

Learner-Centred Pedagogical Model Courseware for Science Education

By

Tan Zan Lixn

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

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BACHELOR OF INFORMATION SYSTEMS (HONS)

BUSINESS INFORMATION SYSTEMS

Faculty of Information and Communication Technology

(Perak Campus)

May 2019



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FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (PERAK CAMPUS)

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I would like to express my sincere thanks and appreciation to my supervisors, Dr. Lee Chen Kang who has given me this bright opportunity to engage in an Educational Courseware project. It is my first step to establish a career in education field. A million thanks to you.

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ABSTRACT

Interactive multimedia courseware is able to enhance the learning experience especially for secondary student when they are having science subject as it is difficult to imagine how the science works. The main purpose for developing this multimedia courseware is to help students have better understanding and virtual demo in order to provide them a better concept to capture those science knowledge. Besides, the targeted audiences are upper secondary school students who are studying physics. By developing this project, ADDIE model will applied as the methodology for instructional design where it consists of five phases which are analysis, design, development, implementation and evaluation. These five phases are able to help author to develop a suitable and appropriate educational courseware for the students. This educational courseware is divided into 2 projects which are Final Year Project I and Final Year Project II. Moreover, this project is to provide motivation for students during learning Physics process as the courseware consists of interesting multimedia elements, animation, audio, text and graphic to allow students keep away from the traditional learning process which is less motivation to learn. On the other hand, as an instructor has advantages in delivering knowledge by using the multimedia courseware because the courseware is able to provide scenarios and virtual images for the students instead of telling them in words.

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CHAPTER 1 Introduction

1.1 Introduction

Generally, Multimedia is content with combination of 5 elements such as text, audio, images, animations and video which can deliver message by displaying and interact with users. Multimedia also can be store and retrieve content by using electrical devices or gadgets. Following the trend of technology, multimedia has become part of people daily life as everyone own at least one smart electric device and interact with each other through the internet. Not only that, multimedia is also used to enrich most of the sector around the world such as business, education, entertainment and medical. Thereby, the uses and importance of multimedia has been amplified in every industry and daily life.

First of all, multimedia has brought innovative changes in education field. Government and private company start to develop education courseware that able to attract youngsters and learners in study. With interesting animation and pictures, learners are able to extract the knowledge easily as “A picture is worth a thousand words”. Thereby, multimedia also implemented in entertainment field. People can enjoy any TV programmes from the television or Viral Video from the internet. Video game, line chatting and drawing pictures in computer are the contribution of multimedia as well.

Especially Medical field, multimedia act as important role as used in diagnosing the diseases and prescribing medicines. As result of applying multimedia, a great enhancement and improvement technology in medical field brings solutions and cure against diseases. In recent years, a new technology has been implemented which is Virtual Reality. It allows user to interact with computer in a simulated environment. Users may learn and practice as a professional in simulated environment such as piloting and surgery training which are not allow any mistakes.

Lastly, it can be concluded that multimedia is a great invention in a modern era which bring benefits and widely used in every industry and sector. As result, people are able to live in a better quality lifestyle due to evolution and utilization of multimedia.

1.2 Problem Statement and Motivation

1. Bad visualization is found by students while using the courseware. “Developing ACM Computing Curriculum Courseware on Graphics and Visual computing” (Czanner, 2002) stated that visualization is the important element while developing a courseware. Education courseware has been developed in years. As the current application is weak designed with bad combination of colour and uncomfortable contrast for users. This may causes the users will not interested of using it and have bad experiences during the learning process. Besides, nowadays, graphic has become an important element in term of technology. Users are desired on good graphic condition which able to bring them interest. With a better development on graphic visualization, users may gradually increasing the interest of learning on education courseware.

2. Full of lecture in current educational courseware is difficult to bring interest for students. “The Current Problems in Multimedia Courseware Teaching and Relevant Suggestion” (Song, 2002) stated that excessive amount of information is one of the problems in Multimedia Courseware. Students will extract more knowledge by using hands-on controls. There is no differences against the traditional teaching method as current application consists of full of lecture to deliver the knowledges and contents. However, by just providing animations and audios, show how the physics works is not efficient to allow students absorb what they should learnt since they are just listening instead of practicing. Thereby, lack of interest from students that do not able to highlight the purpose of using educational courseware.

3. Students are found lack of interest while using the current educational courseware. “Using Teaching Courseware to Enhance Classroom Interaction as a Method of Knowledge Sharing” (AiniArifah, 2013) mentioned that students are lack of interest while using educational courseware. E-learning is a new trend in school since government desire to develop E-learning application for students in 2008. However, the current education courseware do not brings any interest for the students due to weak design and boring lectures in the application. Therefore, students do not able to extract the information and knowledge from the education courseware effectively. Not only that, some of the education courseware consists of high complexity of manipulation which confused users.

1.3 Project Objectives

1. To study the usage of multimedia in educational courseware. The traditional teaching method may bring down the interest of learning for students. As using a text book with full of textual to deliver knowledge is not an effective way for student to learn. Therefore, multimedia has been applied in this digital world which able to bring any attractive and interactive for the learners. Not only in education field, multimedia is applied in every industry and interact with users in order to achieve work to be done. Students are able to have their own learning process and extract the knowledge from the application by using the easy and simple controls.

2. To design and develop a more interactivity and user-friendly of education courseware for students. Most of the existing education courseware required complex manipulating skills that make students confused to use. Not only this, some of the courseware are even lack of basic knowledge for students in order to understand the concept for certain topics. Thereby, the purpose of this project is to design a more user-friendly and high richness of contents and knowledges of education courseware for students. By using simple techniques for design, students are able to clearly understand the contents in the simplest and fastest way.

3. To evaluate the students learning experience while using multimedia courseware. A creative and innovative educational courseware may bring more interest in learning process. Nowadays, manipulate any electronic devices is not a difficult matter for students. With high interactivity, students will willing to explore to know more and found how challenged they are. The educational courseware is designed almost equivalent concept with reality. It is to allow students to capture better pictures and imagination how the physics works. As an image is better than a thousand words.

