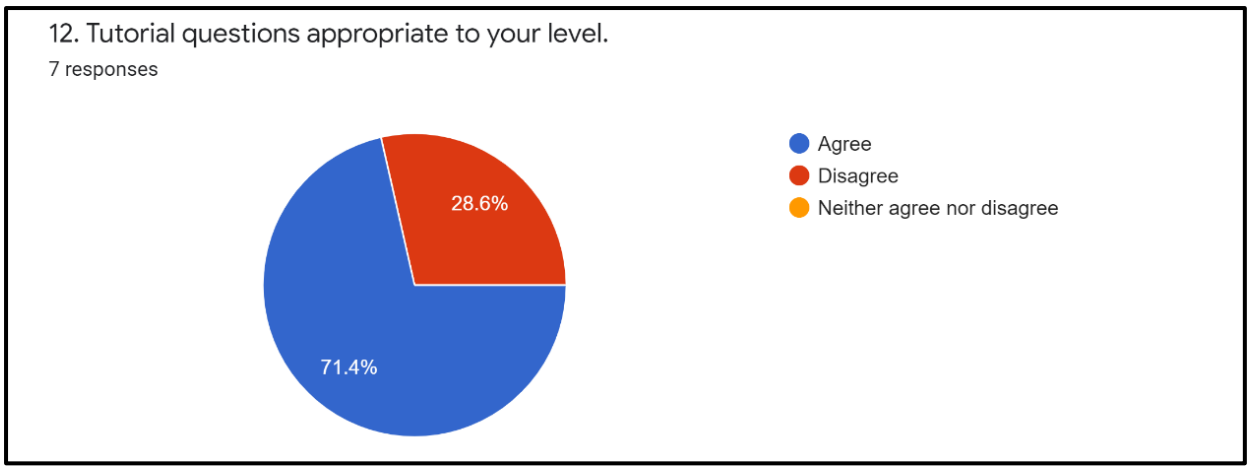


Figure 5.3.1.19 Pie chart showed that user agree that tutorial questions are suitable to their level.

From the Fig.5.3.1.19 above, 71.4% respondents commend that they are able to understand and start to do the tutorial questions whereas 28.6% of the respondents feel that the questions given are not appropriate to their level.

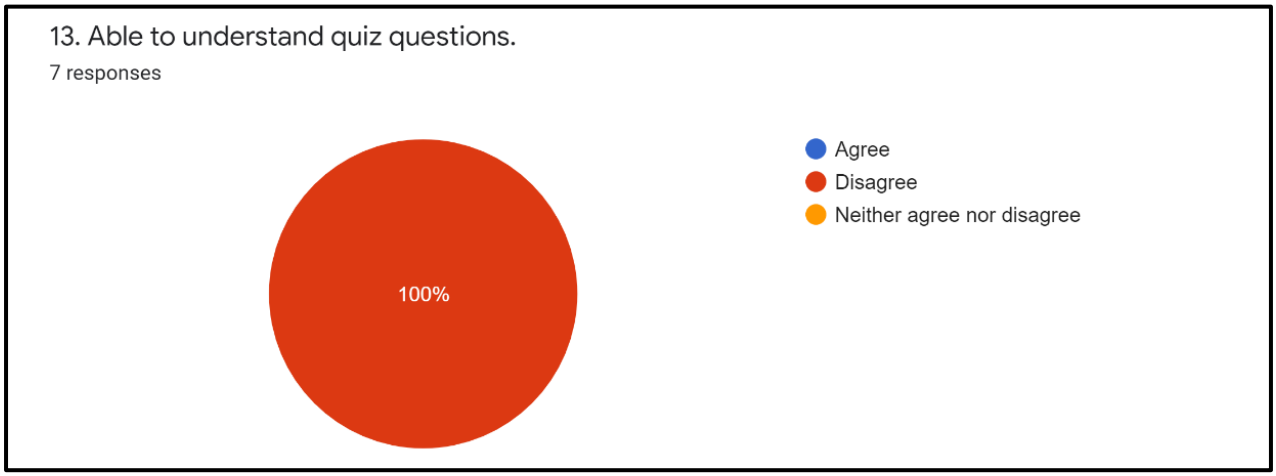


Figure 5.3.1.20 Pie chart stated that user able to capable to do quiz questions.

From the Fig.5.3.1.20 above shown that 100% of the respondents are able to understand and try to solve questions without facing any solving difficulty that out of their level.

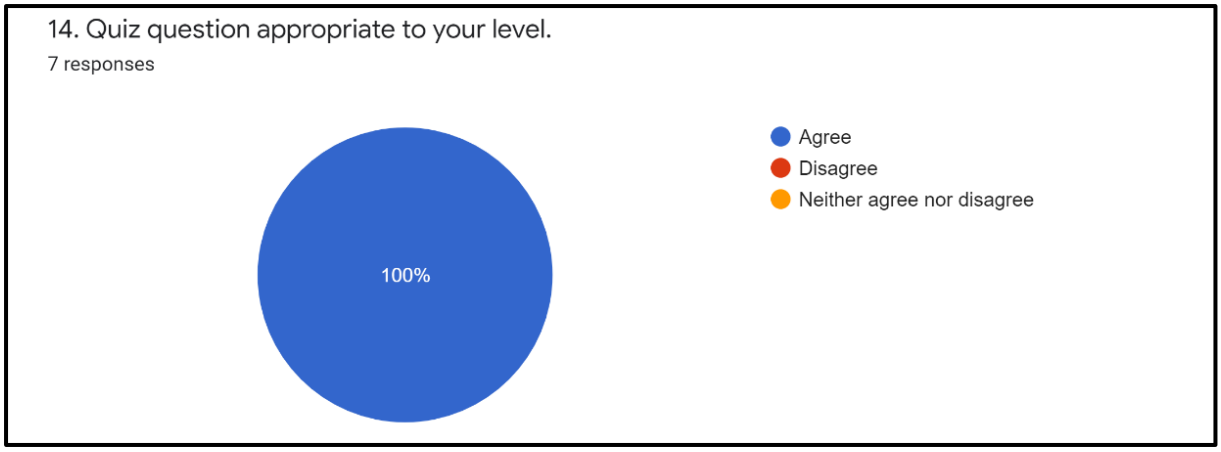


Figure 5.3.1.21 Pie chart showed that user agree that quiz questions which is appropriate to their level.

From pie chart above, all of the respondents mentioned that the quiz question is appropriate to their level as shown in Fig.5.3.1.21 above.

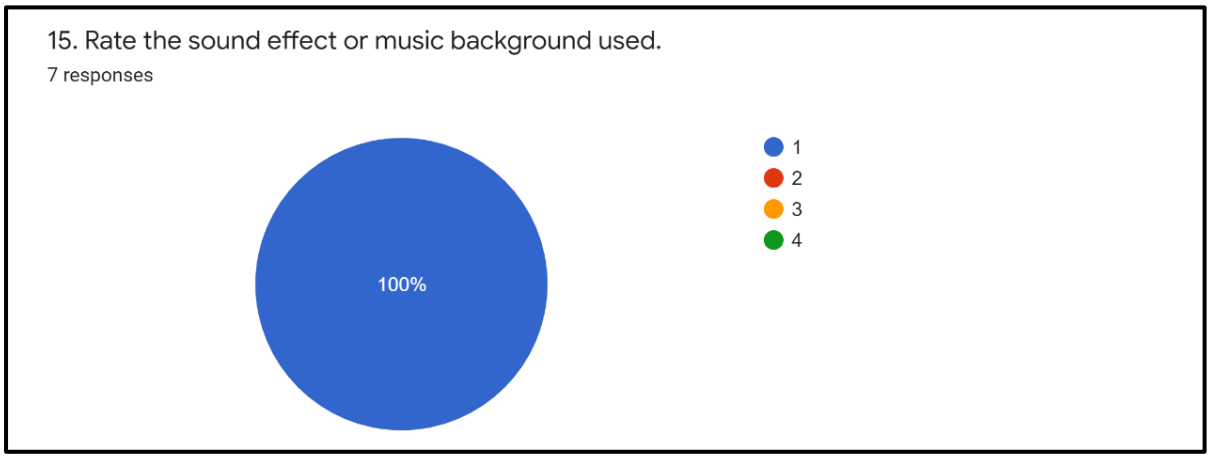


Figure 5.3.1.22 Rate of the sound effect and music background given by user.

From the Fig.5.3.1.22 above, most of the respondents feel unsatisfaction of the sound effect or music background that used in the system. The system lack of some music or sound of the button when user click on it that may decrease the interest of the user to access the system.

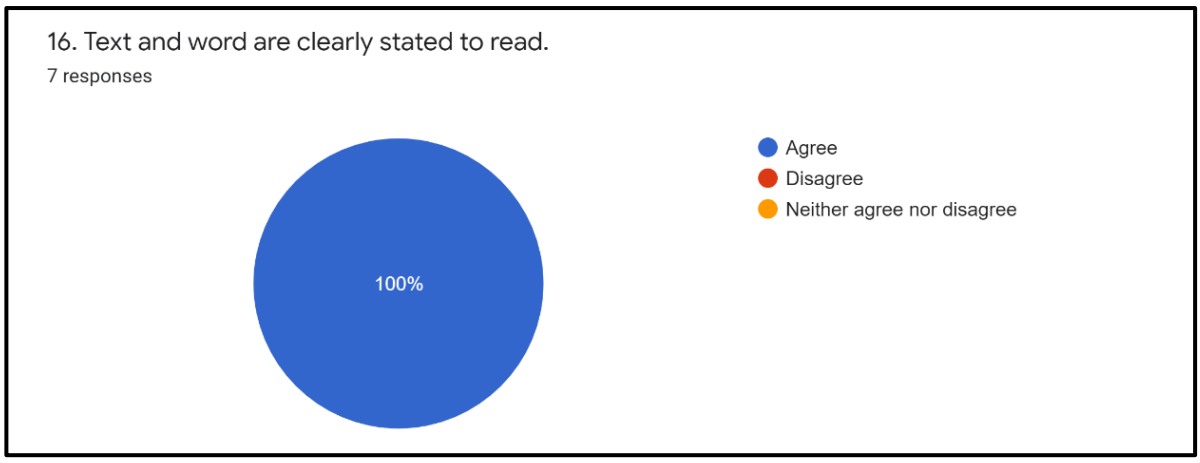


Figure 5.3.1.23 Pie chart showed that user agree that text is clearly display.

As shown in pie chart above, all of the respondent agrees that text and word that use in the system is able to clearly read. It is important because user may not feel confuses or easily make mistake in solving the question given as shown in Fig.5.3.1.23 above.

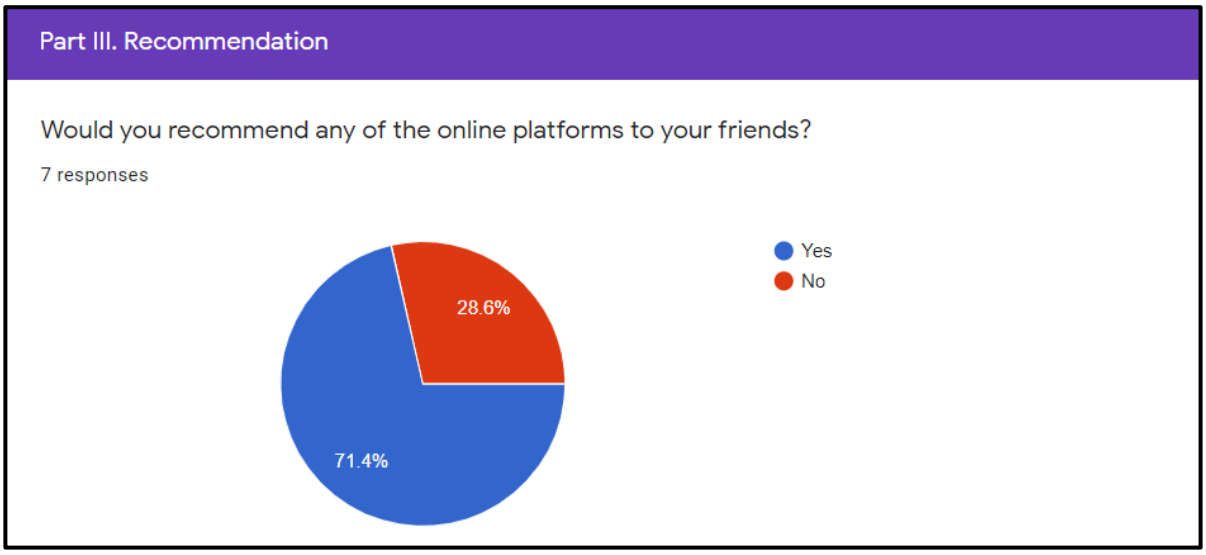


Figure 5.3.1.24 Pie chart showed that user agree to recommend the system to friends.

The pie chart above showed that 71.4% of the respondents agree to recommend any of the online platform or website to their friends whereas 28.6% of the respondents would not recommend any platform to their friends.

5.4 Tools Used

Table 5.4.1 Authoring tools used to develop the system.

Text	Microsoft Word, Notepad, TextEdit
Audio	Adobe Audition, Audacity, YTD
Graphic	Paint X Lite, Vectr, Remove BG, Grapher
Animation	Blender, Adobe Animation, Go Animate

5.5 Requirement

5.5.1 User Requirement

User requirement help developer to better understand and as a guide to attain a higher successful of user expectation. Nevertheless, the main purpose is use as a reference that involve the description of the overall function and performance of the system. It is used to provide a complete workflow that help in implode on the considerable field of software implementation. In spite of this, it is use to demonstrate the range and clearly as a refer to the development situation.

As shown in Fig.5.5.1.1 below, developer can evaluate software component and update the latest information. Also, developer is allowed to maintain or delete any of the software component that contain error occur. Student can use any level that they prefer after the start page. Formula and calculator are provided, so that user can directly get the answers after finished solved all the questions.

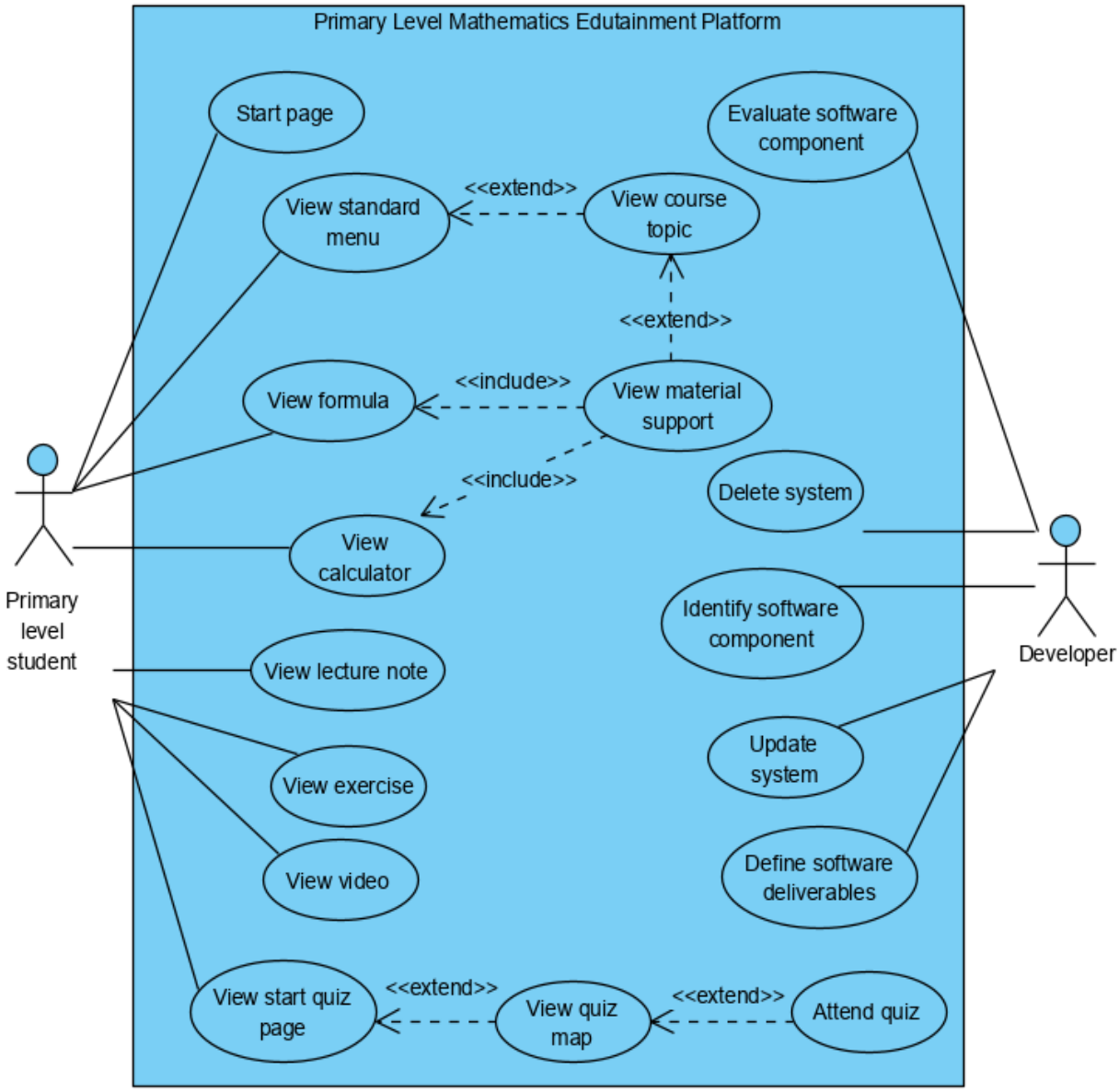


Figure 5.5.1.1 Use Case Diagram

5.5.2 Functional Requirement

Functional requirement is used to further explain the component operation of the process that involve in the software system. A straightforward information of system workflows that perform by the system can easily understand. Below is the functional requirement that involved in the interactive edutainment platform for primary level mathematics.

- Students first required to click on the start button of the page before entering the system.
- Student can choose 3 different mathematics level that they prefer to learn the most which either standard 1, standard 2 or standard 3.
- Primary level students are able to click and view the formula page as a reference purpose during the learning process.
- The application software provides a calculator function for students to easily check for the final answers.
- Students can pick which chapter that they feel some difficulty in learning or solving question process and the lecture notes are ready for them to gain knowledge.
- Multiple exercise question is ready for students to explore and the answers are provided for them to make it easy for checking. Students may know where is the mistake occur.
- Students can choose to view video page and it will automatically link to the related video website.
- Students can choose to attend different level of mathematics quiz.
- Student can choose to redo again and again the quiz or exercise question that consists in the system.
- Different standard level of quiz is provided to entice student's attention and turn down their nervousness.
- Student can click on the explanation button when they answer wrongly.
- Developer can define and evaluate the software component to increase the features and compatibility of the system.
- Developer require to update new information regularly, maintain and delete the system detail if any error occurs of the system regularly.

5.5.3 Non-Functional Requirement

A non-functional requirement is mean that further explain the quality of working software systems such as security, usability, compatibility and performance. Below describes the non-functional requirement involved in the interactive edutainment platform for primary level mathematics.

a. Internet is required

   In order to further studying mathematics course subject through the link that provided, user is essentially to have an internet service and internet browser for foremost operating of the system. Student able to access the system in anywhere and anytime without any limitation of the internet.

b. Efficiency of use

   The system should design in multiple different way that appropriate to the student standard so that student may not feel hesitation in solving the question and difficulty in understanding the meaning during the progress of learning. Therefore, each of the explanation and description of the answers should list down straightforward to the point to help student spend lesser time to figure out meaning.

c. Performance of the system

   Software system should perform either in the average or quick response time. The response of the system will diametrically affect the satisfaction of the system. Loading time should not longer than five seconds for student to access to following or next slide. All the information that include in the system must be on real-time.

d. Modifiability

   After came out with the new information, developer need to be modifiable. It is important to reduce the effort to solve the problem while founded error occur.

5.6 System Performance Definition

5.6.1 Hardware Requirement

Hardware is the physical field of computers, telecommunications and other devices as shown in Table 5.6.1.1 below. Hardware divide into few different aspects such as storage hardware, connecting hardware, input and output hardware. Input hardware consists of external devices which dispatch information and instructions to the computer whereas output hardware is the combination of internal and external devices that deliver the messages from computer CPU's to user. Connecting hardware allow device to communicate with each other such as modem and LAN Card.

Table 5.6.1.1 Hardware Requirement.

Hardware	Specification
Disk storage	Minimum 50GB of free available hard disk space
Processor	Intel core i5-10210U processor, with 2.11 gigahertz (GHz) 1.6 GHz with 64 bits
CPU	800 MHz or faster than 32-bit or 64-bit processor
Physical memory (RAM)	512 MB or 1GB
Internet connection	Network using 10Mbps or higher speed network adapter; WLAN 33.6 KBPS or higher speed modem.
Speaker and Headphones	Microphone Realtek(R) Audio.
Display	Recommended monitor resolution (640 x480) or higher resolution.
Bluetooth	Bluetooth 4.2 wireless technology
Input device such as keyboard and mouse	Any other marque of input device such as Microsoft mouse, Apple Magic mouse 2, Magic keyboard.
Optical Drive	CD or DVD ROM Drive.
Ethernet port such as USB	maximum to 127 peripherals to a single USB port; 16 GB or 32 GB

5.6.2 Software Requirement

Software is used to interrelate the activities and functions of the computer hardware. It divides into four major field such as system software, programming software, application software and utility software. Particular operation may be fulfilled and software can apply as a tool that use to support programmers to instruct computer system when develop a program.