1.4 Project Scope

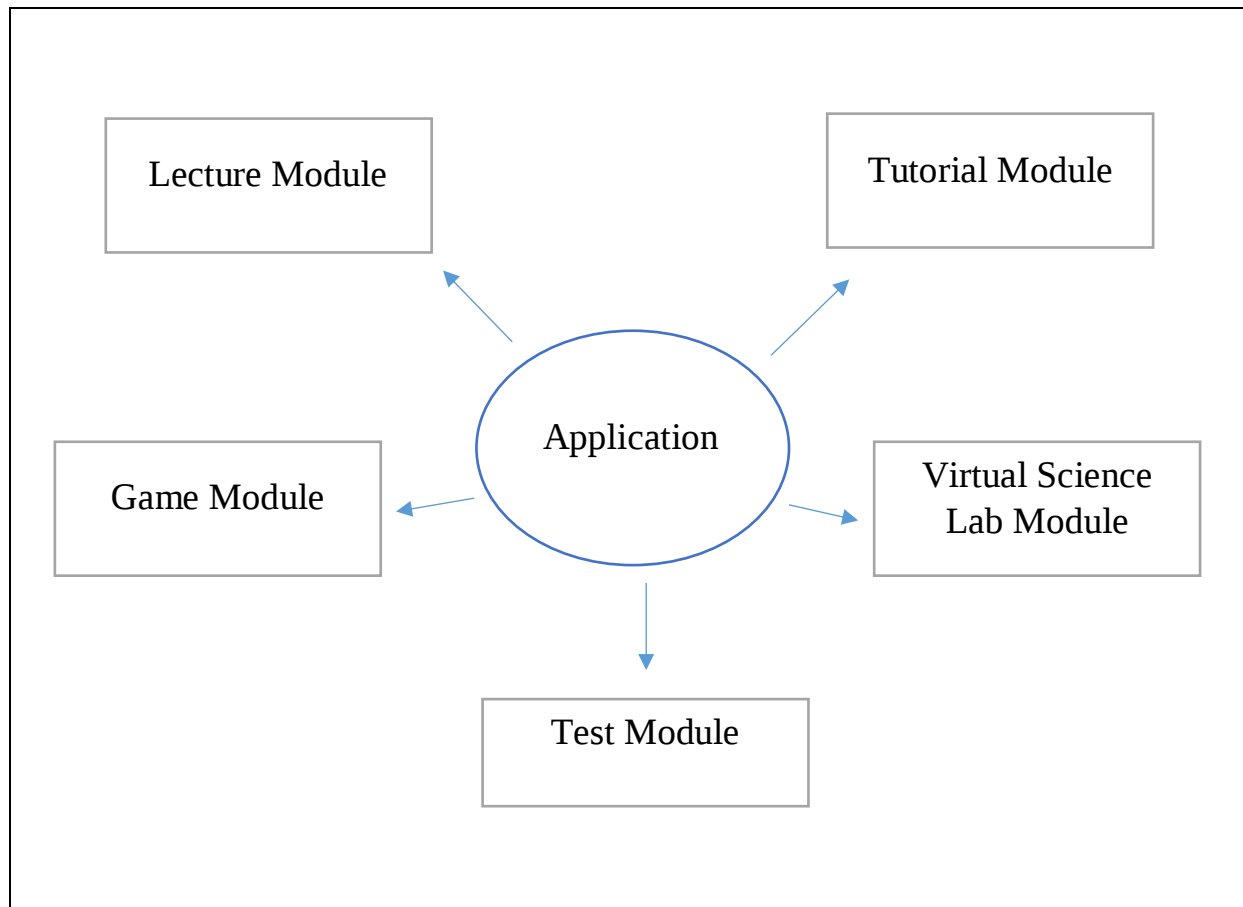


Figure 1.1 Modules for project scope

Modules

1.4.1 Lecture Module

For Lecture Module, it consists of explanation on certain topics and also include animations and audio to show how the physics works to the students. Selection for section will be provided as it consists of several sub topics and sections in a topic. Students are allowed to pick any sub topic that they are confused of and have a better understanding to consolidate their knowledge.

1.4.2 Tutorial Module

For Tutorial Modules, it comes after lecture modules. Based on the lecture module's explanation, students are required to answer the questions from tutorial modules. Tutorial modules will provide various questions in order to allow students solve the question by using the knowledge that they learnt. By practicing on questions, students are able to extract the knowledge instantly instead of just memorizing the theory which full of texts.

1.4.3 Game Module

For Game Modules, it is also an educational module instead of entertaining. It may highly increase the interest of learning while playing the game that content with physics. Game with full of animation, pictures and audio is the easiest way to attract students' attention. The most important function is allow students manipulate the application by themselves and able to have their own experience in learning process.

1.4.4 Virtual Science Lab Module

For Virtual Science Lab Modules, it is to help students have a basic concept for certain topics by providing a lab experiment on how to construct an experiment based on the formula. Students will easily understand how the experiments work and also know how to apply the formula in order to complete an experiment. Lab Modules will demonstrate how to apply formula and how to manipulate the tools in the application with interactive content.

1.4.5 Test Module

For Test Modules, it is a scenario tests for students in order to identify how the students apply the knowledge that have learned and provide correct answer in this application. By providing several scenario, students are able to identify different scenario and conditions may affect different outcomes. With providing different scenario, students are able to determine the minority differences and have better understanding the knowledge that the application trying to deliver.

1.5 Target Audience

The main target audience for this project is Form 4 and Form 5 students who are normally aged 16 and 17 years old in secondary school. Students in science stream are targeted as there are also other streams in secondary school. For science students, there are several science subjects such as Physics, Chemistry and Biology. Each of the subjects consists of 2 hours lecture class and 1 hour for lab session. Based on the education syllabus in Malaysia, students are required to attend all the class within 10 months. Thereby, teachers in school are required to finish all the chapters on time. Students are having crowded schedule as there are also numerous subjects to take care of. Especially, students who are in science stream are required strong foundation knowledge while constructing any experiment. Hence, an efficient and effective learning process is required for the students in secondary school.

CHAPTER 2 Literature Review

2.1 Multimedia

2.1.1 Linear Multimedia

Linear multimedia is a type of multimedia way to deliver and present the message in sequence and flow that contain a starting point to the end point. For instances, power point presentation slides, slideshow of pictures, a movie, and any videos. The purpose of Linear Multimedia is intend to display with less interaction for the users or audiences. By displaying the slides show or video in sequence which is arranged in order early, users have not much interaction with it as the purpose of linear multimedia is to entertain and deliver information and knowledge to the user. The benefit for applying Linear Multimedia is allow audience and user to concentrate on the materials that provide in the slide shows and extract it in efficient way. However, Linear Multimedia is not able to provide much interactivities for the users and audience such as hands-on activity.

2.1.2 Interactive Multimedia

Interactive Multimedia is a type of multimedia way that able to provide hands-on activities for the users such as control, combine and manipulate on the multimedia elements which are audio, animation, text, graphic and video. Most of the examples for Interactive Multimedia are video games, electronic devices, educational courseware and any type of simulator. It is able to provide a platform for users to have high interactivity with the system. Not only that, Interactive Multimedia also can defined as a package of integrated materials and display them to the users in order to allow users to take control or manipulate them by following their choices. The interesting part of Interactive Multimedia for the users is able to personalize with any multimedia elements based on their preferences which brings satisfaction and sense of capable while interacting with Linear Multimedia.

2.2 Interactive Multimedia

2.2.1 Benefits

The advantages of Interactive Multimedia are able to assist user to increase their motivation and bring more interests during learning process. User is more prefer on any hand-on activity which allow them to explore and learn themselves instead of sitting and listening what instructor or teacher request to follow. User is always curious on something interactive and willing to have a try. Hence, they will learn if applying Interactive Multimedia in education.

2.2.2 Limitations

As Interactive Multimedia is able to provide interactivity and bring more interest for users and yet it also may lead user to distract the focus from the lesson and knowledge which are important and necessary to extract. Besides, creating Interactive Multimedia is time consuming because of the editing and developing works. Thus, the project planning will help to manage a well complete project in order to accomplish the available time and resources. Not only this, Interactive Multimedia does not allow to edit if there is any errors and bugs after render. It is crucial to request developer to ensure the software system in zero-error condition and provide users to have better experience during interaction.

2.3 Application in Multimedia

2.3.1 Multimedia in Education

Multimedia has been applied in every industry which represent the functionality of Multimedia is wide usage and provide efficiency for everyone. Especially in Education, multimedia has been utilized to create education courseware with knowledge contents for students. Students will extract and learn in effective and efficient way. However, problems are still exist as students find difficulties and do not have interest while using the current educational courseware.

2.3.2 Multimedia in Entertainment

Multimedia applied in Entertainment is the most common as good combination of multimedia elements will bring joyful and interest for audience. Video game, TV programmes, Radio and mobile apps are the examples that done by using multimedia elements. On the past, the multimedia is came from CD or DVD and now everyone can get it online with required little time to download it.

2.3.3 Multimedia in Science/ Medical Science

As the development of technology is growing rapidly, part of it is credit to multimedia. Multimedia helps not only in education and also science and medical which able to allow the study of these fields reach an advanced situation. For example, doctor is able to communicate using video call features to doctors in oversea who are expertise and ask for advice and knowledge. This is a good scenario for medical field which able to enhance the learning process for all the doctors and also people.

2.3.4 Multimedia in Business

Multimedia is applied in business field for business tools. The business software is designed by using multimedia to assist in the business. Users can make use of the software by click the icon or button to generate the outcomes which they desire to. Multimedia is been used in business widely as it is not only helping to enhance the efficiency of business process and also deliver message to people in effective ways. For example, advertising, profile of company,

business documents and communication tools are apply concept of multimedia in order to perform works

2.4 Multimedia in Science Education

Applying multimedia in education is a good way to deliver knowledge especially in Science. As Science subject is always come with listening and imagination if the materials for an experiment is budgeted for a school. Therefore, designing a science educational courseware is able to allow students consolidate the concept of science theory with animation and video instead of listening words from teacher and reading from a textbook. Not only that, the traditional way of teaching method is not able to bring interest which is less motivation for the students. Hence, interacting with Science educational course, students may find interest and motivation to learn and explore. It is a completely different ways during learning process and experience for the students.

2.5 Comparison of similar multimedia applications

2.5.1 Buoyancy Application

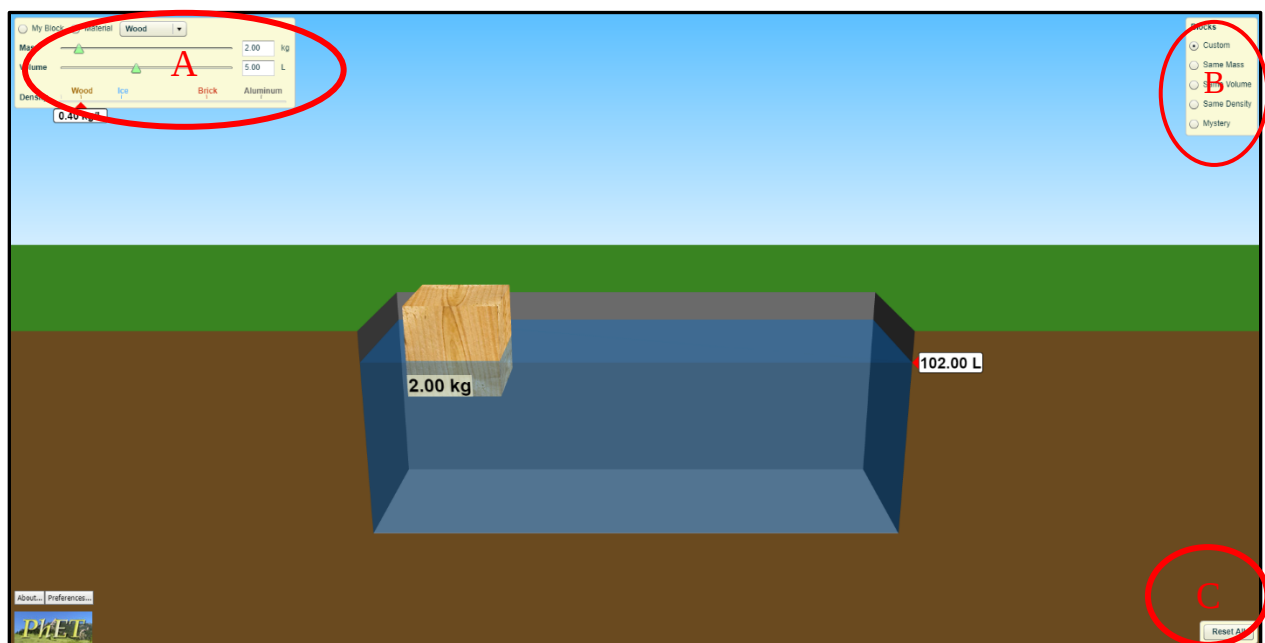


Figure 2.1 Screenshot of Buoyancy application (University of Colorado, 2004-2011)

Buoyancy is a physic simulator application which allow secondary school student to understand the concept of density and the relationship between mass and volume. In order to investigate the floating level among the blocks, users are able to drag and drop any block into the water and observe the result. For Label A, there is a setting which allow the users to select customized brick and several materials of bricks which are wood, ice, brick and aluminium. For Label B, users are allow to set the block with different modes to do comparison with same mass, volume or density. In fact, students are able to differentiate the floating level by using different materials of bricks in water. For Label C, users also allowed to reset the interface to default.

The strength for the Buoyancy application is allow users to customize the mass and volume for the brick and put in the water. It is a very good feature to allow students the relationships between mass and volume in the water. Not only that, the interface of this application is easy to understand that labelled with texts and images. However, there is no audio applied that able to make this application more interesting and fun to users.

2.5.2 Circuit Construction Kit Application



Figure 2.2 Screenshot of Circuit Construction Kit (University of Colorado, 2004-2011)

Circuit Construction Kit is a physic application that designed to allow student how the electric circuit been constructed and the flow of voltage and electrons. For Label A, users are allow to pick any parts of the electric tools by dragging and dropping to construct a proper electric circuit. In order to let students understand more on how the electric circuit works, this application consists of different setting with visual, tools, size and the wire of resistivity. Students are able to construct the electric circuit in this application and try whether the circuits done by them are finely work. For example, the light bulb will burn or will not switch on if the circuit is been done wrongly. For Label B, extra features and tools are added to construct an electric circuit in advance. Especially, users can refer to the chart which display the usage of Current and Voltage as it is important and meaningful details to understand the flow of an electric circuit.