Table 5.6.2.1 Software Requirement.

Software	Specification
Operating System	• Window 10 or Mac OS • 1GB of RAM for 32-bit or 2 GB of RAM for 64-bit. • 1GHz processor or faster 32-bit (x86) or 64-bit (x64). • 16GB of hard drive space for 32-bit or 20 GB for 64-bit.
Web Browser	• Apple Safari 13.0.3 • Google Chrome • Microsoft Internet Explorer7.0 • Mozilla Firefox
Microsoft Office 365	Microsoft word 2019, PowerPoint 2019
Adobe Director	Macromedia Director MX2004
Visual Paradigm	Visual Paradigm 16.1 UML
MP3 converter	It is audio encoding that use to edit the sound base. The other function is use to convert from MPEG-4 or WMA to MP3.
Adobe Flash player	Use for view video, graphics and animation purpose.
Real player and QuickTime player	For audio or video content.

5.7 Verification Plan

User interface flow diagram is one of the tools uses to describe the process the development of the system. Developer can easily analyze and solve the problem more effectively with the help of flowchart. Furthermore, flowchart make more understanding of the activities that involve in the system and provide a graphic that clearly stated information as shown in Fig.5.7.1 below.

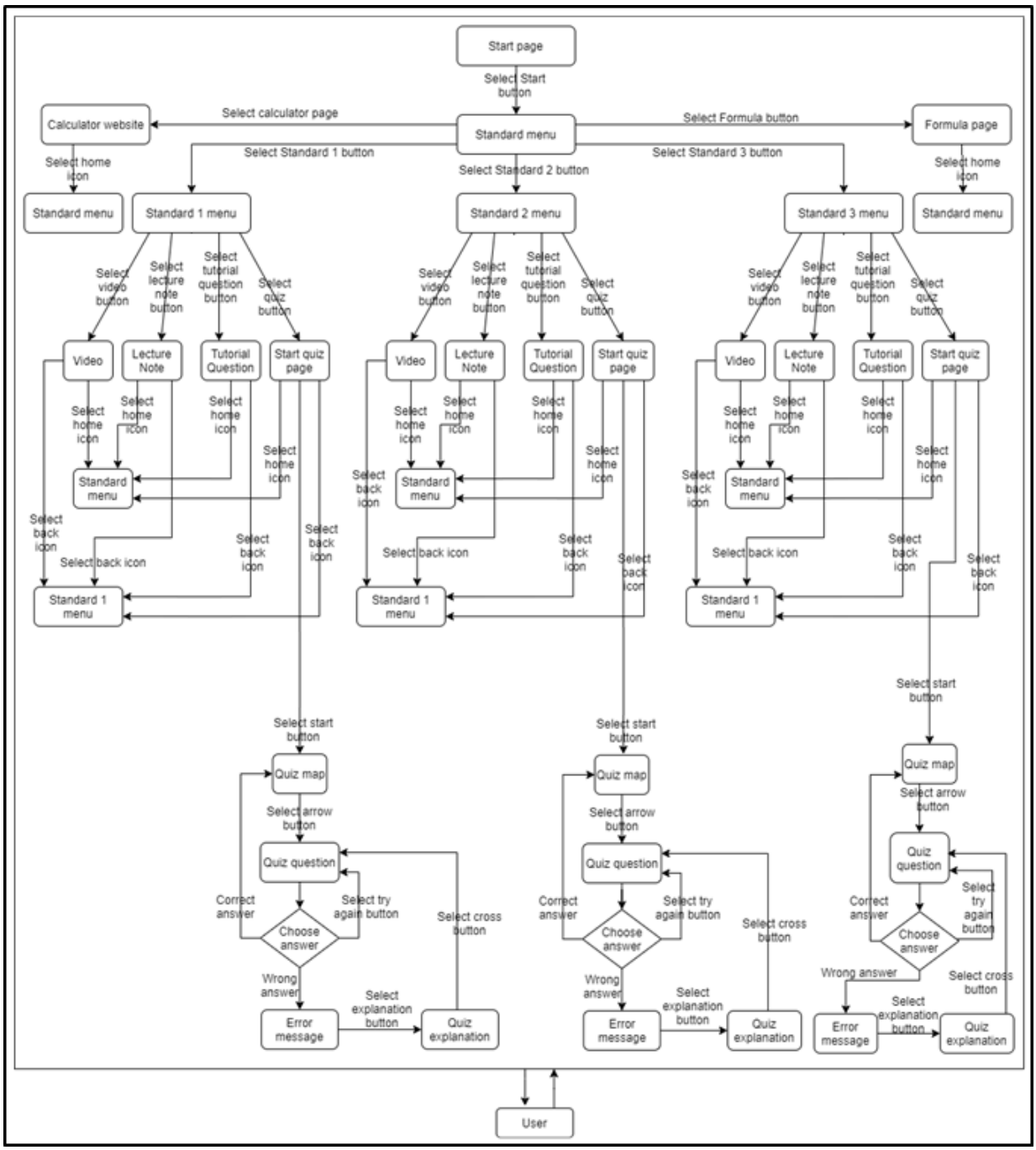


Figure 5.7.1 System flow diagram.

Chapter 6

Implementation and Development

6.1 Pre-Authoring Process

6.1.1 Edit Graphic and Word Frame Process

Primarily, author need to search for any image and graphic that is colourful and attractive enough. Author can choose to screenshot or directly use the copy feature to save the image in Paint software. Author need to crop the image and save it as PNG file type. Then, use authoring tool to make the background image transparent as shown in Fig.6.1.1.1 and Fig.6.1.1.2 below. 2D and 3D animation vector graphics may also need to prepare before start to develop the prototype. Author can use the Paint software to change or edit the image background as shown in Fig.6.1.1.3 below. If author unable to search for any suitable animation or graphic which have the relationship with the background image in each module, author will use PowerPoint software for self-creation purpose. Some of the graphics can be create using PowerPoint software as shown in Fig.6.1.1.4 below. Before use any animation graphics which download online, author need to create a director file for use to test the animation as shown in Fig.6.1.1.5 below. Animation that used need to check before import into the system, avoid any error occur unexpectedly in the future. Also, author will add the background which mean that user able to differentiate when user click on the graphic as shown in Fig.6.1.1.6. The frame graphic is created for the use to insert any word or question quiz during the process development as shown in Fig.6.1.1.7.

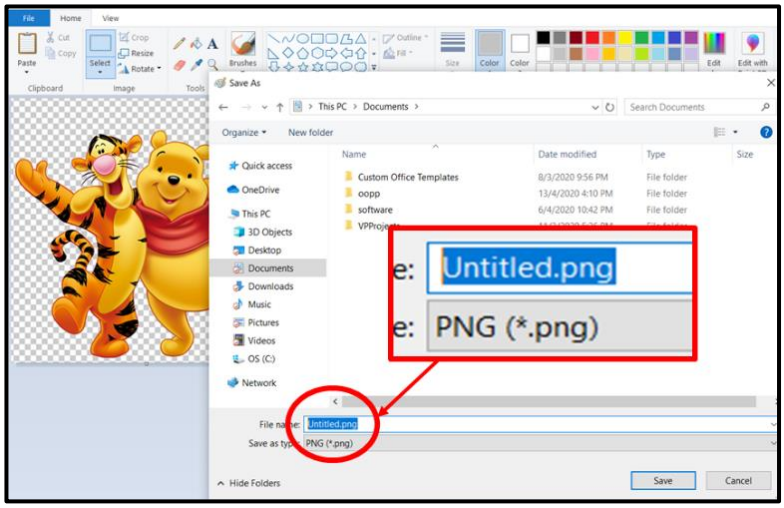


Figure 6.1.1.1 Save the graphics as PNG file type.

Figure 6.1.1.2 Transparent the background of the image.

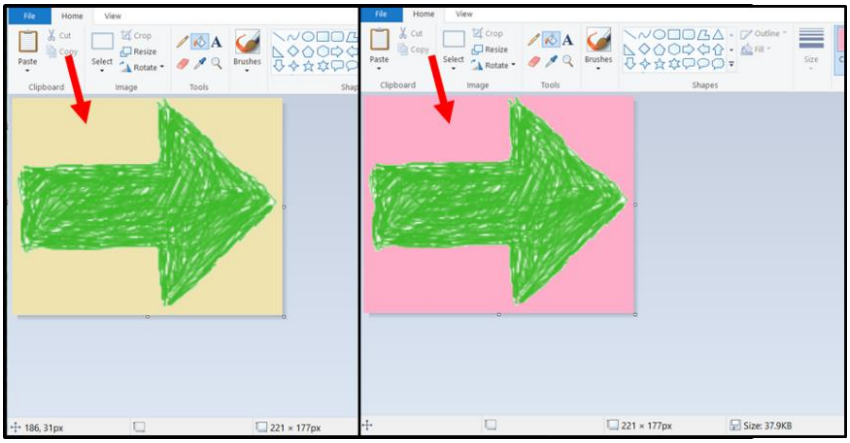


Figure 6.1.1.3 The color of the background image change from light yellow to pink.

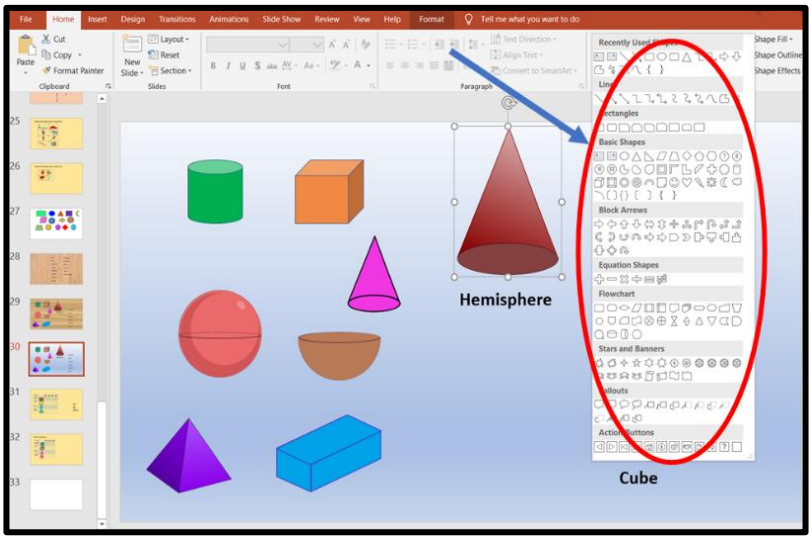


Figure 6.1.1.4 PowerPoint software provide function which let author to create 2D and 3D graphics by themselves.

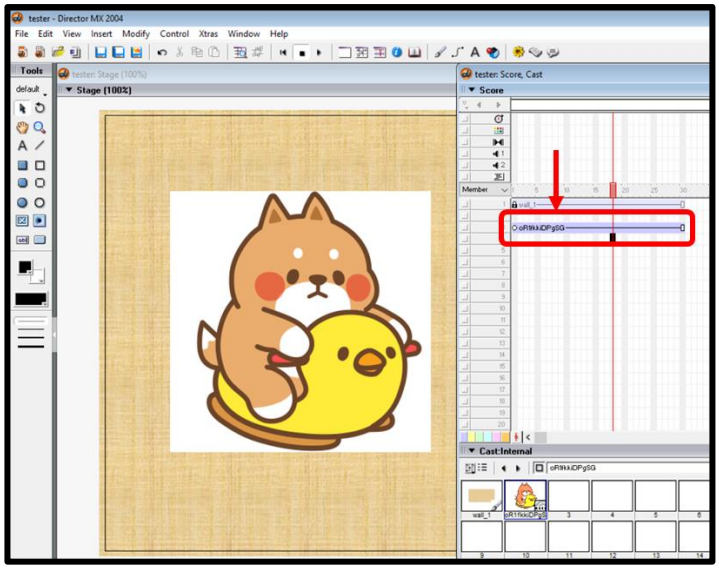


Figure 6.1.1.5 Import and test the animation graphic in macromedia director.

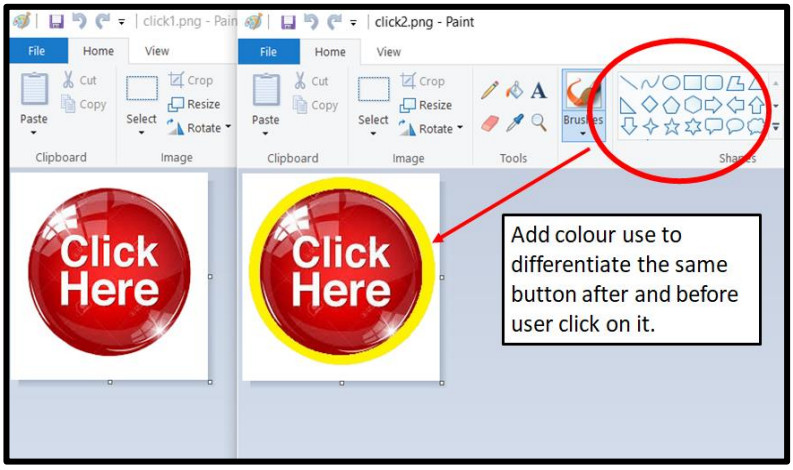


Figure 6.1.1.6 Edit needed within the same graphic for easier differentiate purpose.

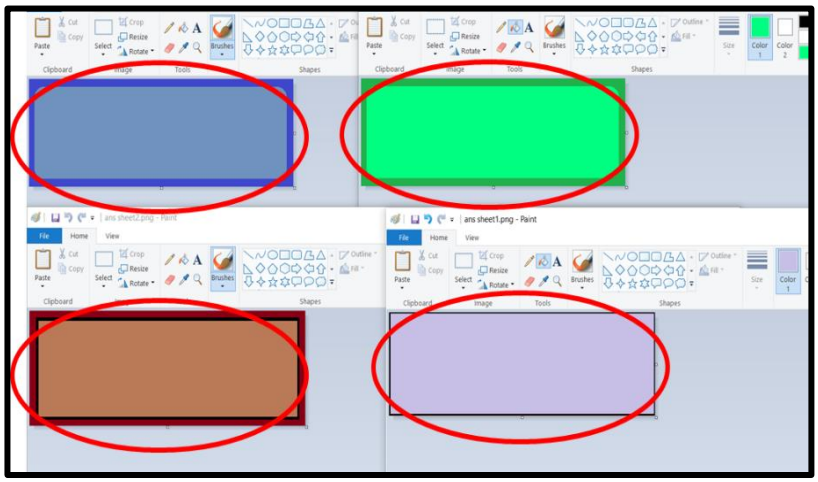


Figure 6.1.1.7 Dissimilar frame is prepared for author to insert any keyword inside the frame.

6.1.2 Edit Audio Effect and Search for Suitable Video Link Process

Before start development of the sound effect, author need to search and download the video first. The sound of music should be related to the background image and able to attract the interest of primary level student Subsequently step is converting the video from Mp4 file to Mp3 file as shown in Fig.6.1.2.1. During the process of converting, author also may put some effort in adjusting the volume and repeatedly try play the music to check and avoid the sound of the audio from too loud or soft as shown in Fig.6.1.2.2. For some of the background music, author need to play and choose properly the most climax part from the whole of the music as shown in Fig.6.1.2.3. Search for the suitable video that appropriate to each of the level of the mathematics subject. Moreover, author ought to ensure that the video of every chapter that get from online must appropriate to each of the student's level. Author need to try and play the do some revision of primary level textbook and play video whenever finish searching.

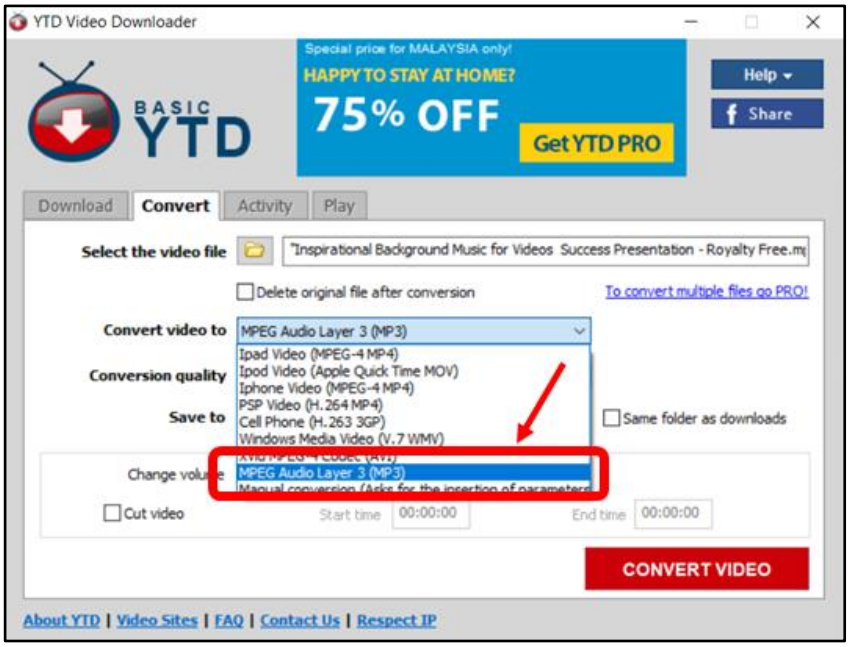


Figure 6.1.2.1 Convert the video from Mp4 to Mp3 file.

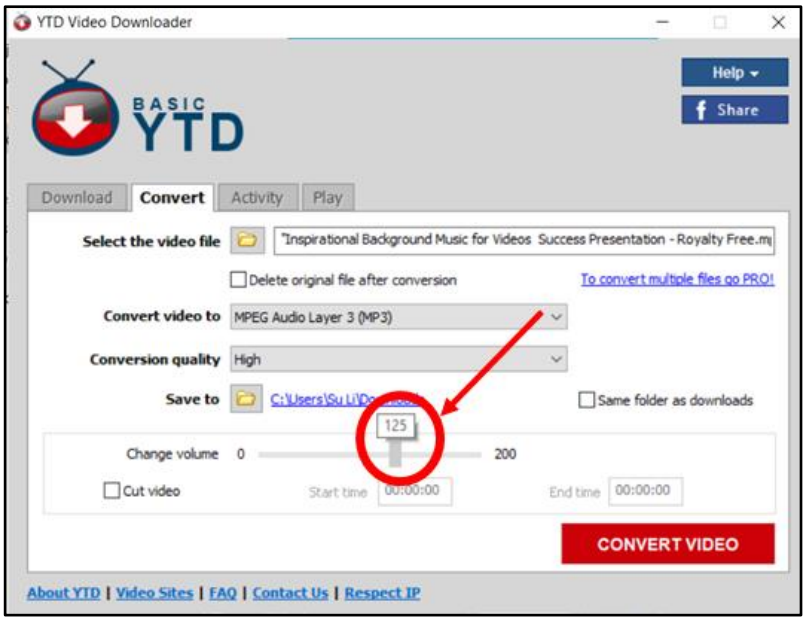


Figure 6.1.2.2 Adjust the volume of sound effect.

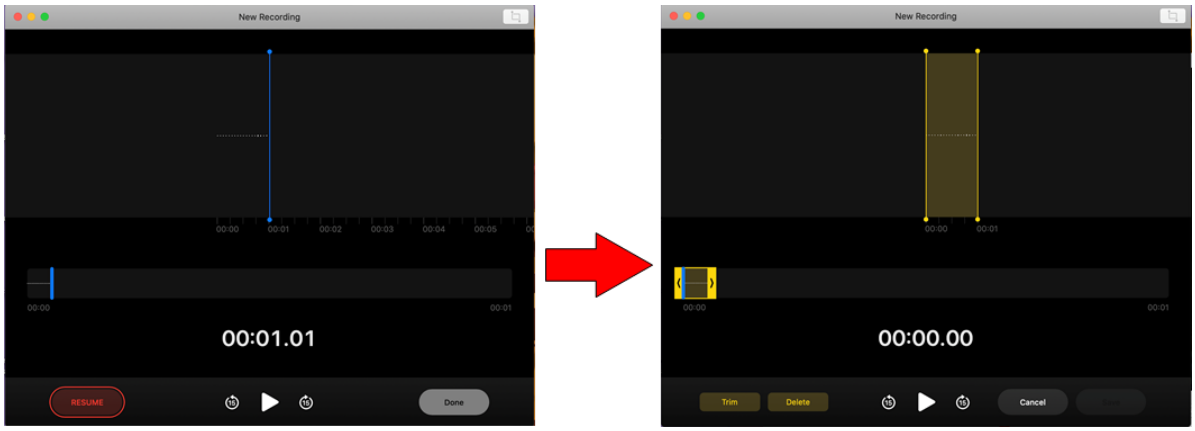


Figure 6.1.2.3 Edit the length for the sound effect.

6.1.3 Edit Text Process

Author need to create the tutorial question, explanation of the quiz questions and quiz question in each chapter with different standard using PowerPoint software as shown in Fig.6.1.3.1, Fig.6.1.3.2 and Fig.6.1.3.3 below. Text color, font type and text size will be adjusted to make the word more creative as shown in Fig.6.1.3.4 below Author can insert the text in the frame graphic that have prepared early as shown in Fig.6.1.3.5 and Fig.6.1.3.6 below.

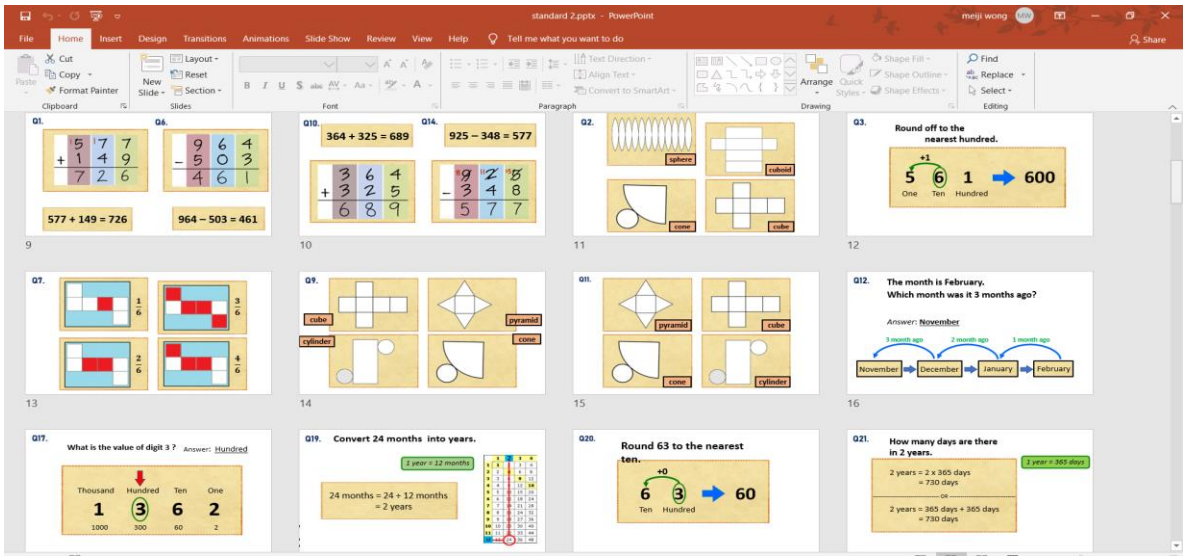


Figure 6.1.3.1 The explanation of each of the question is prepared.

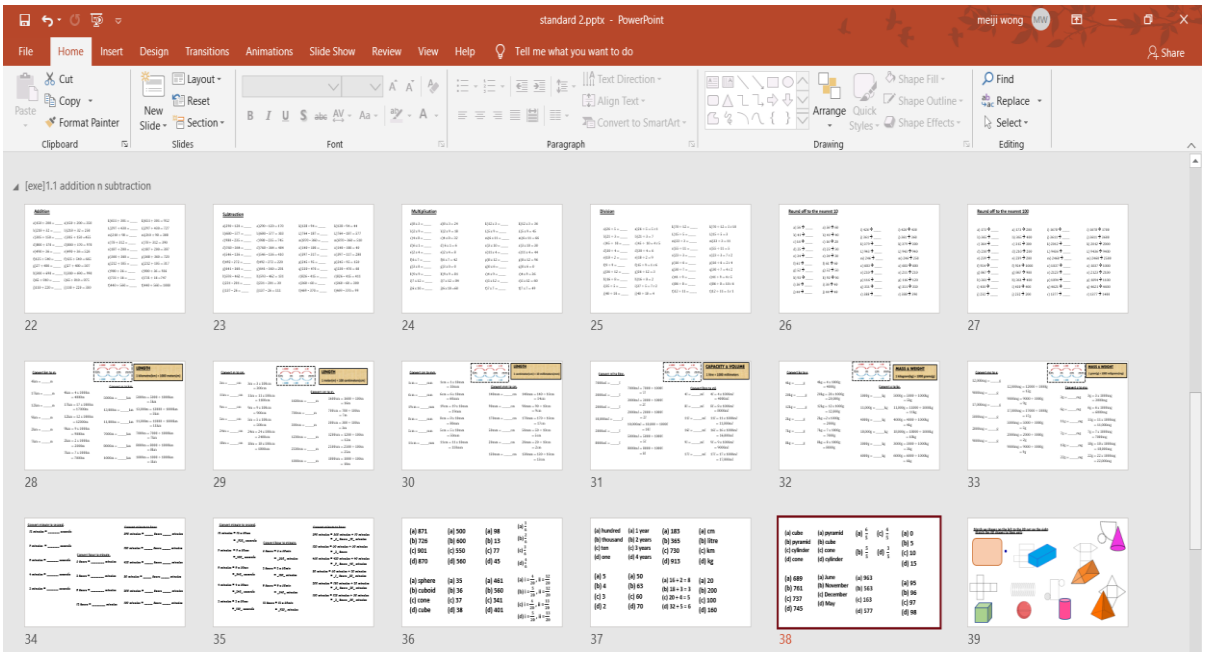


Figure 6.1.3.2 Tutorial questions is prepared before the development procedure.

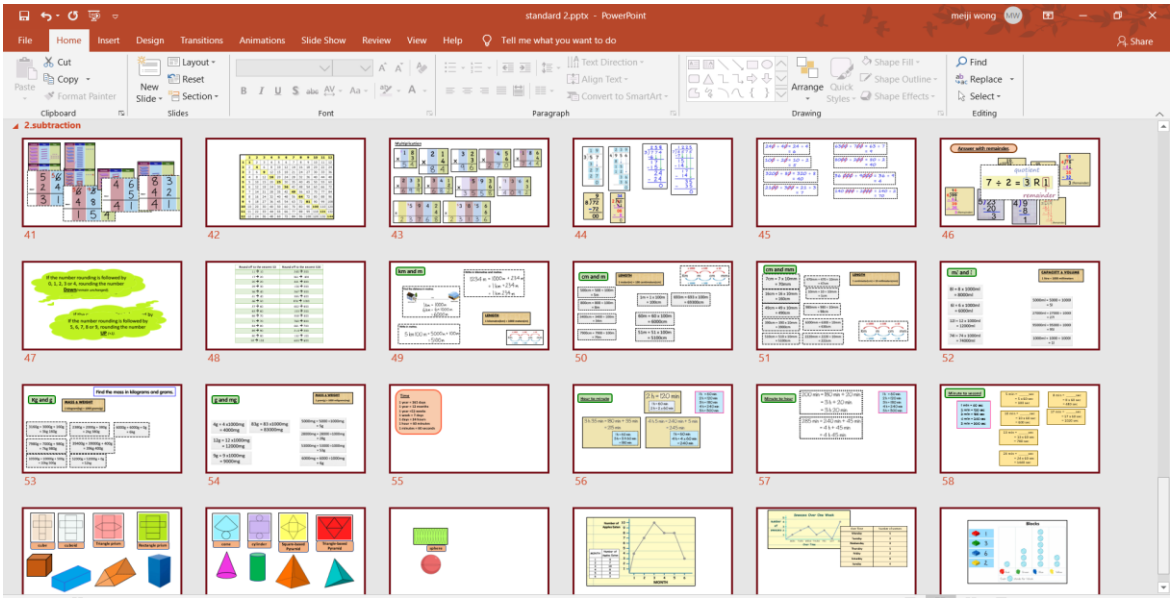


Figure 6.1.3.3 Lecture note

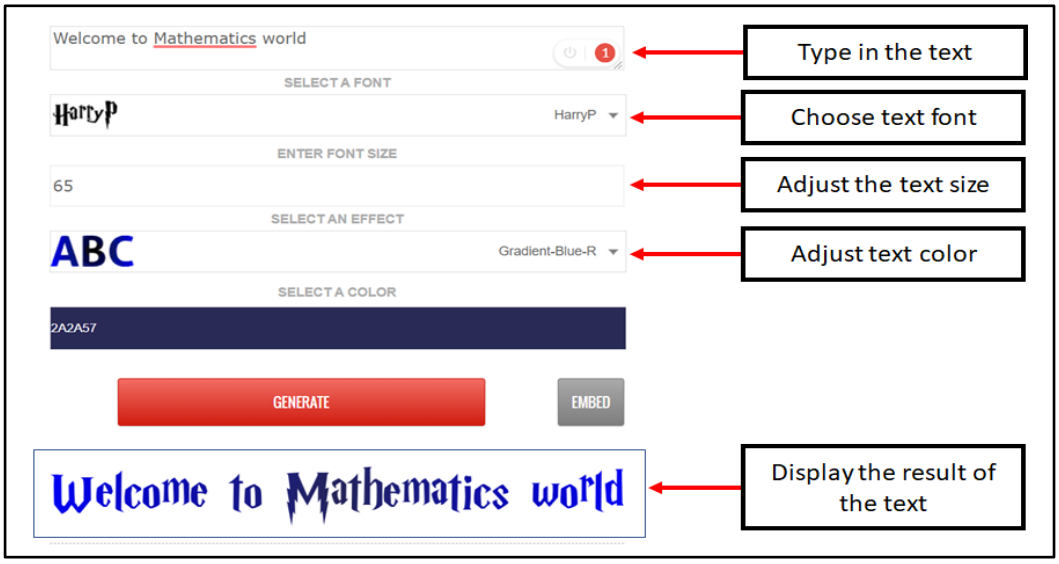


Figure 6.1.3.4 Edit the font type, color and size of the text before import in the system.

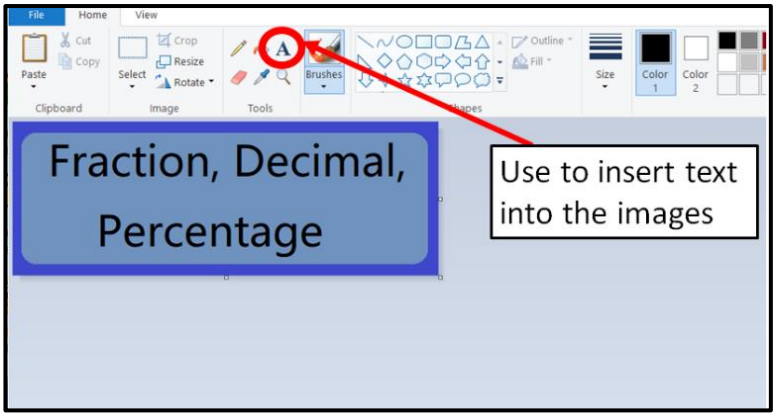


Figure 6.1.3.5 Edit and insert text inside the frame.

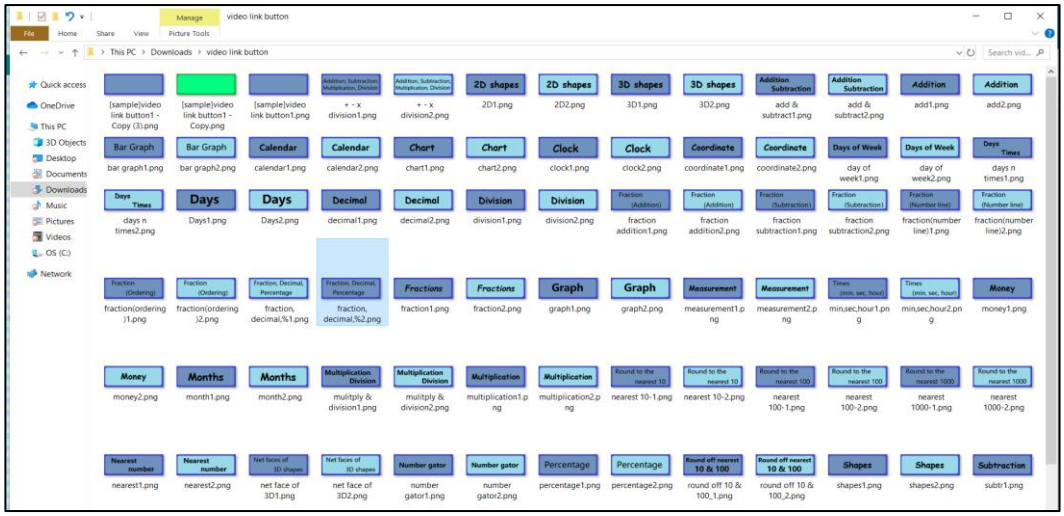


Figure 6.1.3.6 Text file that has been prepare use as the button.

6.2 Post-Authoring Process

Post authoring process is the last section edutainment platform development of the system. As shown in Fig.6.2.1 below, the author needs to click into the publish setting of Macromedia Director MX 2004. Hereafter, there are different file type for the author to choose under publish setting as shown in Fig.6.2.2 below. The final system will develop when the author clicks on the first column which publishes to EXE file type and rename as what the author wants as shown in Fig.6.2.3 below.

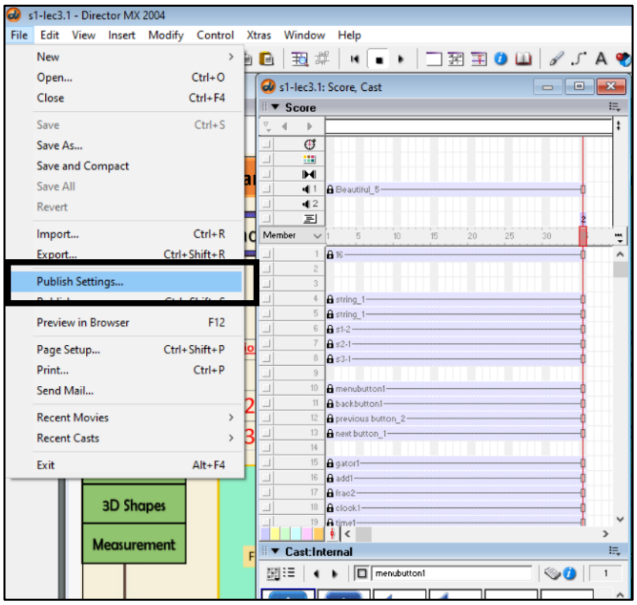


Figure 6.2.1 Publish to executable file extension(.EXE).

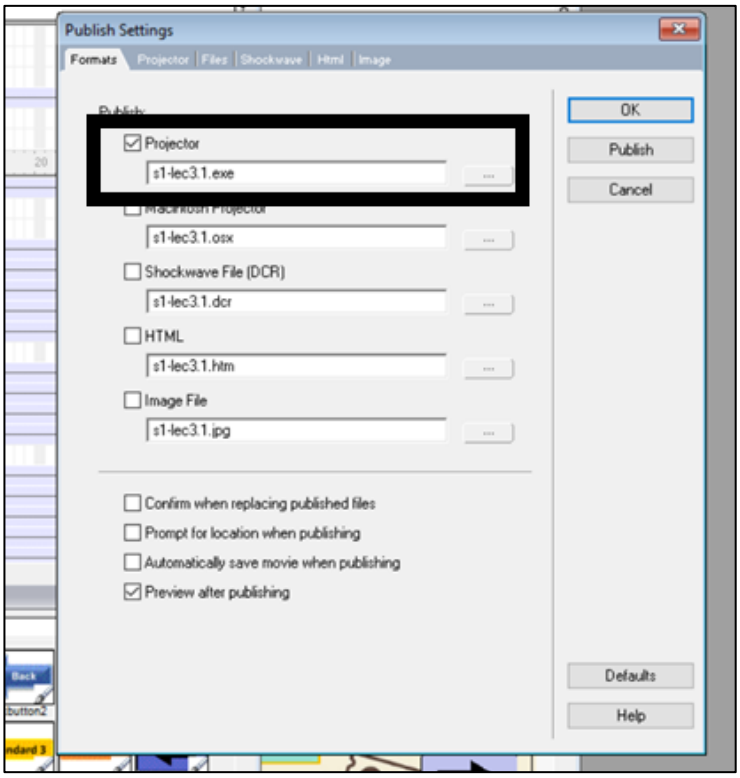


Figure 6.2.2 Choose file format and rename the file name.

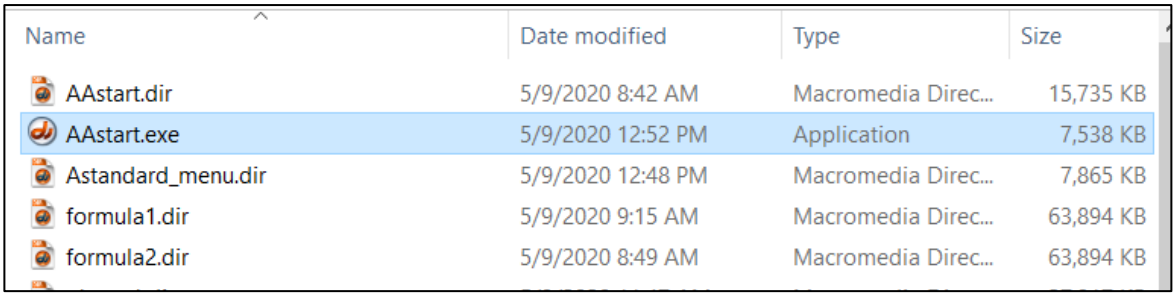


Figure 6.2.3 Final outcome of the system.

6.3 Issues and Challenges Faced

The first challenge that author faced is the design of quiz in three different standards. There have multiple quiz questions each of the standard and it may easily make confuse where is the destination or the arrow point of the question. So, author need to adjust properly to ensure that there is no error occur when testing. Once the arrow point on the questions of the quiz menu page, it will lead user to the wrong question or other complex problem will arise consecutively. So, it may take a lot of time to completely design a perfect user interface. To attain the target of user's expectation, numerous works of the project need to redesign repeatedly.

In addition to that, author need to test all the animation before use in the system as shown in Fig.6.3.1 below. This is because most of the animation have copyright that will directly affect the project progress rate. If author directly use any animation that have copyright without test before it, it will pop out the error message. The most terrible case is the system will automatically terminate all the work that have done and author will unable to reopen the model again. Then, one of the possible methods is redo all the work but it may waste a lot of time. Another effective method is user must frequently backup all the work before process to the next part. Author can try to use any of the authoring tools to edit and redesign the image or animation of the button, background of the system and graphic themselves.

Thirdly, license divide into two different type which is free license base software and license base software. Unfortunately, Macromedia Director MX 2004 categories in license base software so the software require user to key in the serial number or password before install the application as shown in Fig.6.3.2 below. Different authoring tools have different function performance and most of the authoring tools are not free for charge anymore. Some of the software need license to access such as adobe director and Maya. Author may need to spend their money to purchase the serial number before install the software in any of the computer for the creation of the prototype. Some special case might happen such as some of the computer might face some difficulty in completed running of the software. Some of the button unable to work properly and the software did not allow user too upload any video. One of the ways to solve the problem is author can try to use "URL" button for the function to link to the interrelated video page.

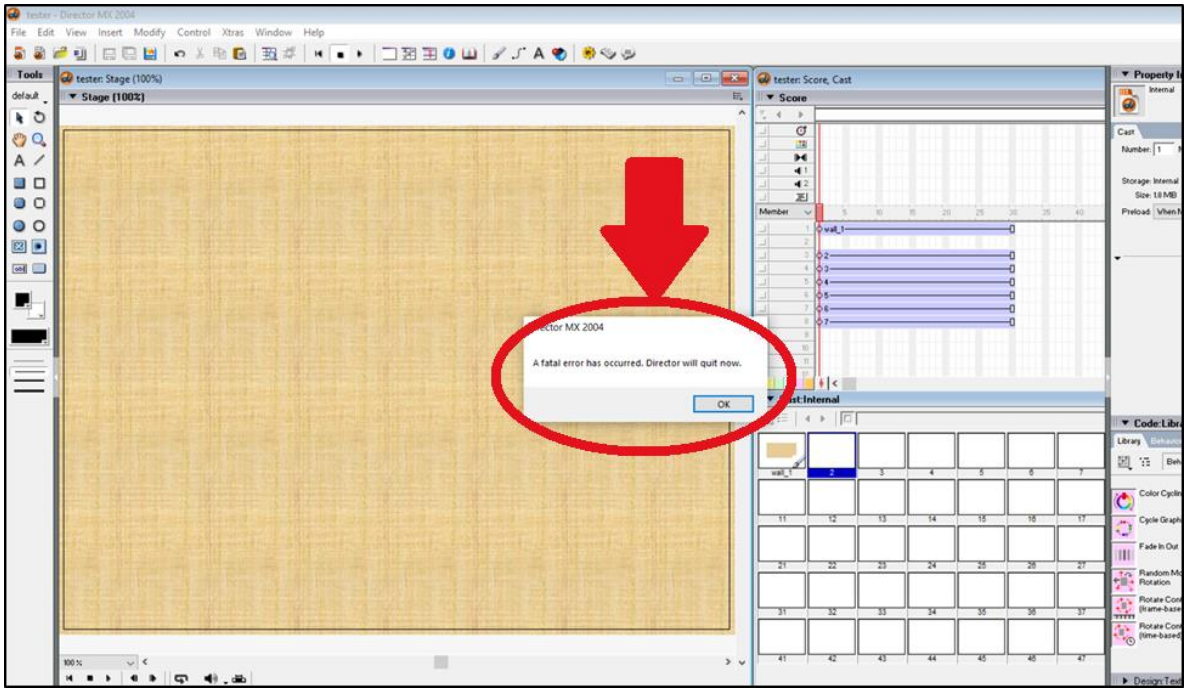


Figure 6.3.1 Error message pop out if author use any animation that contain copyright.