The strength of this application is availability of different electric parts with different features in order to construct a proper electric circuit. However, there is a minor limitation for users that only allow reset the whole interface without undo button if the users accidentally made a mistake. It may cause inconvenient while constructing an electric circuit. Not only that, although there are many texts displayed on settings but users are not able to find any guide to manipulate this application if he or she is lack of computer skills

2.5.3 Energy Skate Park Application

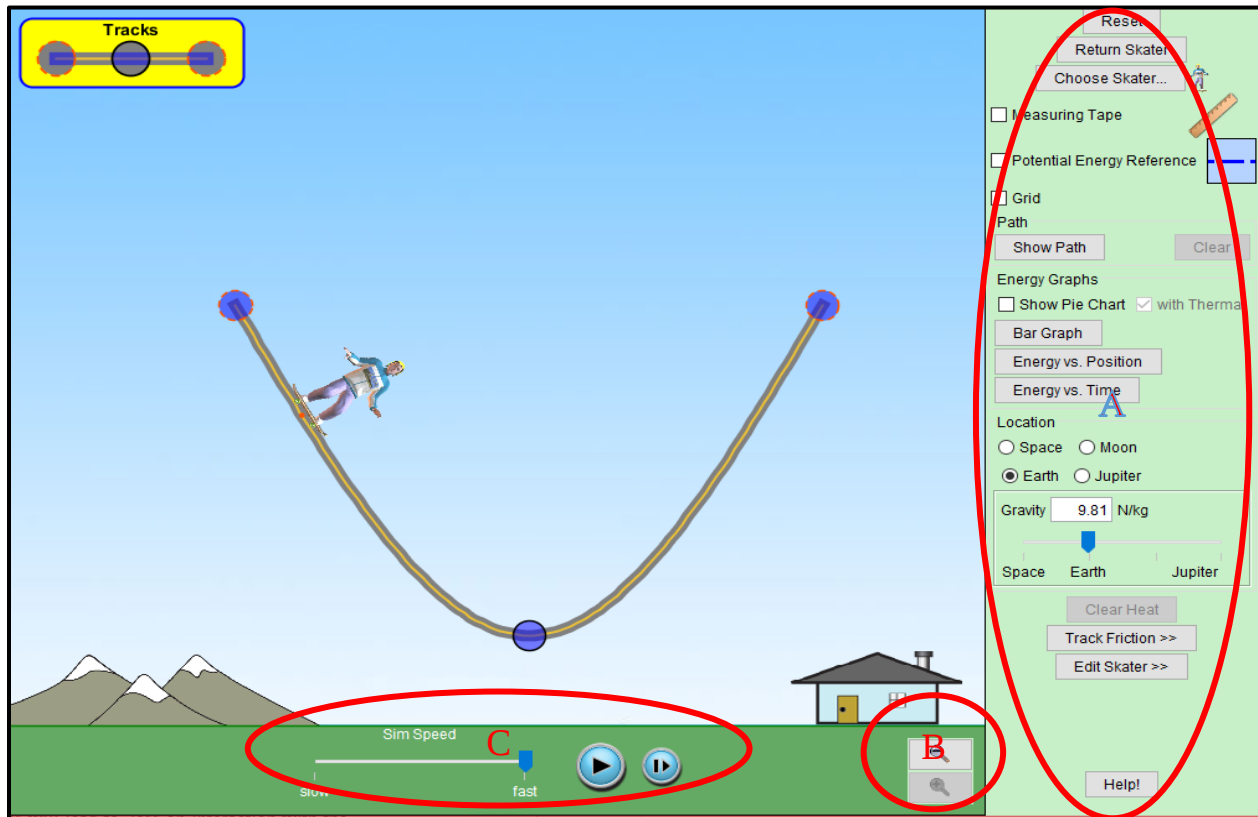


Figure 2.3 Screenshot of Energy Skate Park Application (University of Colorado, 2004-2012)

The screenshot shows above is Energy Skate Park Application that about the transformation of energy. In this application, users are able to create an own path for the skater by their imagination and observe the transformation of energy which consist of gravity, kinetic energy, potential energy and thermal energy. For Label A, it is a setting that allow users to have a design of different conditions and environment which may affect different results for the skater. Users may allow to observe the energy by clicking the check box of Show Pie Chart and to show the transformation of energy in a pie chart to users. Other than that, different location with different gravity setting may cause different results. For label B, users can zoom out to have more spaces to create a longer path in order to identify the transformation of energy. Furthermore, there is a play and fast forward button to allow users to pause the skater while constructing a path for the skater.

The strength of Energy Skate Park is able to customize a path and skaters in many different ways to allow students understand the concept of energy in advance. By creating paths for the skater, students will have fun and interest and observe the skater that make any possible movement on the path. Moreover, this application also apply an artistic background image and smooth animation for the skater. Although this application has good looking interface, and yet it can also implement the audio for the skater to make ease of identifying the force energy. For example, the skater is screaming louder represents the kinetic energy is getting higher.

2.5.4 Mass Spring Application

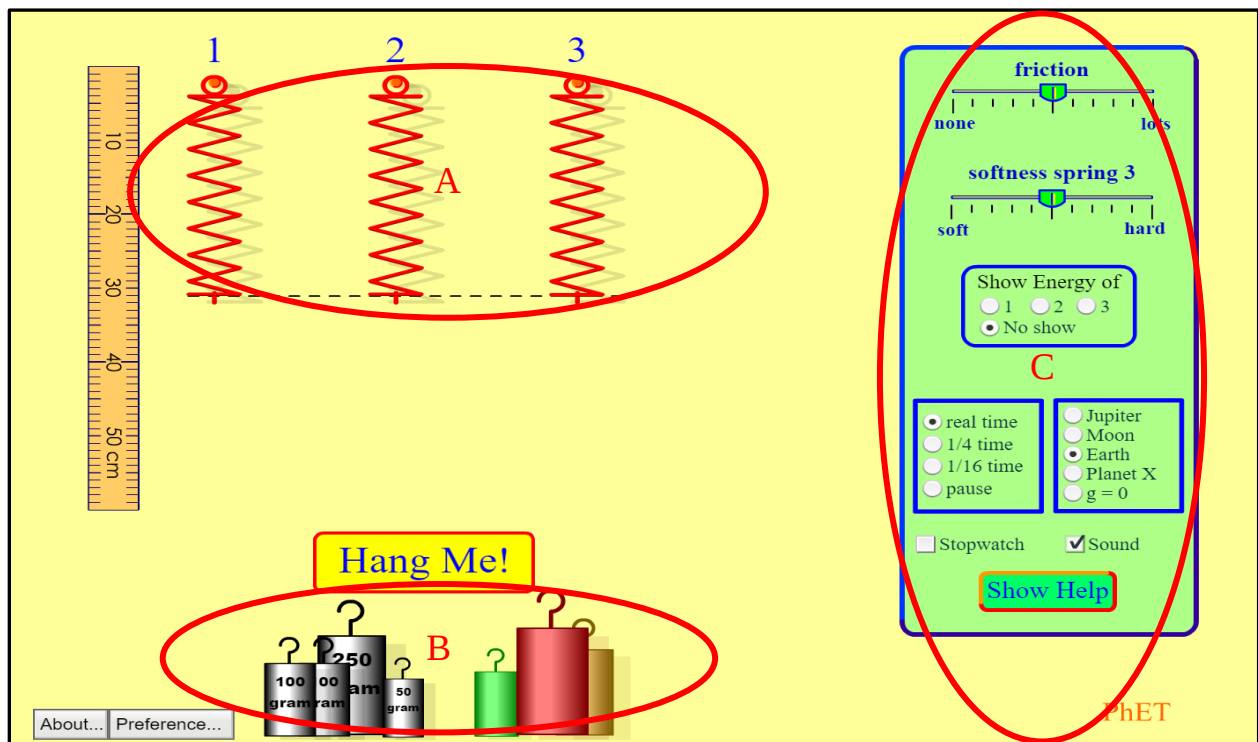


Figure 2.4 Screenshot of Mass Spring Application (University of Colorado, 2004-2011)

The screenshot above is Mass Spring Application. It is an application to study on how mass and friction affect the tension for different types of spring. For Label A, it provides 3 similar springs and ruler which allow the users to place different weights (Label B) and identify the differences among the 3 springs. Users can just dragging the weights and place them on the end of the springs. In order to understand in more details which able to obtain different results for the

tension of springs, users are able to adjust the setting as shown in Label C. By having different settings, the springs can be resulted in different ways to show how the manipulative variables affect the respond variables in Conservation of Energy topic.