Figure 6.3.2 Author need to insert serial number before access the Macromedia Director MX 2004.

Chapter 7

Testing

7.1 Alpha Testing

7.1.1 Math Start Page

Table 7.1.1.1 Math Start Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Drag on the “Start” button	Background image will change to another graphic and the button	Same as expected	Successful
2.	Click on the “Start” button	Come out with sound effect when the mouse clicks on the button and proceed to the standard menu page.	Same as expected	Successful
3.	Drag on the “Let Have Fun” frame	Avoid the mouse when point toward the frame.	Same as expected	Successful

7.1.2 Standard Menu Page

Table 7.1.2.1 Standard Menu Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Click on the “Standard 1” button	Proceed to Standard 1 Content Menu Page.	Same as expected	Successful
2.	Click on the “Standard 2” button	Proceed to Standard 2 Content Menu Page.	Same as expected	Successful
3.	Click on the “Standard 3” button	Proceed to Standard 3 Content Menu Page.	Same as expected	Successful
4.	Click on the “Formula” button	Link to the Formula Page.	Same as expected	Successful

5.	Click on the “Calculator” button	Link to online calculator.	Same as expected	Successful
6.	Drag on the “Standard 1” button	The Harry Potter graphic animation will fly toward the button.	Same as expected	Successful
7.	Drag on the “Standard 2” button	The Harry Potter graphic animation will fly toward the button.	Same as expected	Successful
8.	Drag on the “Standard 3” button	The Harry Potter graphic animation will fly toward the button.	Same as expected	Successful
9.	Background music	The music start play.	Same as expected	Successful

7.1.3 Formula Page

Table 7.1.3.1 Formula Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Home” button	Able to process beck to the Standard Menu Page.	Same as expected	Successful
3.	Click on the “Previous” button	Link to the second page of the formula module.	Same as expected	Successful
4.	Click on the “Next” button	Link back to the first page of the formula module.	Same as expected	Successful

7.1.4 Standard 1 Main Menu Page

Table 7.1.4.1 Standard 1 Main Menu Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the “Lecture” button	Able link to standard 1 Lecture Page and the sound effect play.	Same as expected	Successful
3.	Click on the “Exercise” button	Able link to standard 1 Exercise Page and the sound effect play.	Same as expected	Successful
4.	Click on the “Quiz” button	Able link to standard 1 Quiz Page and the sound effect play.	Same as expected	Successful
5.	Click on the “Video” button	Able link to standard 1 Video Page and the sound effect play.	Same as expected	Successful
6.	Drag on the “Lecture” button	The image of the button will change and the frame will show “Lecture” text.	Same as expected	Successful
7.	Drag on the “Exercise” button	The image of the button will change and the frame will show “Exercise” text.	Same as expected	Successful
8.	Drag on the “Quiz” button	The image of the button will change and the frame will show “Quiz” text.	Same as expected	Successful
9.	Drag on the “Video” button	The image of the button will change and the frame will show “Video” text.	Same as expected	Successful
10.	Click on the “Back” button	Link to the Standard Menu Page.	Same as expected	Successful

7.1.5 Standard 2 Main Menu Page

Table 7.1.5.1 Standard 2 Main Menu Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the "Lecture" button	Able link to standard 2 Lecture Page and the sound effect play.	Same as expected	Successful
3.	Click on the "Exercise" button	Able link to standard 2 Exercise Page and the sound effect play.	Same as expected	Successful
4.	Click on the "Quiz" button	Able link to standard 2 Quiz Page and the sound effect play.	Same as expected	Successful
5.	Click on the "Video" button	Able link to standard 2 Video Page and the sound effect play.	Same as expected	Successful
6.	Drag on the "Lecture" button	The background image will change and four different studying animation graphics will appear.	Same as expected	Successful
7.	Drag on the "Exercise" button	The background image will change and four different animation graphic that relate to the exercise topic will appear.	Same as expected	Successful
8.	Drag on the "Quiz" button	The background image will change and four different animation graphic that relate to the quiz topic will appear.	Same as expected	Successful
9.	Drag on the "Video" button	The background image will change and four different animation graphic that relate to the video topic will appear.	Same as expected	Successful
10.	Click on the "Back" button	Link to the Standard Menu Page.	Same as expected	Successful

7.1.6 Standard 3 Main Menu Page

Table 7.1.6.1 Standard 3 Main Menu Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the “Lecture” button	Able link to standard 3 Lecture Page and the sound effect play.	Same as expected	Successful
3.	Click on the “Exercise” button	Able link to standard 3 Exercise Page and the sound effect play.	Same as expected	Successful
4.	Click on the “Quiz” button	Able link to standard 3 Quiz Page and the sound effect play.	Same as expected	Successful
5.	Click on the “Video” button	Able link to standard 3 Video Page and the sound effect play.	Same as expected	Successful
6.	Drag on the “Lecture” button	The graphic of the button will change to images that related to the lecture topic.	Same as expected	Successful
7.	Drag on the “Exercise” button	The graphic of the button will change to images that is related to the exercise topic.	Same as expected	Successful
8.	Drag on the “Quiz” button	The graphic of the button will change to images that is related to the quiz topic.	Same as expected	Successful
9.	Drag on the “Video” button	The graphic of the button will change to images that is related to the video topic.	Same as expected	Successful
10.	Click on the “Back” button	Link to the Standard Menu Page.	Same as expected	Successful

7.1.7 Standard 1 Lecture Page

Table 7.1.7.1 Standard 1 Lecture Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the “Number Gator” button	Proceed to the number gator topic learning material.	Same as expected	Successful
3.	Click on the “Addition Subtraction” button	Proceed to the addition and subtraction topic learning material.	Same as expected	Successful
4.	Click on the “Fraction” button	Proceed to the fraction topic learning material.	Same as expected	Successful
5.	Click on the “Clock” button	Proceed to the clock topic learning material.	Same as expected	Successful
6.	Click on the “Time” button	Proceed to the time topic learning material.	Same as expected	Successful
7.	Click on the “2D Shapes” button	Proceed to the 2D shapes topic learning material.	Same as expected	Successful
8.	Click on the “3D Shapes” button	Proceed to the 3D shapes topic learning material.	Same as expected	Successful
9.	Click on the “Measurement” button	Proceed to the measurement topic learning material.	Same as expected	Successful
10.	Click on the “Back” button	Link to Standard 1 Menu Page.	Same as expected	Successful
11.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
12.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful

13.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.8 Standard 2 Lecture Page

Table 7.1.8.1 Standard 2 Lecture Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the “Addition” button	Proceed to the addition topic learning material.	Same as expected	Successful
3.	Click on the “Subtraction” button	Proceed to the subtraction topic learning material.	Same as expected	Successful
4.	Click on the “Multiplication” button	Proceed to the multiplication topic learning material.	Same as expected	Successful
5.	Click on the “Division” button	Proceed to the division topic learning material.	Same as expected	Successful
6.	Click on the “Round off nearest 10 & 100” button	Proceed to the related topic learning material.	Same as expected	Successful
7.	Click on the “Measurement” button	Proceed to the measurement topic learning material.	Same as expected	Successful
8.	Click on the “Time” button	Proceed to the time topic learning material.	Same as expected	Successful
9.	Click on the “Net Shapes” button	Proceed to the related topic learning material.	Same as expected	Successful
10.	Click on the “Graph” button	Proceed to the graph topic learning material.	Same as expected	Successful

11.	Click on the “Back” button	Link to Standard 2 Menu Page.	Same as expected	Successful
12.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
13.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
14.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.9 Standard 3 Lecture Page

Table 7.1.9.1 Standard 3 Lecture Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start perform.	Same as expected	Successful
2.	Click on the “Addition” button	Proceed to the addition topic learning material.	Same as expected	Successful
3.	Click on the “Round off nearest 1000” button	Proceed to the related topic learning material.	Same as expected	Successful
4.	Click on the “+ - x ÷” button	Proceed to the combination of the multiplication, subtraction, addition and division topic of the learning material.	Same as expected	Successful
5.	Click on the “Percentage, Decimal and Fraction” button	Proceed to the related topic of the learning material.	Same as expected	Successful
6.	Click on the “Time” button	Proceed to the time topic learning material.	Same as expected	Successful

7.	Click on the “Coordinate” button	Proceed to the coordinate topic learning material.	Same as expected	Successful
8.	Click on the “Bar Graph” button	Proceed to the topic that related to bar graph learning material.	Same as expected	Successful
9.	Click on the “Back” button	Link to Standard 3 Menu Page.	Same as expected	Successful
10.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
11.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
12.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.10 Standard 1 Video page

Table 7.1.10.1 Standard 1 Video Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Addition” button	Proceed to online video.	Same as expected	Successful
3.	Click on the “Subtraction” button	Proceed to online video.	Same as expected	Successful
4.	Click on the “Fractions” button	Proceed to online video.	Same as expected	Successful
5.	Click on the “Clock” button	Proceed to online video.	Same as expected	Successful
6.	Click on the “Month” button	Proceed to online video.	Same as expected	Successful

7.	Click on the “2D Shapes” button	Proceed to online video.	Same as expected	Successful
8.	Click on the “3D Shapes” button	Proceed to online video.	Same as expected	Successful
9.	Click on the “Measurement” button	Proceed to online video.	Same as expected	Successful
10.	Click on the “Number Gator” button	Proceed to online video.	Same as expected	Successful
11.	Click on the “Calendar” button	Proceed to online video.	Same as expected	Successful
12.	Click on the “Days of Week” button	Proceed to online video.	Same as expected	Successful
13.	Click on the “Back” button	Link to Standard 1 Menu Page.	Same as expected	Successful
14.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
15.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
16.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.11 Standard 2 Video page

Table 7.1.11.1 Standard 2 Video Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Addition” button	Proceed to online video.	Same as expected	Successful

3.	Click on the “Subtraction” button	Proceed to online video.	Same as expected	Successful
4.	Click on the “Multiplication” button	Proceed to online video.	Same as expected	Successful
5.	Click on the “Division” button	Proceed to online video.	Same as expected	Successful
6.	Click on the “Round of Nearest 10” button	Proceed to online video.	Same as expected	Successful
7.	Click on the “Round of Nearest 100” button	Proceed to online video.	Same as expected	Successful
8.	Click on the “Times” button	Proceed to online video.	Same as expected	Successful
9.	Click on the “Measurement” button	Proceed to online video.	Same as expected	Successful
10.	Click on the “Fraction (Number Line)” button	Proceed to online video.	Same as expected	Successful
11.	Click on the “Fraction (Ordering)” button	Proceed to online video.	Same as expected	Successful
12.	Click on the “Net faces of 3D Shape” button	Proceed to online video.	Same as expected	Successful
13.	Click on the “Graph” button	Proceed to online video.	Same as expected	Successful
14.	Click on the “Back” button	Link to Standard 2 Menu Page.	Same as expected	Successful
15.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
16.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful

17.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.12 Standard 3 Video page

Table 7.1.12.1 Standard 3 Video Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Addition” button	Proceed to online video.	Same as expected	Successful
3.	Click on the “Subtraction” button	Proceed to online video.	Same as expected	Successful
4.	Click on the “Round of Nearest 1000” button	Proceed to online video.	Same as expected	Successful
5.	Click on the “+ - x ÷” button	Proceed to online video.	Same as expected	Successful
6.	Click on the “Percentage” button	Proceed to online video.	Same as expected	Successful
7.	Click on the “Fraction, Decimal, Percentage” button	Proceed to online video.	Same as expected	Successful
8.	Click on the “Fraction (Addition)” button	Proceed to online video.	Same as expected	Successful
9.	Click on the “Fraction (Subtraction)” button	Proceed to online video.	Same as expected	Successful
10.	Click on the “Time (Addition, Subtraction)” button	Proceed to online video.	Same as expected	Successful
11.	Click on the “Coordinate” button	Proceed to online video.	Same as expected	Successful

12.	Click on the "**B**ar Graph" button	Proceed to online video.	Same as expected	Successful
13.	Click on the "Back" button	Link to Standard 3 Menu Page.	Same as expected	Successful
14.	Click on the "Home" button	Back to the Standard Menu Page	Same as expected	Successful
15.	Click on the "Next" button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
16.	Click on the "Previous" button	Proceed to the upper page within the same chapter.	Same as expected	Successful

7.1.13 Standard 1 Exercise page

Table 7.1.13.1 Standard 1 Exercise Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the "Back" button	Link to Standard 1 Menu Page.	Same as expected	Successful
3.	Click on the "Home" button	Back to the Standard Menu Page	Same as expected	Successful
4.	Click on the "Next" button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
5.	Click on the "Previous" button	Proceed to the upper page within the same chapter.	Same as expected	Successful
6.	Drag on the" Q&A" graphic button	The answer and step by step solving method for	Same as expected	Successful

		each of the question clearly stated.		
7.	Click on the “Addition Subtraction” button	Link to the addition and subtraction exercise module.	Same as expected	Successful
8.	Click on the “Fraction” button	Link to the fraction exercise module.	Same as expected	Successful
9.	Click on the “Money” button	Link to the money related exercise module.	Same as expected	Successful
10.	Click on the “Days / Times” button	Link to the days and tile related exercise page.	Same as expected	Successful
11.	Click on the “Measurement” button	Link to the measurement chapter exercise module.	Same as expected	Successful
12.	Click on the “Shapes” button	Link to the shape chapter exercise module.	Same as expected	Successful
13.	Click on the “Formula” button	Proceed to the formula page	Same as expected	Successful
14.	Click on the “Calculator” button	Able to link to the online calculator	Same as expected	Successful

7.1.14 Standard 2 Exercise page

Table 7.1.14.1 Standard 2 Exercise Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Back” button	Link to Standard 2 Menu Page.	Same as expected	Successful

3.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
4.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
5.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful
6.	Drag on the” Q&A” graphic button	The answer and step by step solving method for each of the question clearly stated.	Same as expected	Successful
7.	Click on the “Addition Subtraction” button	Link to the addition and subtraction exercise module.	Same as expected	Successful
8.	Click on the “Multiplication Division” button	Link to the multiplication and division topic related exercise module.	Same as expected	Successful
9.	Click on the “Round off nearest 10 & 100” button	Link to the round off nearest 10 & 100 chapter related exercise module.	Same as expected	Successful
10.	Click on the “Measurement” button	Link to the measurement chapter exercise module.	Same as expected	Successful
11.	Click on the “Time” button	Link to the time chapter exercise module.	Same as expected	Successful
12.	Click on the “Net Shapes” button	Link to the net shape chapter exercise module.	Same as expected	Successful
13.	Click on the “Formula” button	Proceed to the formula page	Same as expected	Successful

14.	Click on the “Calculator” button	Able to link to the online calculator	Same as expected	Successful

7.1.15 Standard 3 Exercise page

Table 7.1.15.1 Standard 3 Exercise Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The music start play.	Same as expected	Successful
2.	Click on the “Back” button	Link to Standard 3 Menu Page.	Same as expected	Successful
3.	Click on the “Home” button	Back to the Standard Menu Page	Same as expected	Successful
4.	Click on the “Next” button	Proceed to the outcoming page within the same chapter.	Same as expected	Successful
5.	Click on the “Previous” button	Proceed to the upper page within the same chapter.	Same as expected	Successful
6.	Drag on the” Q&A” graphic button	The answer and step by step solving method for each of the question clearly stated.	Same as expected	Successful
7.	Click on the “Addition Subtraction” button	Link to the addition and subtraction exercise module.	Same as expected	Successful
8.	Click on the “Round off nearest 10 & 100” button	Link to the round off nearest 10 & 100 chapter related exercise module.	Same as expected	Successful
9.	Click on the “+ - x ÷” button	Link to combination of multiplication, division,	Same as expected	Successful

		addition and subtraction chapter related exercise module.		
10.	Click on the “Percentage, Decimal, Fraction” button	Link to the related chapter of the exercise module.	Same as expected	Successful
11.	Click on the “Time (addition, Subtraction)” button	Link to the addition and subtraction of time calculation chapter of the exercise module.	Same as expected	Successful
12.	Click on the “Coordinate” button	Link to the coordinate chapter exercise module.	Same as expected	Successful
13.	Click on the “Formula” button	Proceed to the formula page	Same as expected	Successful
14.	Click on the “Calculator” button	Able to link to the online calculator	Same as expected	Successful

7.1.16 Standard 1 Start Quiz page

Table 7.1.16.1 Standard 1 Start Quiz Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The background music start sound.	Same as expected	Successful
2.	Click on the “Start” button	Link to Standard 1 Quiz Map Page.	Same as expected	Successful
3.	Click on the “Back” button	Back to the Standard Menu Page.	Same as expected	Successful
4.	Drag on the “Ready” button	“Ready” word of the button will change to “Start” word	Same as expected	Successful

		that can be seen in the medium of the button.		
5.	Click on the “Back” button	Proceed to the upper page which is the Standard 1 Menu Page.	Same as expected	Successful

7.1.17 Standard 2 Start Quiz page

Table 7.1.17.1 Standard 2 Start Quiz Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The background music start sound.	Same as expected	Successful
2.	Click on the “Start” button	Link to Standard 2 Quiz Map Page.	Same as expected	Successful
3.	Click on the “Back” button	Back to the Standard Menu Page.	Same as expected	Successful
4.	Drag on the “Ready” button	“Ready” word of the button will change to “Start” word that can be seen in the medium of the button.	Same as expected	Successful
5.	Click on the “Back” button	Proceed to the upper page which is the Standard 2 Menu Page.	Same as expected	Successful

7.1.18 Standard 3 Start Quiz page

Table 7.1.18.1 Standard 3 Start Quiz Page

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music	The background music start sound.	Same as expected	Successful
2.	Click on the “Start” button	Link to Standard 3 Quiz Map Page.	Same as expected	Successful
3.	Click on the “Back” button	Back to the Standard Menu Page.	Same as expected	Successful
4.	Drag on the “Ready” button	“Ready” word of the button will change to “Start” word that can be seen in the medium of the button.	Same as expected	Successful
5.	Click on the “Back” button	Proceed to the upper page which is the Standard 3 Menu Page.	Same as expected	Successful

7.1.19 Standard 1, 2 and 3 Quiz pages

Table 7.1.19.1 Standard 1, 2 and 3 Quiz Pages

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Background music of quiz map	The music start play.	Same as expected	Successful
2.	Click on the “Back” button	Link to Standard Menu Page.	Same as expected	Successful
3.	Click on the button that arrow image point	Able to proceed to the question.	Same as expected	Successful
4.	Click on the answer selection	Able to check whether the answer chosen is either correct or wrong	Same as expected	Successful

5.	Correct answer	Able to link to quiz map and point at the of the following question.	Same as expected	Successful
6.	Wrong answer	Able to play wrong sound effect and error message.	Same as expected	Successful
7.	Click on the “Redo” button	Able to link back to the	Same as expected	Successful
8.	Click on the explanation button	Link to the explanation page of each of the questions.	Same as expected	Successful
9.	Click on the “Cross” button	Able back to the question and reselect the correct answer.	Same as expected	Successful
10.	Background music of explanation module	Background music is play.	Same as expected	Successful
11.	Wrong sound effect	Able to play the sound effect.	Same as expected	Successful
12.	Click on the “Formula” button	Proceed to the formula page.	Same as expected	Successful
13.	Click on the “Retry” button	Allow to redo all the questions again start from the first question.	Same as expected	Successful

7.2 System Testing

Table 7.2.1 System Testing on Hardware Specification.

No.	Test Field	Expected Outcome	Actual Result	Status
1.	Run the system in Asus VivoBook 15" (Window 10) - 8.00 GB RAM - 64-bit operating system - Intel Core i5	Run without any problem.	Same as expected	Successful
2.	Run the system in Toshiba laptop (Window 7) - 4.00 GB RAM	Run without any problem.	Same as expected	Successful
3.	Run the system in Samsung PC (Window 10) - 8.00 GB RAM	Run without any problem.	Same as expected	Successful

7.3 Beta Testing

The author had invited four reals users which age within seven to nine years old to participate in the testing for the mathematics system before product development to the public. It is important to ensure the learning materials are appropriate to each of the kid level and reduce error occur. Through the survey that gathered, it can help to subside failure risks and increase the performance of the system in future improvement to guaranty a high-quality product delivered.