The strength which impressed for this application is do apply audio for the weight dropping instead of others. Different weights produce different level of volume. Not only that, from Label C, it provides a simple guide for users on how to manipulate the application. On the other hand, there is a weakness for this application. It implements bad combination of colours which do not brings artistic vision to the users.

2.5.5 Balancing Act Application

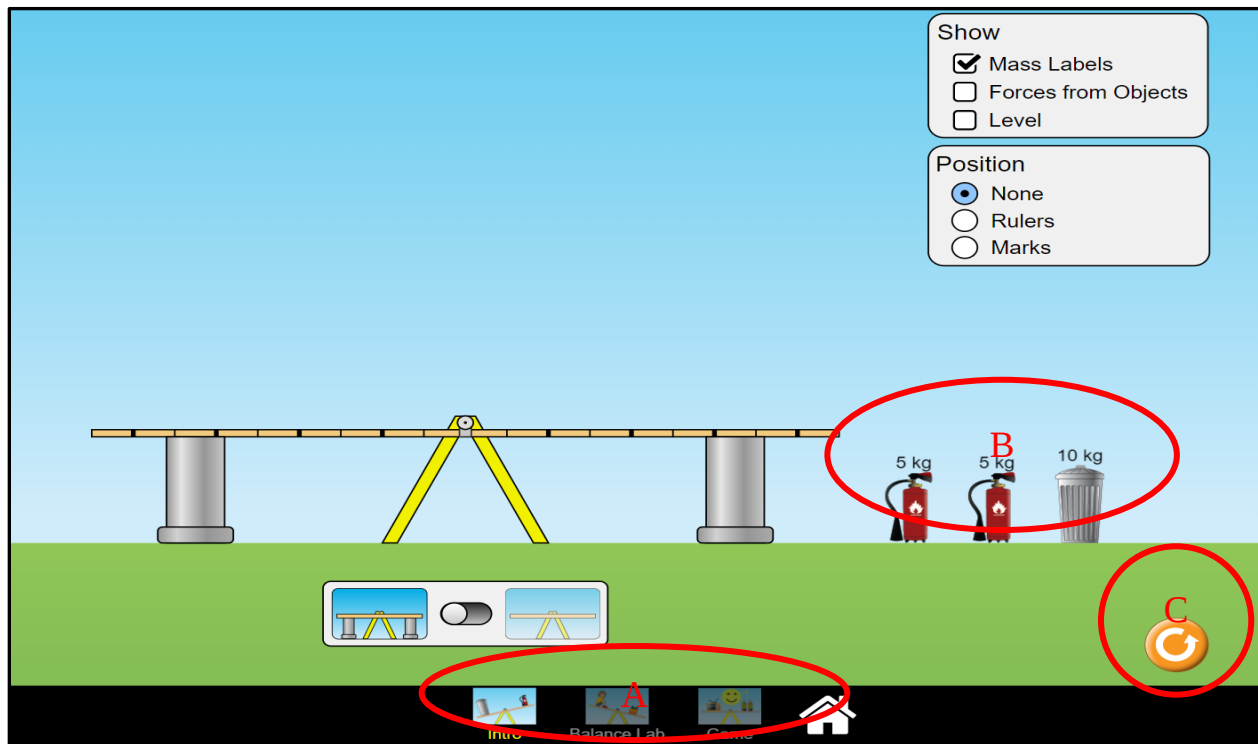


Figure 2.5 Screenshot of Balancing Act Application (University of Colorado Boulder, 2004-2016)

Balancing Act Application provides 3 different modes for users which are Introduction, Balance Lab and Game to allow users to have better understanding on Rotational Equilibrium topic. In these 3 modes (Label A), the similarity among them is providing a teeter totter to allow users

have fun with the weights. The purpose for placing the weights (Label B) is to identify how to balance the teeter totter with different weights on different spot. Besides, the most interesting part is in Game mode which consists of 6 stages for each difficulty levels. With the gaming mode, it is to allow students to have better understanding on concept of balancing while having fun. This application is user-friendly as it also provides a reset button (Label C) if users did any mistakes.

The strength for this application is implementing a good combination of colours as the colours on the interface are soft and have good contrast. Not only that, this application is easy to be manipulated although there is no guide for the users. However, audio only applied in Game Mode when you successfully pass a stage with high scores.

2.6 Summary of the Similar Applications

2.6.1 Comparison Table of Multimedia Element for Similar Applications

Application Name	Multimedia Element					
	Audio	Animation		Text	Graphic	Video
		2D	3D			
Buoyancy (University of Colorado, 2004-2011)		√		√	√	
Circuit Construct Kit (University of Colorado, 2004-2011)		√		√	√	
Energy Skate Park (University of Colorado, 2004-2012)		√		√	√	
Mass Spring (University of Colorado, 2004-2011)	√	√		√	√	
Balancing Act (University of Colorado Boulder, 2004-2016)	√	√		√	√	

Table 2.1 Comparison Table of Multimedia Element for Similar Applications

2.6.2 Comparison Table of criteria for similar applications

Application Name	Interface Design			Content	Interactivity
	Navigation	Color	User Friendliness		
Buoyancy (University of Colorado, 2004-2011)	3	3	3	4	4
Circuit Construct Kit (University of Colorado, 2004-2011)	2	2	2	3	3
Energy Skate Park (University of Colorado, 2004-2012)	4	4	4	3	5
Mass Spring (University of Colorado, 2004-2011)	3	2	4	4	3
Balancing Act (University of Colorado Boulder, 2004-2016)	4	5	4	4	4

5 – Excellent 4 – Good 3 – Average 2 – Poor 1 – Bad

Table 2.2 Comparison Table of criteria for Similar Applications

2.7 Learning Approach (Learner Centred Approach)

Learning Centred Approach is a different method of learning experience that consists of high variety education programs. As we known, learning in school and university usually comes with a set of teaching method as lecturer or teacher present with teaching materials to many students. However, Learning Centred Approach is active and self-manage learning process for the students. It is completely rely on independence and responsibility for students. It also focus on the learning process and outcomes which refer to students learning experience and results instead of the traditional learning with rely on the syllabus and lecture which is input. Besides, Learning Centred Approach encourages explicit skill instruction that allow students able to think, solve problem, evaluate, analyse and generate hypotheses. These learning skills are not able to extract from the traditional learning. By overtime, students are completely equip capable skills in order to accomplish in the industry.