7.4 User Evaluation

7.4.1 Survey and Questionnaire

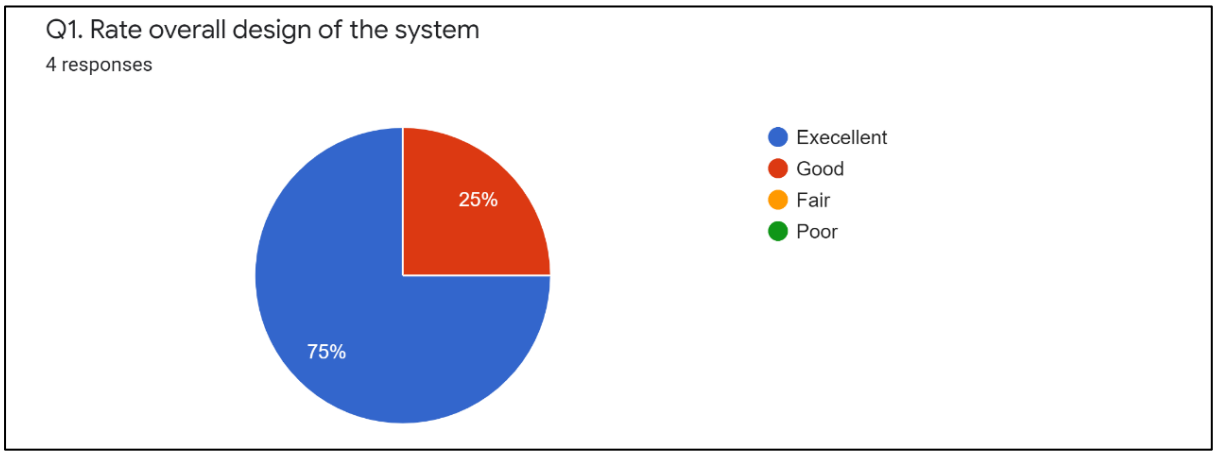


Figure 7.4.1.1 The pie chart showed design rate of the system.

Based on Fig.7.4.1.1 above, more than half of the respondents vote the excellent rate of the overall of the system. One of the respondents vote a good rate for the overall design of the system.

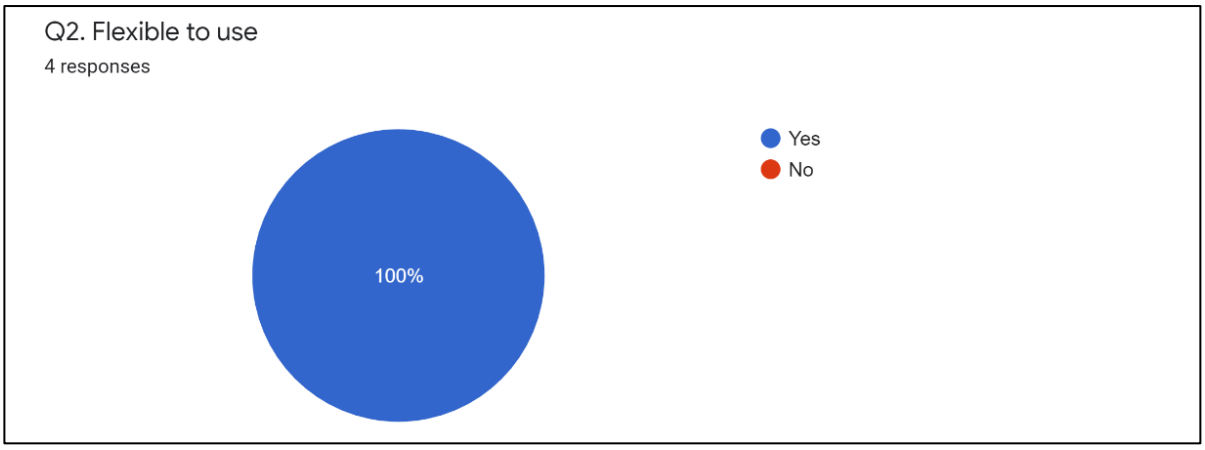


Figure 7.4.1.2 The pie chart showed flexible use of the system.

As shown in Fig.7.4.1.2 above, all respondents felt agile when using the system. Respondent able to search for information that they want easily.

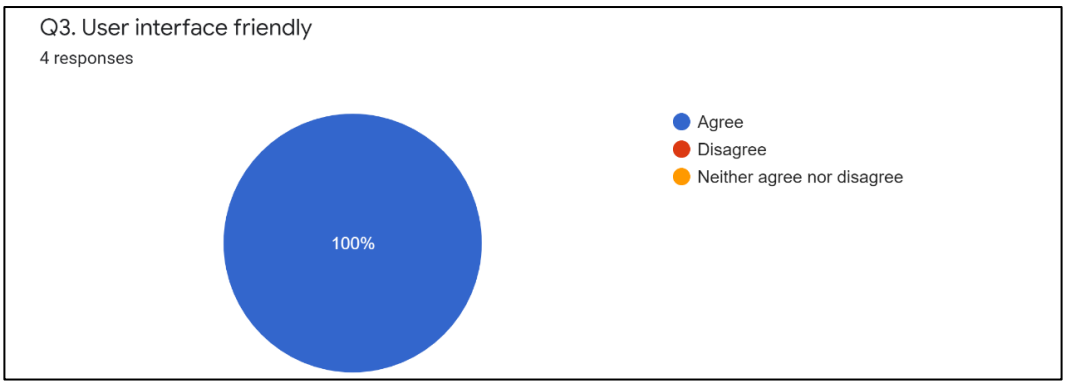


Figure 7.4.1.3 The pie chart showed the rate of friendly user interface.

As shown in Fig.7.4.1.3 above, all respondents agree with the friendly user interface. Friendly user interface helps to highly heighten the usage rate of the mathematics platform.

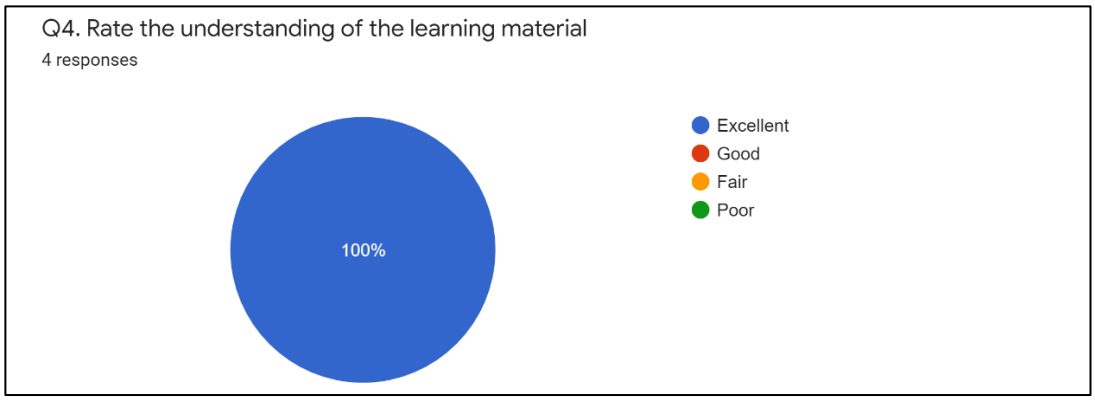


Figure 7.4.1.4 The pie chart showed the rate of understanding of learning material.

As shown in Fig.7.4.1.4 above, all respondents felt excellent with the learning material that includes in the system. The result shows that the material comprises is straight forward to the important point in each of the chapters.

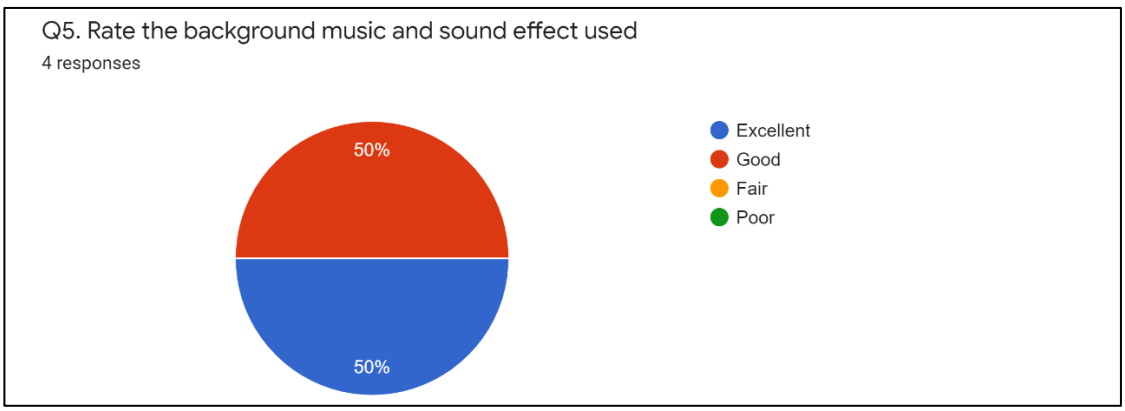


Figure 7.4.1.5 The pie chart showed the rate of background music and sound effect of the system.

The pie chart above shown that 50% of the respondents rate excellent for the background music that used in the system and half of the respondents rate good of the background song that used.

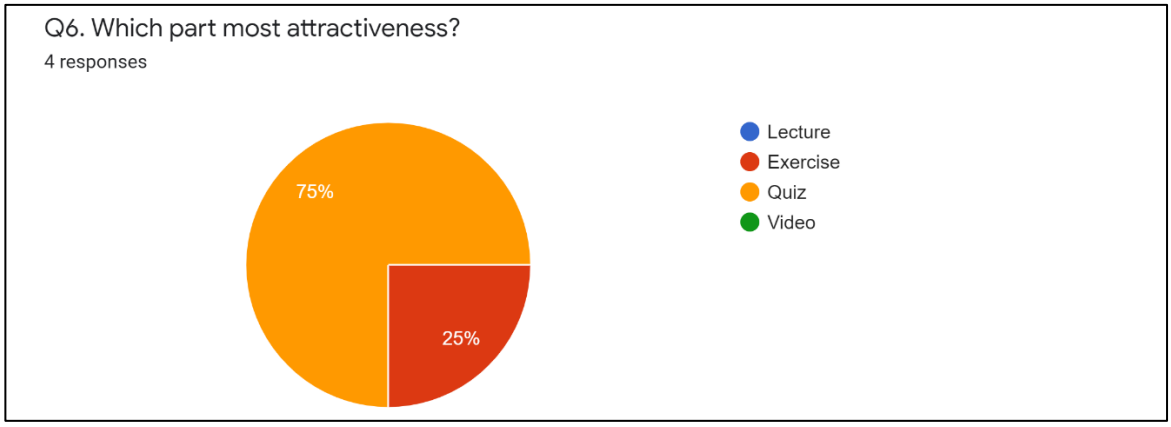


Figure 7.4.1.6 The pie chart showed the rate of which part is the most attractiveness.

From the pie chart above, 3 respondents out of 4 rates that quiz is the most attractive and challenging part during the process of learning. On the contrary, only one respondent seem that exercise is the most attractive part.

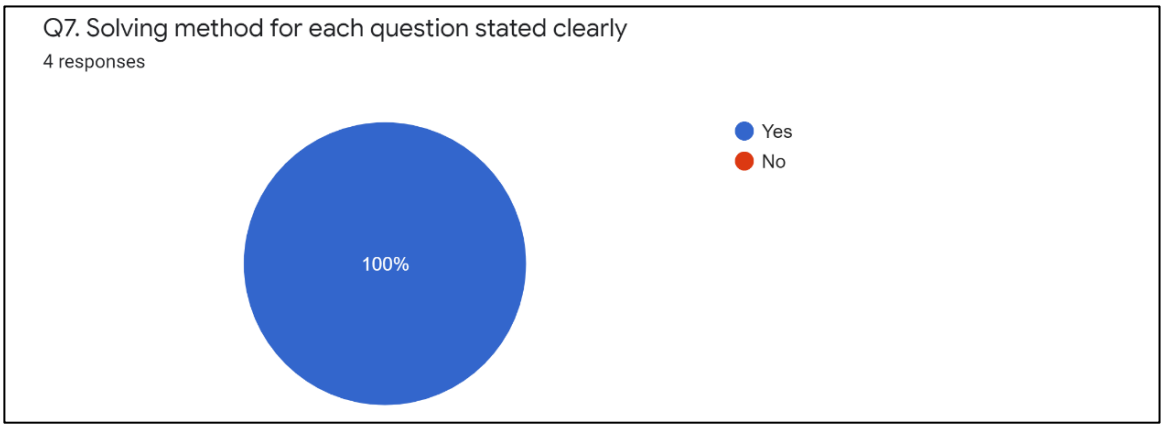


Figure 7.4.1.7 The pie chart showed rate of solving method given obviously.

From the Fig.7.4.1.7 above stated that most of the respondents feel satisfied with the solving method for each of the question that includes in the system. Step-by-step solving skills given is important for respondents to know when facing some difficulty during the process of solving the question.

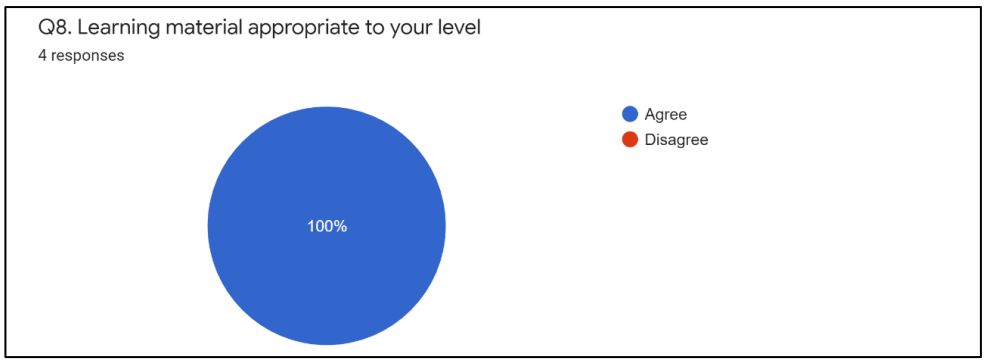


Figure 7.4.1.8 The pie chart whether courseware material adequate the level.

Result of the Fig.7.4.1.8 above shown that 4 of the respondents feel that the learning material suitable to their level.

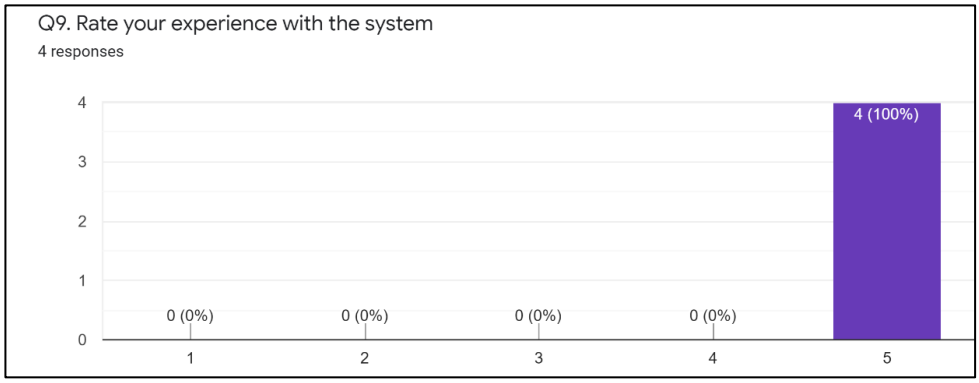


Figure 7.4.1.9 The pie chart showed experience rate.

From the pie chart Fig.7.4.1.9 above mentioned that all respondents rate that they are satisfied with the overall system.

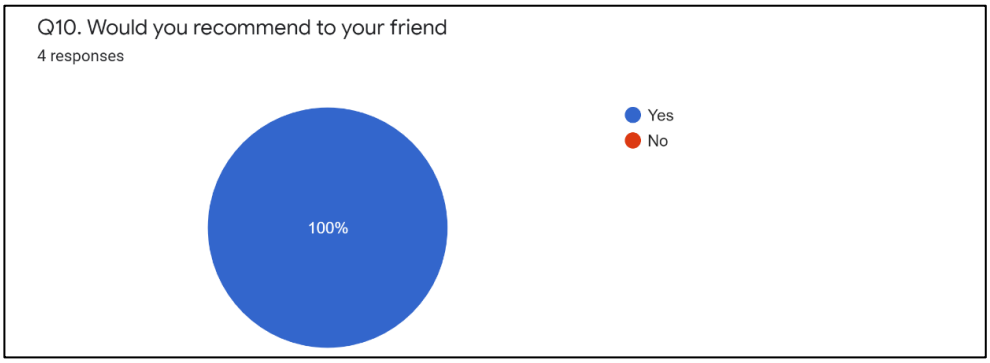


Figure 7.4.1.10 The pie chart ask user whether recommend the system to others.

From the Fig.7.4.1.10 shown above that all of the respondents choose to recommend the system to their friends. This means that most of the kids feel that the edutainment platform helps them to increase mathematics subject knowledge.

Chapter 8

Conclusion

8.1 Project Review, Discussions and Conclusion

The interactive edutainment platform in range between the age of seven to nine years old. Each standard divide into 5 distinct zone which include formula, lecture note, tutorial part, video page and interactive quiz provided. Edutainment platform can reduce time spending in understanding the learning material. Different learning material and environment offer for user to revise and practice, user can randomly choose which learning environment that they prefer.

Insufficient information as a reference for student will directly affect the usage rate and the performance of the system will be affected. Student able to solve the similar question if face the similar question in future. Other than that, shortage of images and animation graphic may unable to catch user's attention especially the young generation. Most of the user might not willing to spend their time revise without any imagination and creative images during the process of e-learning. Lack of meaning multimedia element and button is one of the common problems in most of the online learning platform. User face difficulty and so need to waste their precious in searching the ways or any of the learning material that they prefer.

First workable solution is designing some creative and stimulation games such as 3D puzzle for student to easily play and learn at the same time. Hint and step-by-step process stated can let user completely understand the solving method, so that they will not easily give up. Interactive platform can help to cultivate student's interest and joy in the process of answering questions. Friendly user interface design should be included in the system. Author will need to make sure that all the questions set must appropriate each of the student level. Hint and explanation for each of the question should be include in the system so that student might not repeat the same mistake next time. In here, colorful text and images can be used so that user able to enhance memorization of the learning point even though during the school exam. Imagination and graphic approach can be created to motivate and attract user's interest and attention. Interactive between system and user can be made and develop by developer. For instance, author can design some questions that might require user to choose their answer before process to the next question. Learning material that include in the system should be able to memorize and remember by user. Formula page is one of the timesaving and essential data when student unquiet in solving the mathematics questions.

8.2 Future Work

The mathematics edutainment platform of FYP is more focusing on the overall design, learning material and background effect of the system. In future, it can be done by converting all the material of the system in other platforms such as website platform and mobile application. Courseware material should update regularly to guarantee new and challenging questions included in the system. In addition, any of the games that are related to the mathematics subject can be include. It can help to connive brain in constant acceleration, increase problem-solving technique and faster strategic thinking. The challenging topic and question should be updated wisely in future and highly recommended that help user especially kids to learn themselves spontaneously and enjoyable during gaining knowledge process in a comfortable environment.

References

Abbit, J. T., & Klett, M. D. (2007). Identifying influences on attitudes and self –efficacy beliefs towards technology integration among pre-service educators: Electronic Journal for the integration of technology in Education. Retrieved from https://www.semanticscholar.org/paper/Identifying-influences-on-attitudes-and-beliefs-Abbitt-Klett/d1d2625c826a098034aff9e730231f0e505a70f4

Adams, D. A; Nelson, R. R.; Todd, P. A. (1992). "Perceived usefulness, ease of use, and usage of information technology: A replication. Retrieved from https://pdfs.semanticscholar.org/be8a/eabd40db44898df38ecf3a125758864896be.pdf?_ga=2.87982616.1880940731.1586643717-1521354373.1586643717

Akkoyuklu, B. & Soylu, M. Y. (2006). A study on students‟ views on blended learning environment. Retrieved from https://www.researchgate.net/publication/26442280_A_Study_on_Students'_Views_On_Blended_Learning_Environment

Aksakal, N. (2015). Theoretical view to the approach of the edutainment. *Procedia-Social and Behavioral Sciences*. Retrieved from https://www.sciencedirect.com/science/article/pii/S1877042815023411

Al-adwan, A., & Smedly, J. (2012). Implementing E-Learning in the Jordanian Higher Education System: Factors Affecting Impact. Retrieved from https://www.researchgate.net/publication/272942607_Implementing_e-learning_in_the_Jordanian_Higher_Education_System_Factors_affecting_impact

Alarifi, Y. (2003). E-learning Technology: Promising Method, E-learning International Conference. Retrieved from http://www.sciepub.com/reference/122227

Alias, N. A., & Zainuddin, A. M. (2005). Innovation for Better Teaching and Learning: Adopting the Learning Management System. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.119.9362&rep=rep1&type=pdf

Al-Rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015). Exploring the factors that affect student satisfaction through using e-learning in malaysian higher education institutions. Retrieved from https://www.researchgate.net/publication/281571575_The_Effectiveness_of_Using_E-Learning_in_Malaysian_Higher_Education_A_Case_Study_Universiti_Teknologi_Malaysia

Alsalem, A. (2004). The Impact Of Changing Technology: The Case Of E-Learning. Retrieved from https://www.researchgate.net/publication/298332420_The_Impact_Of_Changing_Technology_The_Case_Of_E-Learning

Andersson, A. (2008). Seven Major Challenges for e-learning in Developing Countries. Retrieved from https://www.learntechlib.org/p/42324/

A Range of Edutainment Games for an Interactive and interesting learning experience. (n.d.). Retrieved from https://www.dialog.lk/blog/a-range-of-edutainment-games-for-an-interactive-and-interesting-learning-experience/.