Thereby, applying Learning Centred Approach for the project is completely appropriate for learners as educational courseware is able to provide learners self-manage and independent learning experience instead of just listening and memorizing the knowledge from teachers and text books. As learning process and outcomes are preferable, students will encouraged to have hands-on activity which is more joyful and interested compare the traditional way with intentionally keep the complicated knowledge in memory.

2.8 User Requirement Data Collection and Analysis

In order to analyze how students react to current educational courseware, questionnaires has been conducted by 30 respondents who are secondary students. It is important to investigate students' preferences to develop better educational courseware. An online survey has been implemented by google form for data collection and analysis.

The questions has designed and attached as Appendix at page G.

1. Gender:

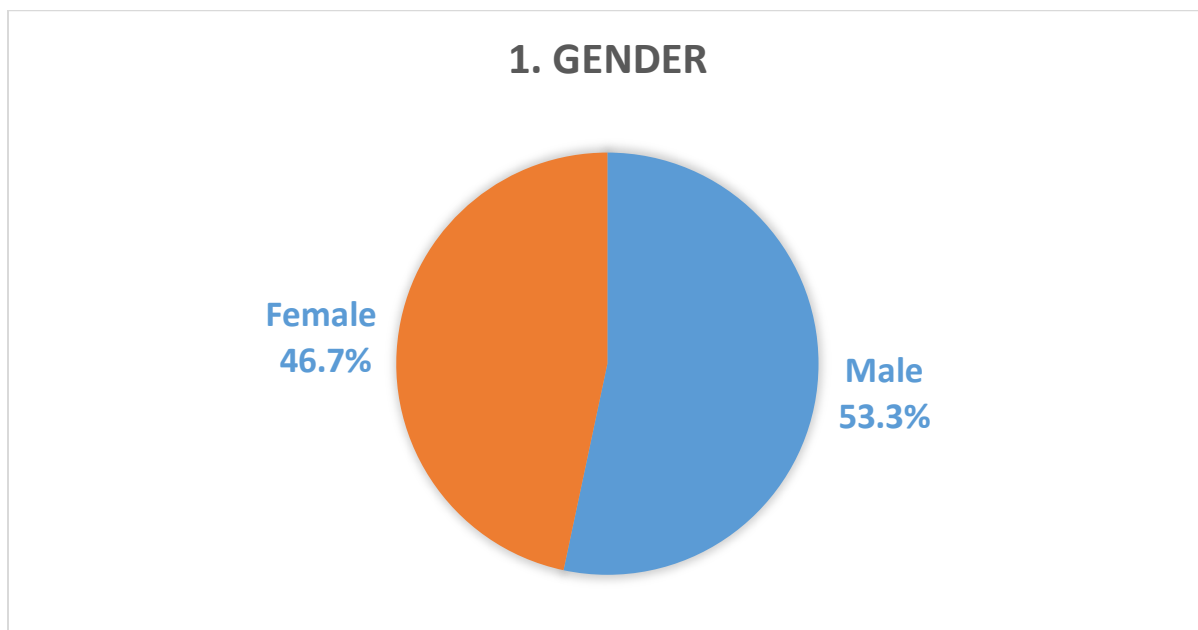


Figure 2.6 Pie chart of representing the percentage of all the respondents' gender

As refer to Figure, the chart shows that all the respondents who are students and participating in the survey question which include 46.7% of female and 53.3% of male.

2. Do you experience courseware before for your learning?

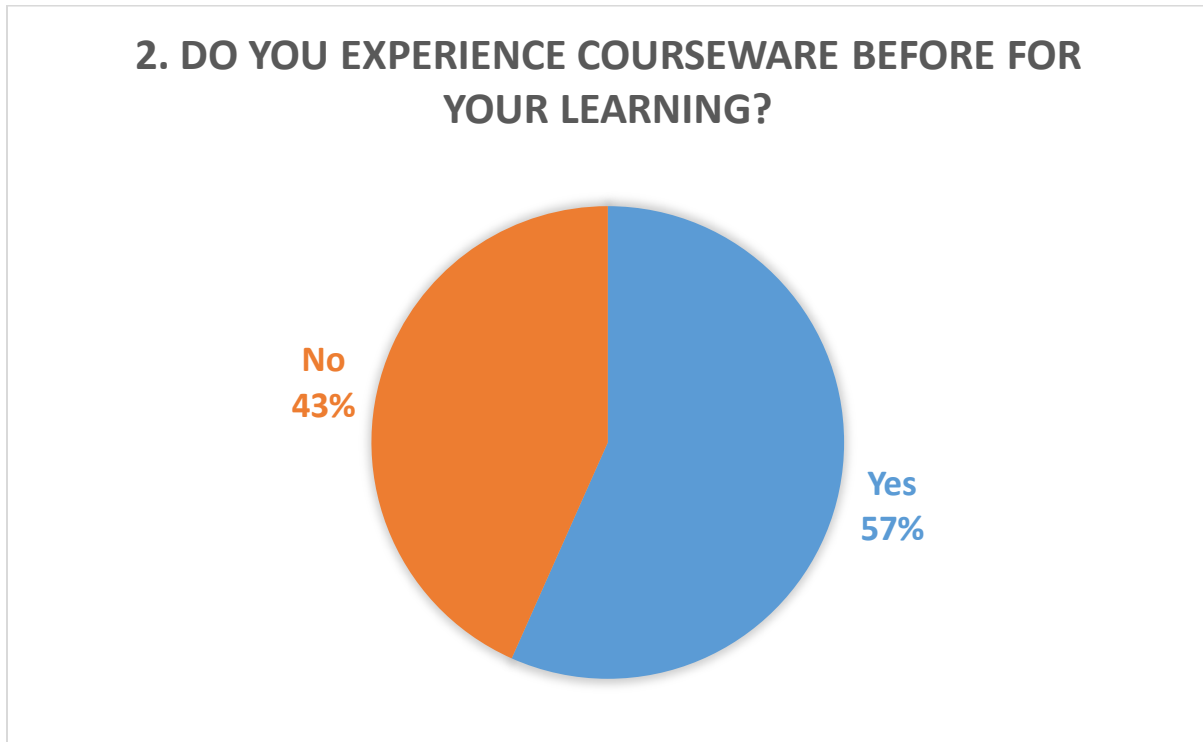


Figure 2.7 Pie chart of representing whether the respondent experience courseware before

As refer to Figure, the chart shows that 43% of the respondent has experienced courseware and 57% do not experienced before. There is more than half of the respondents have experience courseware before as courseware has been developed since years ago.

3. Do you think educational courseware is very effective to assist current learning programmes?

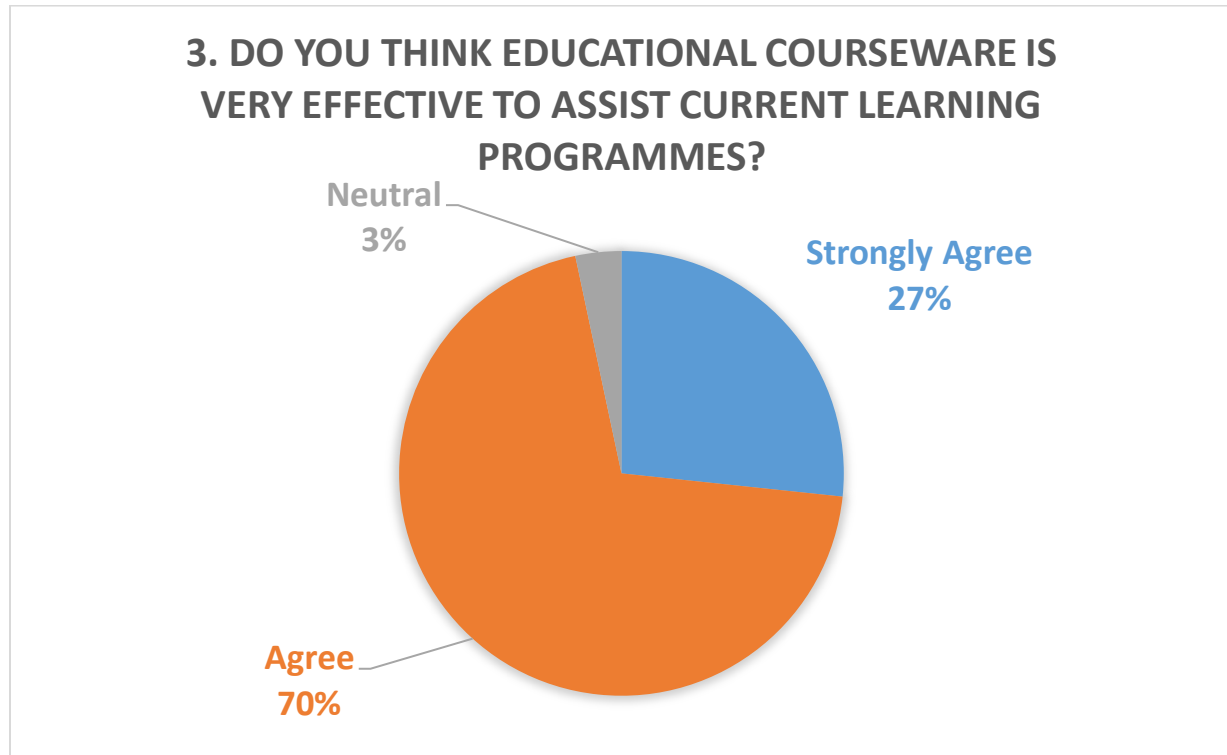


Figure 2.8 Pie chart of representing the agreement of respondents for educational courseware is effective to assist current learning programmes

As refer to Figure, the chart show that the majority of students agree educational courseware will assist current learning programmes in effective way which include 27% of them select strong agree option and 70% of them select agree. However, 3% of them claim that is neutral for educational courseware assists current learning programmes effectively. Almost all of the respondents state that educational courseware is very effective in learning even some of them never experience educational courseware before. Thereby, educational courseware is known publicly as a good tool during learning process.

4. Does it helps to enhance your understanding in science subjects?

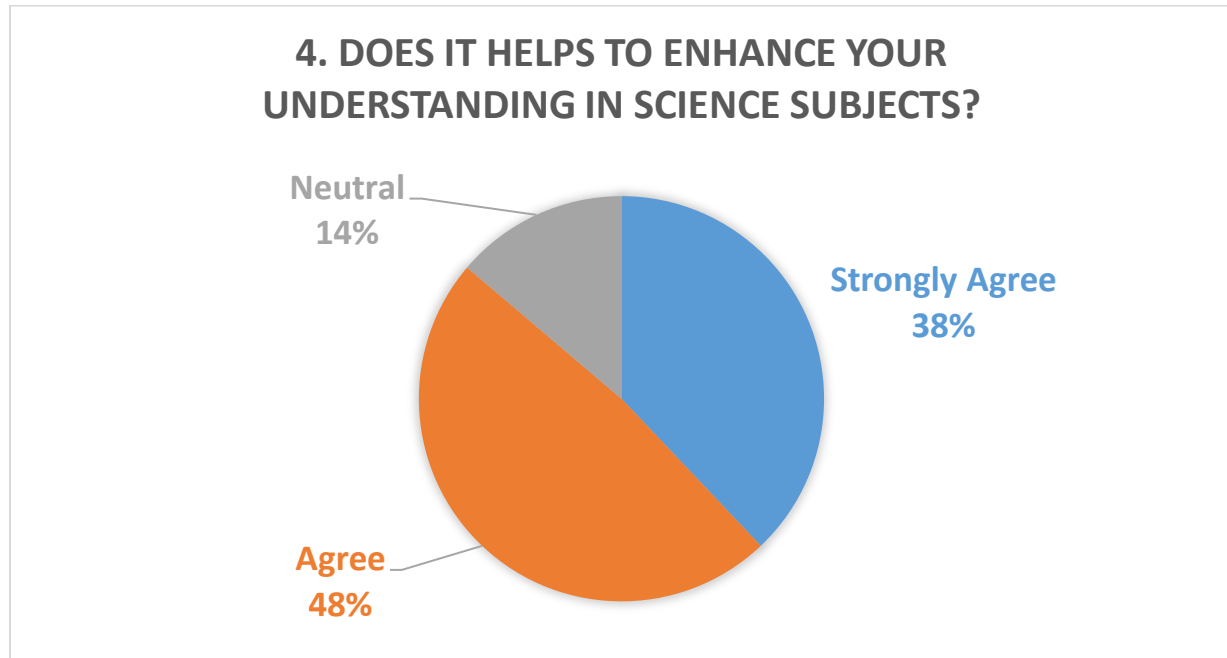


Figure 2.9 Pie chart of representing the agreement of respondents for courseware will enhance understanding in science subjects

As refer to Figure, the chart show that most of the students agree that educational courseware is able to help to enhance understanding especially in science subjects which include 38% of them select strongly agree and 48% of them select agree other than 14% of the students state that it is neutral. From the chart above, it can conclude that multimedia courseware is definitely a good helper for learning especially in science subject because it is difficult to request students to imagine those science theory by reading notes from textbook. As educational courseware is able to help students make up and consolidate their imagination and creativeness by using multimedia elements such as animation and audio.

5. Which part of the educational courseware do you think it is useful in aiding you to have a better understanding in science subjects?