Bailey, A. (2014): The Digital Disruption of Education Publishing. bcg.com (online). Retrieved from https://www.bcg.com/en-gb/publications/2014/media-entertainment-digital-disruption-of-education-publishing.aspx

Boudreau, K. (2010). Open Platform Strategies and Innovation: Granting Access vs. Devolving Control. Retrieved from https://pubsonline.informs.org/doi/10.1287/mnsc.1100.1215

Brown, D., Cromby, J., & Standen, P. (2001). The effective use of virtual environments in the education and rehabilitation of students with intellectual disabilities. Retrieved from https://www.researchgate.net/publication/229617189_The_effective_use_of_virtual_environments_in_the_education_and_rehabilitation_of_students_with_intellectual_disabilities

Brown, E. (2015): Meet Hank Green, one of America's most popular science teachers. washingtonpost.com (online). Retrieved from https://www.washingtonpost.com/news/education/wp/2015/09/11/meet-hank-green-one-of-americas-most-popular-science-teachers/?noredirect=on&utm_term=.9fdf1ed46ada

Castillo, M. (2018): YouTube invests $20 million in educational videos, giving advertisers more safe places for ads. cnbc.com (online). Retrieved from https://www.cnbc.com/2018/10/22/youtube-invests-20-million-in-educational-tutorial-and-diy-videos.html

Ceccagnoli, M., Forman, C., Huang, P., & Wu, D. J. (2012). Cocreation of Value in a Platform Ecosystem: The Case of Enterprise Software. Retrieved from https://www.semanticscholar.org/paper/Cocreation-of-Value-in-a-Platform-Ecosystem%3A-The-of-Ceccagnoli-Forman/66007118ad2e9ae6af4c69f74a732dea493b3506

Chen & W. (2005). Effect of web-browsing interfaces in web-based instruction: A quantitative study. Retrieved from https://www.researchgate.net/publication/3051045_Effect_of_Web-Browsing_Interfaces_in_Web-Based_Instruction_A_Quantitative_Study

Chisnall, D. (2007, March 16). Free Software Versus Open Source Software. Retrieved from https://www.informit.com/articles/article.aspx?p=706208

Chiu & C et al., (2005). Usability, quality, value and e-learning continuance decisions. Retrieved from https://www.researchgate.net/publication/222953211_Usability_quality_value_and_e-learning_continuance_decisions

Collins, J., Hammond, M. & Wellington, J. (1997). Teaching and Learning with Multimedia. Retrieved from https://www.taylorfrancis.com/books/9780203441305

CoSN: K-12 Open Technologies. (n.d.). How can open technologies benefit K-12 schools? Retrieved from http://www.k12opentech.org/how-can-open-technologies-benefit-k-12-schools

Deepa N. (2014), E-Learning and Motivation, White Paper, ITEC. Retrieved from https://www.researchgate.net/publication/264417866_E-Learning_and_Students'_Motivation_A_Research_Study_on_the_Effect_of_E-Learning_on_Higher_Education

Duncan, A. (2019, July 19). Educational Sites That Will Teach Your Kids Something New Today. Retrieved from https://www.verywellfamily.com/best-free-educational-websites-for-kids-3129084.

Economides, N., & Katsamakas, E. (2006). Two-Sided Competition of Proprietary vs. Open Source Technology Platforms and the Implications for the Software Industry. Retrieved from http://neconomides.stern.nyu.edu/networks/Economides_Katsamakas_Two-sided.pdf

Educational Games for Kids' Early Learning. (n.d.). Retrieved from https://www.education.com/games/.

European Commission (2018). Measuring the digital collaborative economy, Note Eurostat, Luxembourg. Retrieved from https://ec.europa.eu/eurostat/documents/341889/725159/OECD+Manual+Measuring+the+Digital+Economy/6418c566-4074-4461-9186-9ad509bc4a4d

Faraj, S., Krogh, G. Von, Monteiro, E., & Lakhani, K. R. (2016). Online Community as Space for Knowledge Flows. Retrieved from https://www.researchgate.net/publication/311341785_Online_Community_as_Space_for_Knowledge_Flows

Ferrera, E. (2016). *Media as a tool for institutional change in development.* Retrieved from https://edi.opml.co.uk/wpcms/wp-content/uploads/2016/08/EDI-PF-PAPER-10.III_.4-La-Ferrera.pdf

Free Math Worksheets, Problems and Practice. (n.d.). Retrieved from https://www.adaptedmind.com/gradelist.php?grade=1.

Ghazawneh, A., & Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2575.2012.00406.x

Gotschall M. (2000). E-learning strategies for executive education and corporate training. Retrieved from http://ijedict.dec.uwi.edu/viewarticle.php?id=435&layout=html

Gupta, P. (2016, June 14). World of Edutainment Websites, Apps, Games and More. Retrieved from https://edtechreview.in/trends-insights/trends/2404-edutainment-games-software-apps.

Gulbahar, Y. (2007). Technology planning: A Roadmap to successful technology integration in

schools. Computers and Education. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.612.6730&rep=rep1&type=pdf

Guru99. (2020). Alpha Testing Vs Beta Testing: What's the Difference. Retrieved from https://www.guru99.com/alpha-beta-testing-demystified.html.

Hagiu & A. (2013). Strategic Decisions for Multisided Platforms. Retrieved from https://sloanreview.mit.edu/article/strategic-decisions-for-multisided-platforms/

Hameed, S. Badii, A. & Cullen, A. J. (2008). Effective e-learning integration with traditional learning in a blended learning environment. Retrieved from https://www.researchgate.net/publication/228422212_Effective_E-Learning_Integration_with_Traditional_Learning_in_a_Blended_Learning_Environment

Hareesol K., Mohd Sofian & Haji Othman. (2016). The Mathematics Performance of Primary School Students. Retrieved from https://www.researchgate.net/publication/315631080_The_Mathematics_Performance_of_Primary_School_Studentsa_in_Southern_Thailand

Helene. (2019, October 30). 7 Quality Math Websites for Kids. Retrieved from https://proudtobeprimary.com/math-websites-for-kids/.

Hong, Y., and Pavlou, P. A. (2017). On Buyer Selection of Service Providers in Online Outsourcing Platforms for IT Services. Retrieved from https://asu.pure.elsevier.com/en/publications/on-buyer-selection-of-service-providers-in-online-outsourcing-pla

Hua, K. (2015): Education as Entertainment: Youtube Sensations Teaching the Future. forbes.com (online). Retrieved from https://www.forbes.com/sites/karenhua/2015/06/23/education-as-entertainment-youtube-sensations-teaching-the-future/#190a94ae47c2

Huber, T. L., Kude, T., & Dibbern, J. (2017). Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance costs. Retrieved from https://www.researchgate.net/publication/312976468_Governance_Practices_in_Platform_Ecosystems_Navigating_Tensions_Between_Cocreated_Value_and_Governance_Costs

Iqbal, M. J. & Ahmad, M. (2018). Enhancing quality of education through e-learning. Retrieved from http://mjli.uum.edu.my/images/Vol15No1June2018/a-1-34.pdf

Johnson, R. et al., (2008). An empirical examination of factors contributing to the creation of successful e-learning environments. Retrieved from https://www.researchgate.net/publication/223883336_An_empirical_examination_of_factors_contributing_to_the_creation_of_successful_e-learning_environments

Johnson, S. D., Aragon, S. R., Shaik, N., & Palma-Rivas, N. (2000). Comparative analysis of learner satisfaction and learning outcomes in online and face-to-face learning environments. Retrieved from http://faculty.weber.edu/eamsel/Research%20Groups/Online%20Learning/Johnson%20et%20al%20(2000).pdf

Kane, G. C., Alavi, M., Labianca, G., and Borgatti, S. P. (2014). What's Different About Social Media Networks? A Framework and Research Agenda. Retrieved from https://www.researchgate.net/publication/307958345_What'_different_about_social_media_networks_A_framework_and_research_agenda

Kapoor, R., and Agarwal, S. (2017). "Sustaining Superior Performance in Business Ecosystems: Evidence from Application Software Developers in the iOS and Android Smartphone Ecosystems. Retrieved from https://pubsonline.informs.org/doi/10.1287/orsc.2017.1122

Kate, T. (2016, December 26). All-Around Development: 7 Best Educational Online Games for Children. Retrieved from https://www.gettingsmart.com/2016/12/the-7-great-educational-online-games/.

Kenny, J. (2003). Student perceptions of the use of online learning technology in their courses. ultiBase Articles. Retrieved from http://ultibase.rmit.edu.au/Articles/march03/kenny2.pdf

Khan, B. H. (2005). Managing E-learning: Design, Delivery, Implementation and Evaluation. Retrieved from https://www.researchgate.net/publication/287690737_Managing_e-learning_strategies_Design_delivery_implementation_and_evaluation

Kwofie, B., and Henten, A. (2011). The Advantages and Challenges of E - Learning Implementation. Retrieved from https://vbn.aau.dk/ws/portalfiles/portal/60337174/The_advantages_and_challenges_of_e_learning_implementation_The_story_of_a_developing_nation.pdf

K-12 School Computer Networking/Chapter 25/Edutainment (2013). Retrieved from http://en.wikibooks.org/wiki/K-12_School_Computer_Networking/Chapter_25/Edutainment

Learning Content Management System. (2009, July 13). In Wikipedia, the free encyclopedia. Retrieved July 13, 2009, from http://en.wikipedia.org/wiki/Learning_management_system

Lee, J. (2010). Online support service quality, online learning acceptance, and student satisfaction. Retrieved from https://www.researchgate.net/publication/225084010_Online_support_service_quality_online_learning_acceptance_and_student_satisfaction

Liem Cassandra (January 2016). The economic value of personal data for online platforms, firms and consumers.

Retrieved from http://bruegel.org/2016/01/the-economic-value-of-personal-data-for-online-platforms-firms-and-consumers

Lonn, S. and Teasley,D. (2009). Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. Retrieved from https://www.learntechlib.org/p/67264/

Martens, B. (2016). An economic policy perspective on online platforms. Retrieved from https://ec.europa.eu/jrc/sites/jrcsh/files/JRC101501.pdf

Michailidou, A. & Economides, A. (2003). E-learn: Towards a collaborative educational virtual environment. Retrieved from https://www.researchgate.net/publication/26388609_Elearn_Towards_a_Collaborative_Educational_Virtual_Environment

MindShift. (2014, March 12). 10 Free Online Educational Game Sites. Retrieved from https://www.kqed.org/mindshift/34761/10-free-online-educational-game-sites.

M. Nehme. (2010). E-Learning and Students' Motivation. Retrieved from https://www.researchgate.net/publication/264417866_E-Learning_and_Students'_Motivation_A_Research_Study_on_the_Effect_of_E-Learning_on_Higher_Education

Morgan, D.L. (2007). Paradigms Lost and Pragmatism Regained Methodological Implications of Combining Qualitative and Quantitative Methods. Retrieved from http://journals.sagepub.com/doi/abs/10.1177/2345678906292462

Nichols, M. (2003). A Theory for E-Learning, Educational Technology and Society. Retrieved from https://www.scirp.org/(S(vtj3fa45qm1ean45vvffcz55))/reference/ReferencesPapers.aspx?ReferenceID=1639566

Nisbet, J. (2019, September 30). 27 Best Educational Games for Kids by Subject [MUST-SEE]. Retrieved from https://www.prodigygame.com/blog/educational-games-for-kids/.

Nor, A. & Ahmed, M. (2005). Innovation for better teaching and learning: Adopting the Learning Management System. Retrieved from

https://www.researchgate.net/publication/228696199_Innovation_for_better_teaching_and_learning_adopting_the_learning_management_system

Oblinger, D. G., & Hawkins, B. L. (2005). The myth about E-learning. Retrieved from https://er.educause.edu/articles/2005/1/the-myth-about-elearning

OECD (2005). E-learning in tertiary education. Retrieved from http://www.oecd.org/edu/ceri/35991871.pdf

Papastergiou, M. (2006). Course management systems as tools for the creation of online learning environments: Evaluation from a social constructivist perspective and implications for their design. Retrieved from https://www.researchgate.net/publication/233854049_Course_Management_Systems_as_tools_for_the_creation_of_online_learning_environments_Evaluation_from_a_social_constructivist_perspective_and_implications_for_their_design

Parker, G., Alstyne, M. Van, and Jiang, X. 2017. Platform ecosystems: How developers invert the firm. Retrieved from https://www.researchgate.net/publication/314439560_Platform_Ecosystems_How_Developers_Invert_the_Firm

Paul, Ernest (n.d.). WHAT IS THE PHILOSOPHY OF MATHEMATICS EDUCATION? Retrieved from https://socialsciences.exeter.ac.uk/education/research/centres/stem/publications/pmej/pome18/PhoM_%20for_ICME_04.htm.

Pearson, (2018): What do Generation Z and millennials expect from technology in education? pearsoned.com (online). Retrieved from https://www.pearsoned.com/generation-z-millennials-expect-technology-education/

Pilgrim, M. E., & Dick, T. (2019, November 11). How math education can catch up to the 21st century. Retrieved from http://theconversation.com/how-math-education-can-catch-up-to-the-21st-century-77129.

RD B., Fatma A, & Malathi B. (2001). A Perspective Study on Content Management in ELearning and M-Learning. Retrieved from https://arxiv.org/ftp/arxiv/papers/1605/1605.02093.pdf

Reinhilde V., Bruno van Pottelsberghe, & Nicolas V. (2012). Lessons for ICT Innovative Industries: Three Experts' Positions on Financing, IPR and Industrial Ecosystems. Retrieved from http://ftp.jrc.es/EURdoc/JRC76458.pdf

Rosenberg J.M. (2001). E-learning: Strategies for Delivering Knowledge in the Digital Age. Retrieved from https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx?ReferenceID=1165124

Rossi.P.G. (2009). Learning environment with artificial intelligence elements. Retrieved from https://pdfs.semanticscholar.org/c32a/c38a0895dd9df8f48345ae1049fd85ff84d6.pdf

Sach, C. (2012). Learning management systems: Top Open Source Learning Management System. Retrieved from http://elearningindustry.com/top-open-source-learningmanagement-systems

Sadler-Smith, E. (2002). Modern learning methods: rhetoric and reality. Retrieved from https://www.researchgate.net/publication/235253261_Modern_learning_methods_rhetoric_and_reality_-_further_to_Sadler-Smith_et_al

Salmon, G. (2004). E-moderating: the key teaching and learning online. Retrieved from https://www.researchgate.net/publication/44824356_E-moderating_The_key_to_teaching_and_learning_online

Scott B., Ken C. H. & Edwin M. G. (1999). The Effects of Internet-Based Instruction on Student Learning. Retrieved from https://wikieducator.org/images/3/3c/Effects_of_Internet-Based_Instruction_on_Learning.pdf

Serwatka, J. (2002). Improving student performance in distance learning courses. Retrieved from https://www.questia.com/library/journal/1G1-86388448/improving-student-performance-in-distance-learning

Setyaningrum, W., & Waryanto, N. H. (1970, January 1). Developing mathematics edutainment media for Android based on students' understanding and interest: a teachers' review. Retrieved 2018, from https://www.semanticscholar.org/paper/Developing-mathematics-edutainment-media-for-based-Setyaningrum-Waryanto/1e6e77845edb32d43a2b9f621f2ef8a5da55fec8.

Shu-Sheng, L. (2007).Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system. Retrieved from https://www.researchgate.net/publication/222416067_Investigating_students'_perceived_satisfaction_behavioral_intention_and_effectiveness_of_e-learning_A_case_study_of_the_Blackboard_system

Sia, P. D. (2017, October 22). Learning mathematics through games in primary school: an applicative path. Retrieved from https://jecs.pl/index.php/EDUT/article/view/10.15503.edut.2016.1.127.133.

Silvia Wen-Yu Lee, C.-C. T. (2012, May 25). Technology-supported Learning in Secondary and Undergraduate Biological Education: Observations from Literature Review. Retrieved April 2013, from https://link.springer.com/article/10.1007/s10956-012-9388-6.

Singh H. (2001). Building effective blended learning programs. Retrieved from https://www.researchgate.net/publication/265024077_Building_Effective_Blended_Learning_Programs

Smedley, J.K. (2009). Modelling the impact of knowledge management using technology. Retrieved from https://www.researchgate.net/publication/220438594_Modelling_the_impact_of_knowledge_management_using_technology

Staff, T. T. (2017, September 13). 6 Basic Benefits of Game-Based Learning. Retrieved from https://www.teachthought.com/technology/6-basic-benefits-of-game-based-learning/.

Sun, Pei-Chen, Ray J. & Glenn F. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. Retrieved from https://www.researchgate.net/publication/222937513_What_drives_a_successful_e-Learning_An_empirical_investigation_of_the_critical_factors_influencing_learner_satisfaction

The Faculty of Education. (n.d.). Retrieved 2018, from https://www.educ.cam.ac.uk/courses/graduate/masters/themes/mathsed/.

The Star Online. (1969, December 31). Rich in info and edutainment. Retrieved August 1, 2004, from https://www.thestar.com.my/news/education/2004/08/01/rich-in-info-and-edutainment.

Thurmond, V. A., Wambach, K., & Connors, H. R. (2002). Evaluation of student satisfaction: determining the impact of a web-based environment by controlling for student characteristics. Retrieved from https://www.researchgate.net/publication/248940463_Evaluation_of_Student_Satisfaction_Determining_the_Impact_of_a_Web-Based_Environment_by_Controlling_for_Student_Characteristics

Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. Retrieved from https://econpapers.repec.org/article/inmorisre/v_3a21_3ay_3a2010_3ai_3a4_3ap_3a675-687.html

Top 25 Math Websites For Teachers and Students. (2019, August 23). Retrieved from https://www.edsys.in/math-websites-for-teachers-and-students/.

Valentina A. & Nelly A. (2014). Use of Computer in Education. Retrieved from https://www.ijern.com/journal/2014/December-2014/34.pdf

Wang, Y. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. Retrieved from https://www.researchgate.net/publication/222300791_Assessment_of_learner_satisfaction_with_asynchronous_e-learning_systems

Wertenbroch, A., & Nabeth, T. (2000). Advanced learning approaches and technologies: The CALT Perspective. The Center for Advanced Learning Technologies. Retrieved from http://www.insead.fr/CALT/Publication/CALTReport/caltperspective.pdf

What is Edutainment? How is it Beneficial for Kids? (2019, July 24). Retrieved from https://www.edsys.in/edutainment-beneficial-kids/.

White, R. January 3, (2003). That's Edutainment.". Retrieved from http://www.whitehutchinson.com/leisure/articles/edutainment.shtml

Yang, L., Su, G., & Yuan, H. (2014). Design Principles of Integrated Information Platform for Emergency Responses: The Case of 2008 Beijing Olympic Games. Retrieved from

https://repository.lboro.ac.uk/articles/Design_principles_of_integrated_information_platform_for_emergency_responses_The_case_of_2008_Beijing_Olympic_Games/9501338

Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for Innovation in the Digitized World. Retrieved from https://www.researchgate.net/publication/262282923_Organizing_for_Innovation_in_the_Digitized_World

Zorica, M. (2014). *Edutainment at the higher education as an element for the learning success*. Retrieved from https://www.researchgate.net/publication/264382563_EDUTAINMENT_AT_THE_HIGHER_EDUCATION_AS_AN_ELEMENT_FOR_THE_LEARNING_SUCCESS

Appendix A

Survey Questionnaire 1 (Before Development)

Personal Information

1. What is the gender?
    - Female
    - Male
2. Please choose your age.
    - 7 years old
    - 8 years old
    - 9 years old
    - 10 years old
3. Do you interest I technology products (rate 1 – 4).
    - Yes
    - No
4. How many hours did you spend in focus studying?
    - 1 hour
    - 2 hours
    - More than 2 hours
5. How many hours did you spend playing games?
    - Less than 1 hour
    - 1 hour
    - More than 1 hour

Part I. Traditional way of learning

1. Do you ever access any system or website to do some additional or revision of the mathematics subject?
    - Yes
    - No
    - Maybe

2. Do you prefer to use traditional ways rather than use the online platform as your subject revision?
    - Yes
    - No
    - Maybe

Part II. The evaluation of the existing system (CK-12 application)

1. Design of the existing system attractiveness?
    - Agree
    - Disagree
    - Neither agree nor disagree
2. The system is easy and flexible to use.
    - Agree
    - Disagree
    - Neither agree nor disagree
3. User interface of the system is friendly.
    - Agree
    - Disagree
    - Neither agree nor disagree
4. Which is the most attractiveness part?
    - Lecture note
    - Tutorial question
    - Video
    - Quiz
5. Rate your experience with the system.
    - 1
    - 2
    - 3
    - 4
6. Able to easily find the information needed quickly.
    - Agree
    - Disagree

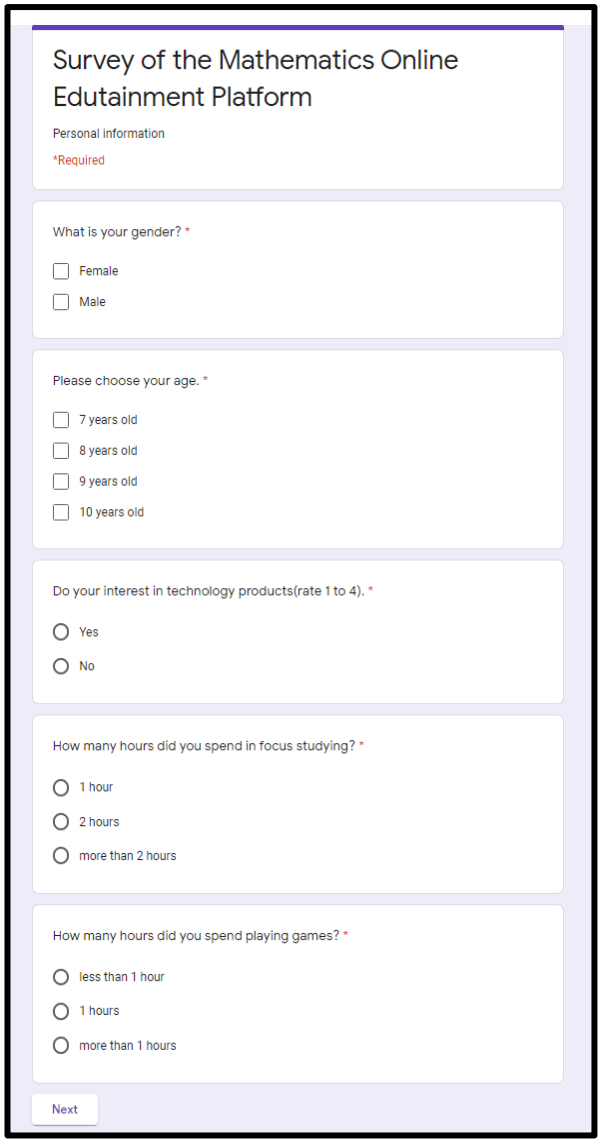
- Neither agree nor disagree

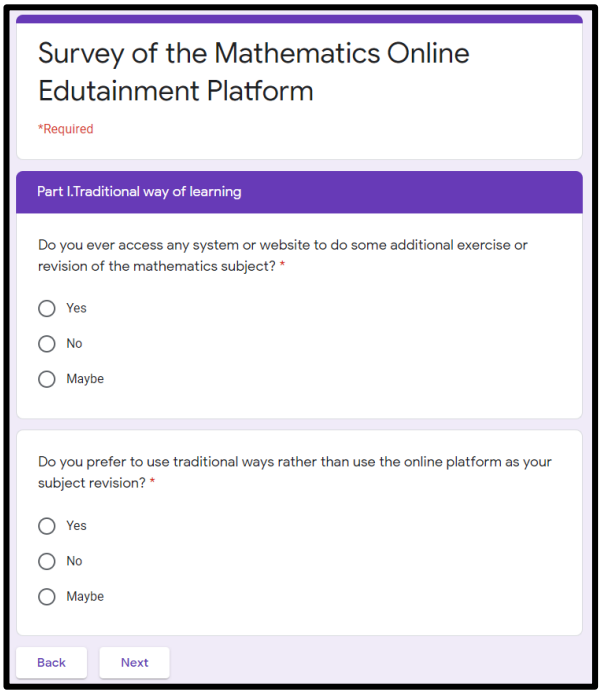
7. Able to understand and learn the lecture note?
    - Agree
    - Disagree
    - Neither agree nor disagree
8. Lecture note appropriate to your level.
    - Agree
    - Disagree
    - Neither agree nor disagree
9. Able to do the tutorial questions.
    - Agree
    - Disagree
    - Neither agree nor disagree
10. The system will give error messages that clearly state where is the mistake occurs after solving the questions.
    - Agree
    - Disagree
    - Neither agree nor disagree
11. The step-by-step question-solving answer is given clearly.
    - Agree
    - Disagree
    - Neither agree nor disagree
12. Tutorial questions appropriate to your level.
    - Agree
    - Disagree
    - Neither agree nor disagree
13. Able to understand quiz questions.
    - Agree
    - Disagree
    - Neither agree nor disagree
14. Quiz question appropriate to your level.
    - Agree
    - Disagree
    - Neither agree nor disagree

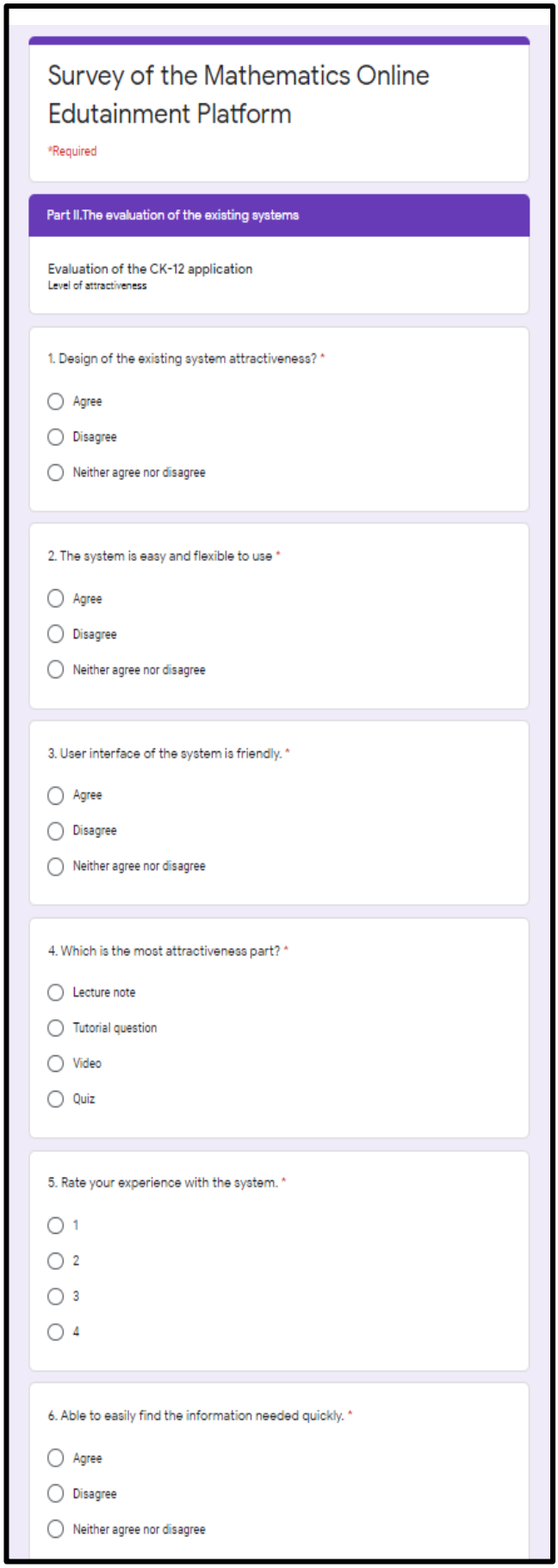
15. Rate the sound effect or music background used.
    - 1
    - 2
    - 3
    - 4
16. Text and word are clearly stated to read.
    - Agree
    - Disagree
    - Neither agree nor disagree

Part III. Recommendation

1. Would you recommend any of the online platform to your friends?
    - Yes
    - No


Survey of the Mathematics Online Edutainment Platform
Personal information
*Required
What is your gender? *
Female
Male
Please choose your age. *
7 years old
8 years old
9 years old
10 years old
Do your interest in technology products(rate 1 to 4). *
Yes
No
How many hours did you spend in focus studying? *
1 hour
2 hours
more than 2 hours
How many hours did you spend playing games? *
less than 1 hour
1 hours
more than 1 hours
Next


Survey of the Mathematics Online Edutainment Platform
*Required
Part I.Traditional way of learning
Do you ever access any system or website to do some additional exercise or revision of the mathematics subject? *
Yes
No
Maybe
Do you prefer to use traditional ways rather than use the online platform as your subject revision? *
Yes
No
Maybe
Back
Next



Survey of the Mathematics Online Edutainment Platform

*Required

Part II.The evaluation of the existing systems

Evaluation of the CK-12 application
Level of attractiveness

1. Design of the existing system attractiveness? *

- Agree
- Disagree
- Neither agree nor disagree

2. The system is easy and flexible to use *

- Agree
- Disagree
- Neither agree nor disagree

3. User interface of the system is friendly. *

- Agree
- Disagree
- Neither agree nor disagree

4. Which is the most attractiveness part? *

- Lecture note
- Tutorial question
- Video
- Quiz

5. Rate your experience with the system. *

- 1
- 2
- 3
- 4

6. Able to easily find the information needed quickly. *

- Agree
- Disagree
- Neither agree nor disagree

7. Able to understand and learn the lecture notes? *

- Agree
- Disagree
- Neither agree nor disagree

8. Lecture notes appropriate to your level. *

- Agree
- Disagree
- Neither agree nor disagree

9. Able to do the tutorial questions. *

- Agree
- Disagree
- Neither agree nor disagree

10. The system will give error messages that clearly state where is the mistake occurs after solving the questions. *

- Agree
- Disagree
- Neither agree nor diagree

11. The step-by-step question-solving answer is given clearly. *

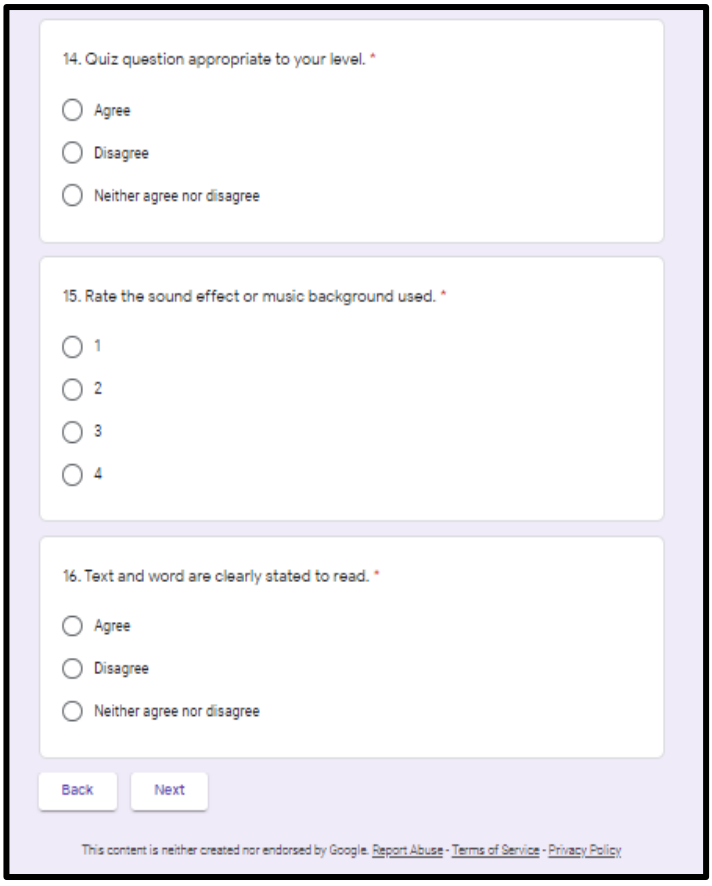
- Agree
- Disagree
- Neither agree nor disagree

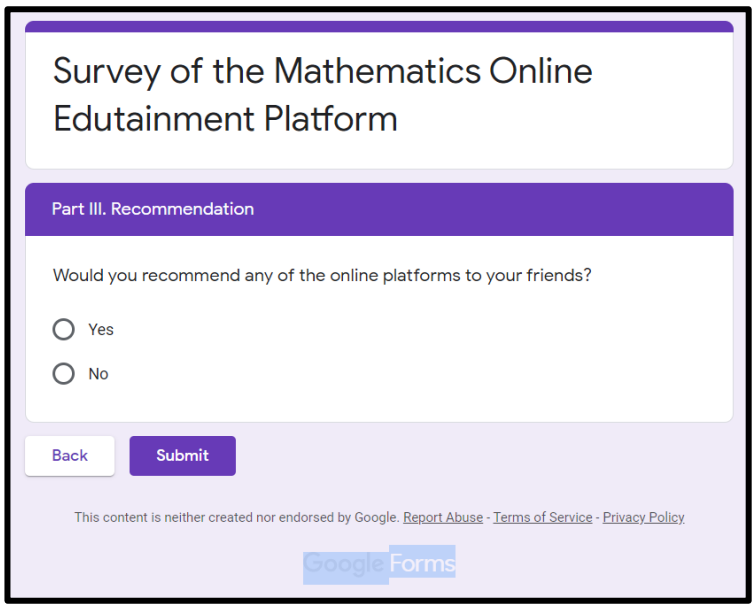
12. Tutorial questions appropriate to your level. *

- Agree
- Disagree
- Neither agree nor disagree

13. Able to understand quiz questions.

- Agree
- Disagree
- Neither agree nor disagree


14. Quiz question appropriate to your level. *
Agree
Disagree
Neither agree nor disagree
15. Rate the sound effect or music background used. *
1
2
3
4
16. Text and word are clearly stated to read. *
Agree
Disagree
Neither agree nor disagree
Back
Next
This content is neither created nor endorsed by Google. Report Abuse - Terms of Service - Privacy Policy

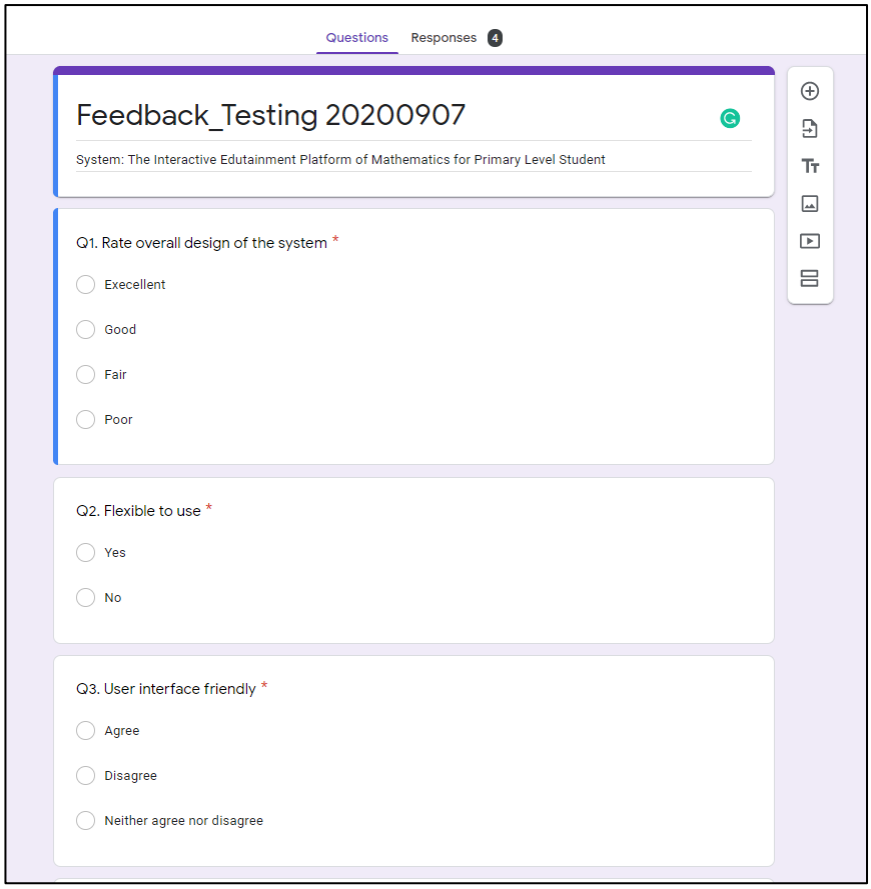

Survey of the Mathematics Online Edutainment Platform
Part III. Recommendation
Would you recommend any of the online platforms to your friends?
Yes
No
Back
Submit
This content is neither created nor endorsed by Google. Report Abuse - Terms of Service - Privacy Policy
Google Forms

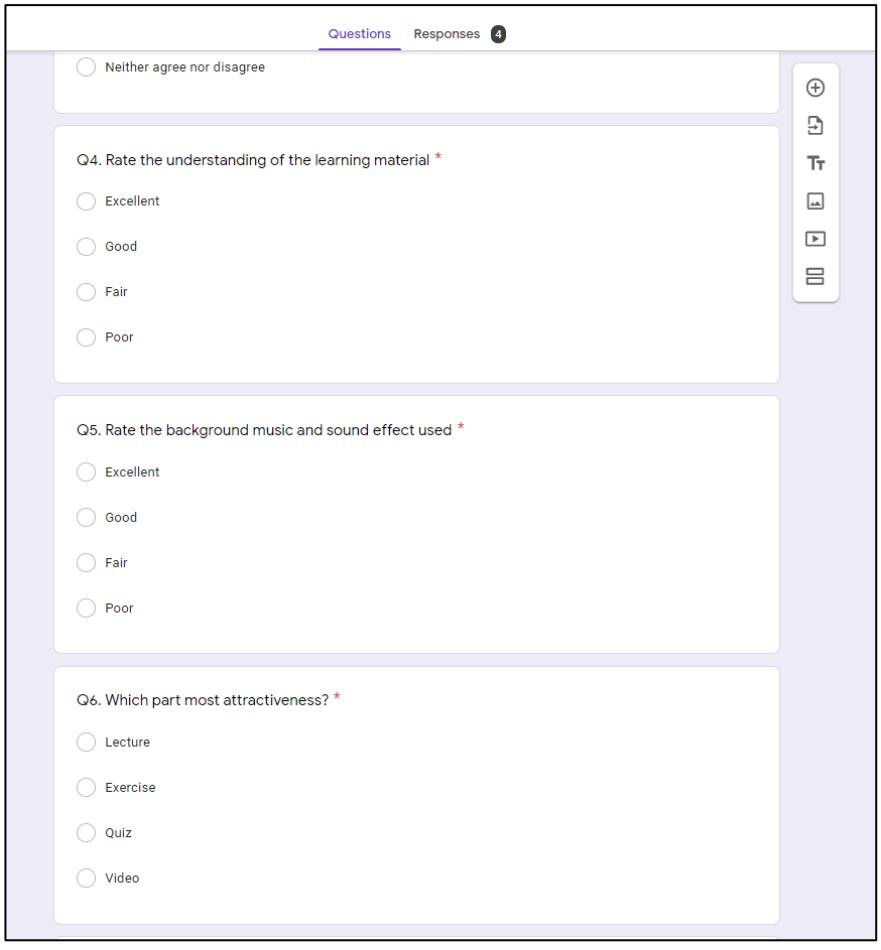
Appendix B

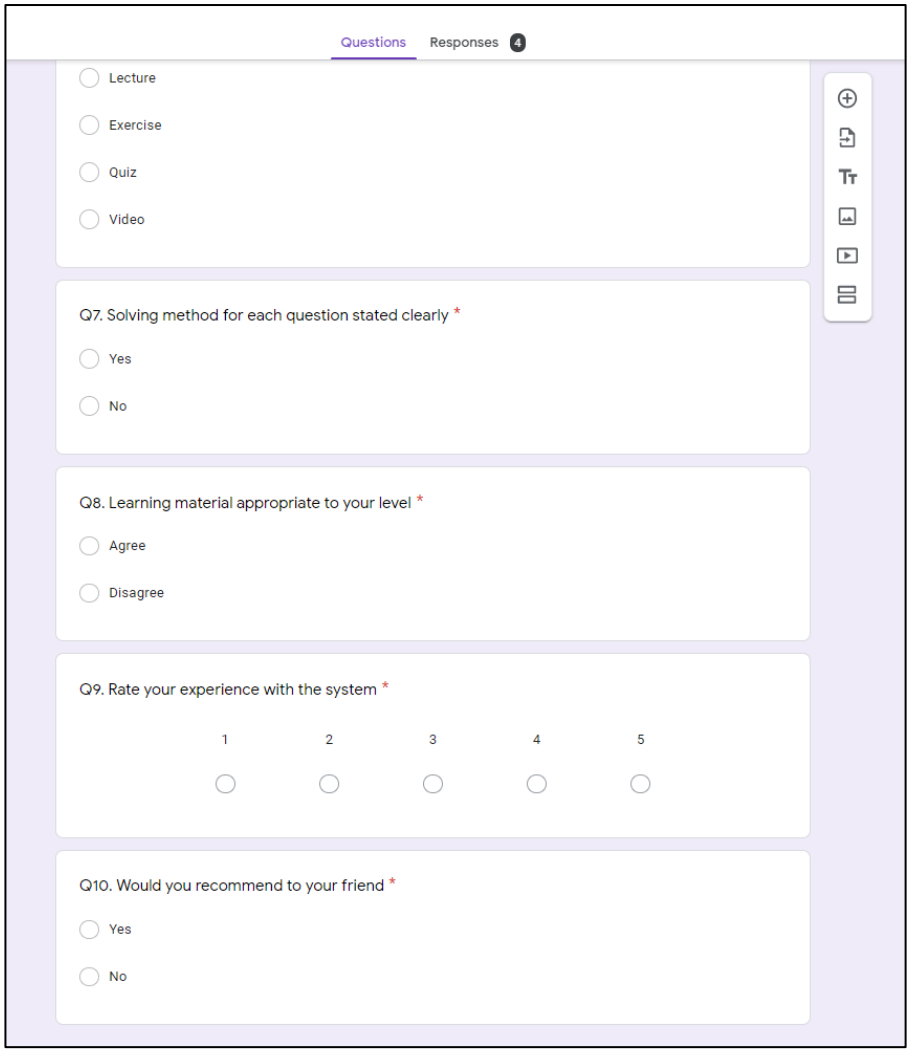
Survey Questionnaire 2 (Testing Process)

1. Rate overall design of the system.
    - Excellent
    - Good
    - Fair
    - Poor
2. Flexible to use?
    - Yes
    - No
3. User interface friendly?
    - Agree
    - Disagree
    - Neither agree nor disagree
4. Rate the understanding of the learning material.
    - Excellent
    - Good
    - Fair
    - Poor
5. Rate the background music and sound effect used.
    - Excellent
    - Good
    - Fair
    - Poor
6. Which part most attractiveness?
    - Lecture
    - Exercise
    - Quiz
    - Video
7. Solving method for each question stated clearly?
    - Yes
    - No

8. Learning material appropriate to your level?
    - Agree
    - Disagree
9. Rate your experience with the system.
    - Rate 1
    - Rate 2
    - Rate 3
    - Rate 4
10. Would you recommend to your friend?
    - Yes
    - No

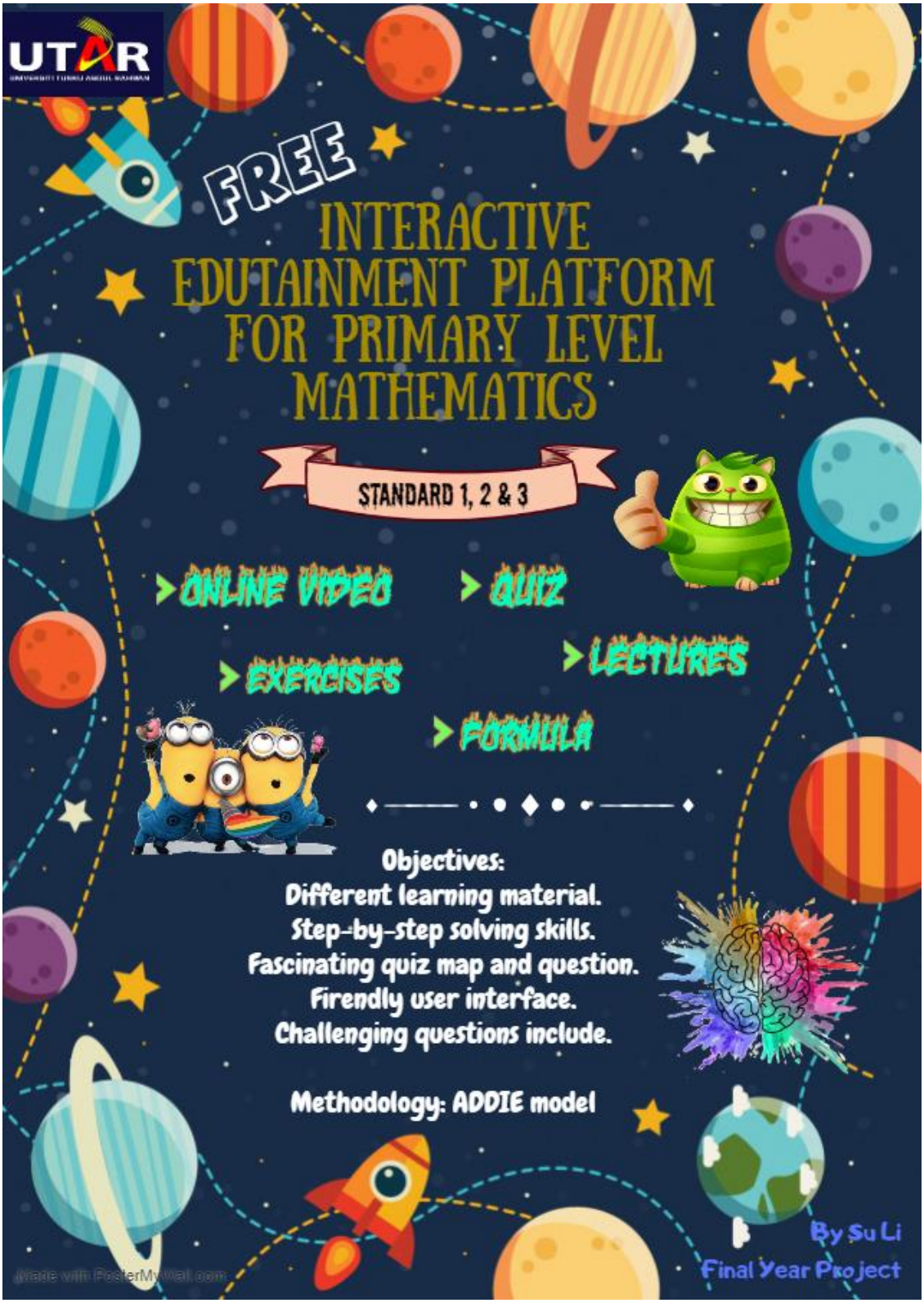

Questions
Responses 4
Feedback_Testing 20200907
System: The Interactive Edutainment Platform of Mathematics for Primary Level Student
Q1. Rate overall design of the system *
Execellent
Good
Fair
Poor
Q2. Flexible to use *
Yes
No
Q3. User interface friendly *
Agree
Disagree
Neither agree nor disagree


Questions
Responses 4
Neither agree nor disagree
Q4. Rate the understanding of the learning material *
Excellent
Good
Fair
Poor
Q5. Rate the background music and sound effect used *
Excellent
Good
Fair
Poor
Q6. Which part most attractiveness? *
Lecture
Exercise
Quiz
Video


Questions
Responses 4
Lecture
Exercise
Quiz
Video
Q7. Solving method for each question stated clearly *
Yes
No
Q8. Learning material appropriate to your level *
Agree
Disagree
Q9. Rate your experience with the system *
1
2
3
4
5
Q10. Would you recommend to your friend *
Yes
No

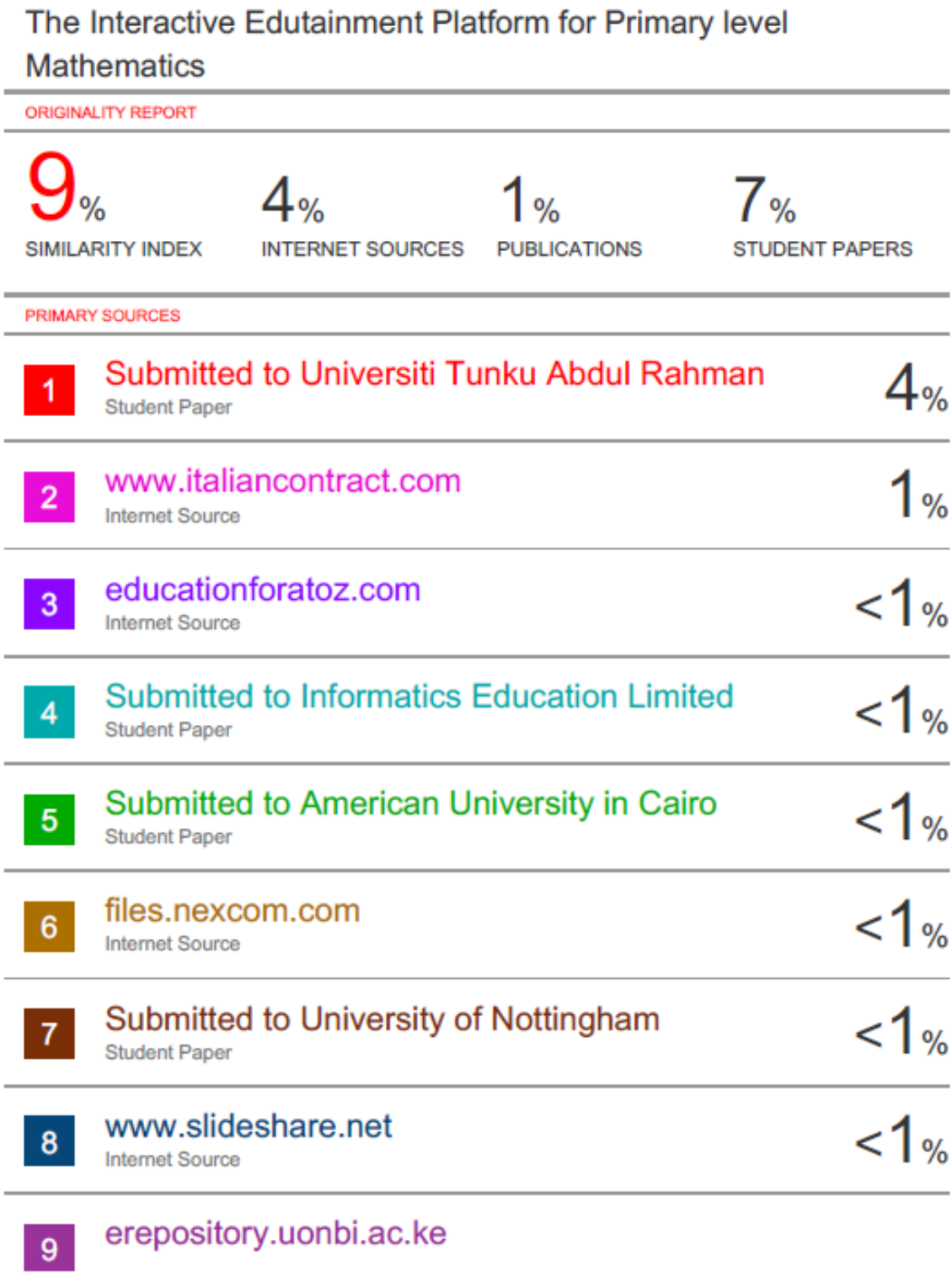
Appendix C

Poster



Appendix D

Plagiarism Check Result



The Interactive Edutainment Platform for Primary level Mathematics

ORIGINALITY REPORT

9%	4%	1%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Universiti Tunku Abdul Rahman Student Paper	4%
2	www.italiancontract.com Internet Source	1%
3	educationforatoz.com Internet Source	<1%
4	Submitted to Informatics Education Limited Student Paper	<1%
5	Submitted to American University in Cairo Student Paper	<1%
6	files.nexcom.com Internet Source	<1%
7	Submitted to University of Nottingham Student Paper	<1%
8	www.slideshare.net Internet Source	<1%
9	erepository.uonbi.ac.ke	

	Internet Source	<1%
10	Submitted to University of Newcastle Student Paper	<1%
11	safelagoon.com Internet Source	<1%
12	www.karanrawat.com Internet Source	<1%
13	www.bbvaopenmind.com Internet Source	<1%
14	Submitted to Grand Canyon University Student Paper	<1%
15	www.researchgate.net Internet Source	<1%
16	aip.scitation.org Internet Source	<1%
17	citeseerx.ist.psu.edu Internet Source	<1%
18	www.mathplayground.com Internet Source	<1%
19	Submitted to University of Brighton Student Paper	<1%
20	hdl.handle.net Internet Source	<1%

21	Submitted to American Intercontinental University Online Student Paper	<1%
22	Submitted to University of Greenwich Student Paper	<1%
23	scholarworks.utrgv.edu Internet Source	<1%
24	core.ac.uk Internet Source	<1%
25	Submitted to University of Bradford Student Paper	<1%
26	www.jotse.org Internet Source	<1%
27	library.umac.mo Internet Source	<1%
28	Submitted to University of Glamorgan Student Paper	<1%
29	eprints.utar.edu.my Internet Source	<1%
30	Submitted to CSU, Long Beach Student Paper	<1%
31	repository.nwu.ac.za Internet Source	<1%

32	"Introducing and Installing Microsoft Vista", Elsevier BV, 2007 Publication	<1%
33	Submitted to (school name not available) Student Paper	<1%
34	link.springer.com Internet Source	<1%
35	docplayer.net Internet Source	<1%
36	tribeau.jp Internet Source	<1%
37	psasir.upm.edu.my Internet Source	<1%
38	www.mdpi.com Internet Source	<1%
39	www.ukessays.com Internet Source	<1%
40	www.fao.org Internet Source	<1%
41	ceur-ws.org Internet Source	<1%
42	ska-sdp.org Internet Source	<1%

Exclude quotes	On	Exclude matches	< 8 words
Exclude bibliography	On		

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Su Li
Assignment title:	FYP 2 Report-Check
Submission title:	The Interactive Edutainment Platfor…
File name:	fyp2_report.docx
File size:	35.94M
Page count:	149
Word count:	21,898
Character count:	112,622
Submission date:	09-Sep-2020 09:42PM (UTC+0800)
Submission ID:	1382706223

Chapter 1

Introduction

1.1 Problem Statement

1. **Lack of interactivity and features of edutainment platform.**

Dissimilar and creative component of cartographic design is one of the most important process. The design of the edutainment platform must be creative and add some unique or additional button feature for user to look forward the tutorial or lecture resources. So, it must not design in a too simple way but the user interface should also not be too complicated. More visual, interactive and ancillary to appeal to multiple learning style is encouraged. "Interactive concepts such as "simulations interactively" or hyperlinked interactivity" (Shiru, 1997), which describe different ways in which the learner can navigate, access and manipulate learning material within a specific learning environment. The higher the interactive with the system, the more motivation, learning outcome and benefit" (Stephan, 2008). "Overall, the more interactive the experience can be, the closer we are to the constructivist pedagogy that encourages the learner to discover, to explore and to construct his own knowledge" (Bruner, 1966).

2. **Lack of information for user to be a reference and clearly understand the solving skills.**

Insufficient of further or more detail information for user to clearly understand the solving method is consider as a poor design system. "A good design allows to visualize difficult and culturally dynamic concepts, promote active learning, problem-solving, and critical thinking with interactive simulations and virtual environments, interact with the content with self-pacers, and access content anytime, anywhere, at any pace" (Huang, 2009, p.224). The system should provide step-by-step solving method for student to follow and they can know the important reasons of doing the previous or next steps. One of the researches conducted that, "The instructions for use of the system should be visible or easily retrievable whenever appropriate" (Nielsen, 1994). Also, one of the researches

1

Appendix E

FINAL YEAR PROJECT WEEKLY REPORT*(Project II)*

Trimester, Year: T2 Y4	**Study week no.: 3**
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

- Search for suitable graphic, animation and background images.
- Create the image of the frame that will use in the system.
- Come out with the standard 1, standard 2 and standard 3 quiz question.

2. WORK TO BE DONE

- Redo all the system
- Design storyboard

3. PROBLEMS ENCOUNTERED

- Lack creative of storyboard design.

4. SELF EVALUATION OF THE PROGRESS

- Spend a lot of time in searching for a suitable background image and music.

Supervisor's signature

Student's signature

Trimester, Year: T2 Y4	**Study week no.: 5**
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

- Edit picture using Paint software.

2. WORK TO BE DONE

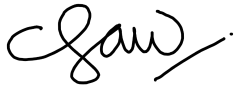
- Finish set lecture note, tutorial question using PowerPoint software.
- Start to develop module.
- Continue design and make some further improvement of the project storyboard.
- Edit graphic and design button images.
- Set the lecture note, tutorial question using PowerPoint software.

3. PROBLEMS ENCOUNTERED

- Lack creative of storyboard design.

4. SELF EVALUATION OF THE PROGRESS

- Moderate in overall progress.



Supervisor's signature

Student's signature

Trimester, Year: T2 Y4	Study week no.: 7
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Finish record the sound effect of button element.

2. WORK TO BE DONE

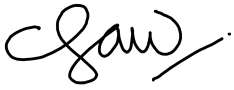
- Edit the length and volume of background music.
- Start to develop standard 1 module.
- Continue design and make some further improvement of the project storyboard.

3. PROBLEMS ENCOUNTERED

- Difficult to get the mathematics primary level textbook.

4. SELF EVALUATION OF THE PROGRESS

- Moderate in overall progress.



Supervisor's signature

Student's signature

Trimester, Year: T2 Y4	Study week no.: 9
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Finish develop standard 1 module.
- Final design of the storyboard is done.

2. WORK TO BE DONE

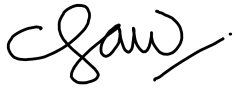
- Start to develop standard 2 and standard 3 module.

3. PROBLEMS ENCOUNTERED

- Unable to access standard 1 lecture module because it may happen some error of the animation graphic that block to open the module.
- Some problem occurred when author try to access the module that have done previously.

4. SELF EVALUATION OF THE PROGRESS

- Moderate in overall progress.



Supervisor's signature

Student's signature

Trimester, Year: T2 Y4	Study week no.:11
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Quiz map, question and explanation of standard 1, 2 and 3 completely developed in the system.
- Finish development of all the standard 1 and standard 2 module.

2. WORK TO BE DONE

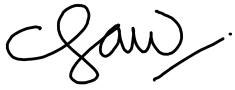
- Import background music and sound effect for each of the button.
- Finish the methodology, storyboard and flowchart of the report.
- Finish the flowchart and storyboard of the FYP report.
- Finish development of standard 3 module.
- Collect feedback from respondent which range between the age of 7 to 10 years old

3. PROBLEMS ENCOUNTERED

- All the background graphics and button are not arranged nicely and tidy.

4. SELF EVALUATION OF THE PROGRESS

- Moderate in overall progress.



Supervisor's signature

Student's signature

Trimester, Year: T2 Y4	Study week no.: 13
Student Name & ID: Su Li 15ACB03065	
Supervisor: Ms. Saw Seow Hui	
Project Title: Interactive Edutainment Platform for Primary Level Mathematics	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Finalized report is done.
- All the module includes background music and the sound effect should be done in for every button.
- Combine all the module and publish as .EXE file format using Adobe Director.
- Upload for the Turnitin check.
- Check and test system whether it is function.

2. WORK TO BE DONE

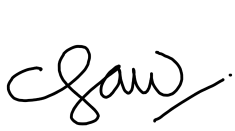
- Prepare the presentation slide and record into a video before deadline.
- Submit FYP system.

3. PROBLEMS ENCOUNTERED

- Forget and find some difficulty on how to break and change the page numbering of FYP report.

4. SELF EVALUATION OF THE PROGRESS

- Moderate in overall progress.



Supervisor's signature

Student's signature

Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	SU LI
ID Number(s)	15ACB03065
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONS) INFORMATION SYSTEMS ENGINEERING (IA)
Title of Final Year Project	The Interactive Edutainment Platform for Primary Level Mathematics

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: 9 **%** **Similarity by source** Internet Sources: 4 % Publications: 1 % Student Papers: 7 %	
Number of individual sources listed of more than 3% similarity: _____	
Parameters of originality required and limits approved by UTAR are as Follows: **(i) Overall similarity index is 20% and below, and** **(ii) Matching of individual sources listed must be less than 3% each, and** **(iii) Matching texts in continuous block must not exceed 8 words** ***Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.***	

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: SAW SEOW HUI

Date: 11/09/2020

Signature of Co-Supervisor

Name: _____

Date: _____

BIS (Hons) Information Systems Engineering
Faculty of Information and Communication Technology (Kampar Campus), UTAR

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	15ACB03065
Student Name	SU LI
Supervisor Name	MS. SAW SEOW HUI

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
√	Front Cover
√	Signed Report Status Declaration Form
√	Title Page
√	Signed form of the Declaration of Originality
√	Acknowledgement
√	Abstract
√	Table of Contents
√	List of Figures (if applicable)
√	List of Tables (if applicable)
√	List of Symbols (if applicable)
√	List of Abbreviations (if applicable)
√	Chapters / Content
√	Bibliography (or References)
√	All references in bibliography are cited in the thesis, especially in the chapter of literature review
√	Appendices (if applicable)
√	Poster
√	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report. _____ (Signature of Student) Date: 09th September 2020	Supervisor verification. Report with incorrect format can get 5 mark (1 grade) reduction. _____ (Signature of Supervisor) Date: 11/09/2020