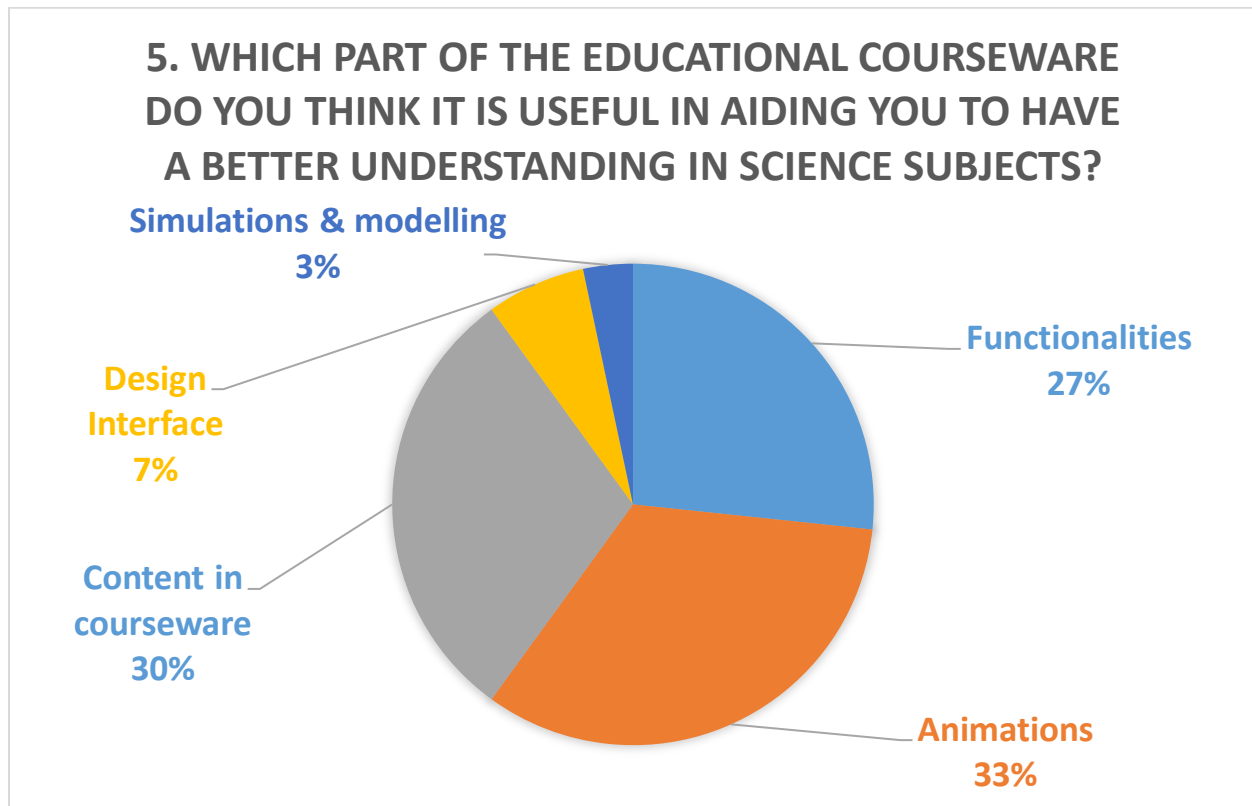


Figure 2.10 Pie chart of representing which part of educational courseware is useful in helping to have better understanding in science subjects

As refer to Figure, the chart shows that 33% of the students think that animations in the courseware may help them to have better understanding in science subjects, 30% of them select content in courseware might be help, 27% of them claims that functionalities of the courseware will be useful to have better understanding and 7% of them states that design interface is important while using educational courseware. Besides, 3% of them mention educational courseware with simulations and modelling will be better for aiding understanding in science subjects. The criteria which respondents mentioned is important in order to develop an effective and interesting courseware.

6. What are the problems that you can identify in the current educational courseware?

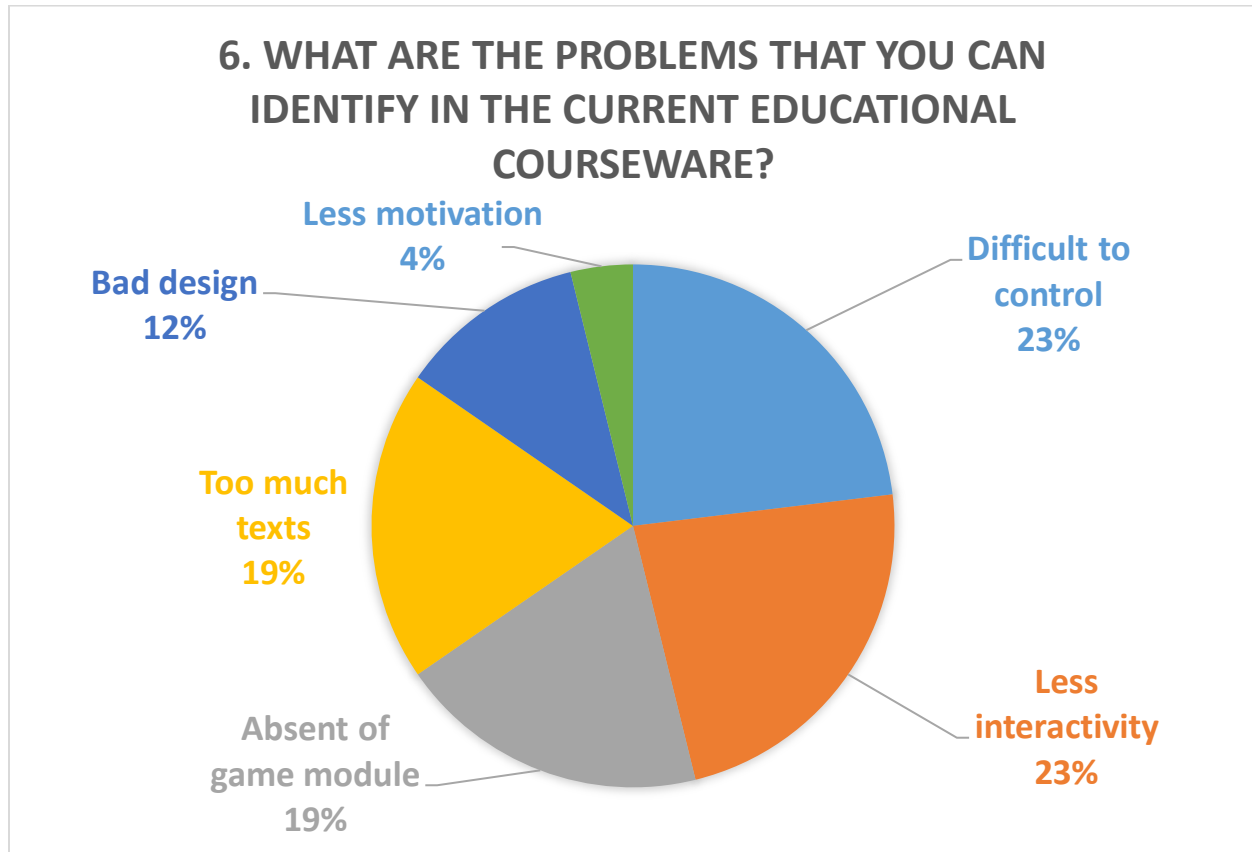


Figure 2.11 Pie chart of representing the problems from students in the current educational courseware

As refer to Figure, the chart shows that 23% of the students state that the current educational courseware is difficult to control which refer to not using friendly and less interactivity while using the courseware. Furthermore, 19% of them claims that there is too much texts in the current educational courseware and also wish to include game module which able to bring joy and fun while learning. Not only that, 12% of them states that the current educational courseware is designed badly and 4% of them is saying less motivation. All of the problems identified by respondents is the reason that why current educational courseware fail to become part of the education syllabus in learning process. Since multimedia technology is getting advance, educational course can be developed in better way in order to become a powerful tool for students to extract knowledge.

7. Based on your opinion, what are the new features that you expect to be include in the new educational courseware?

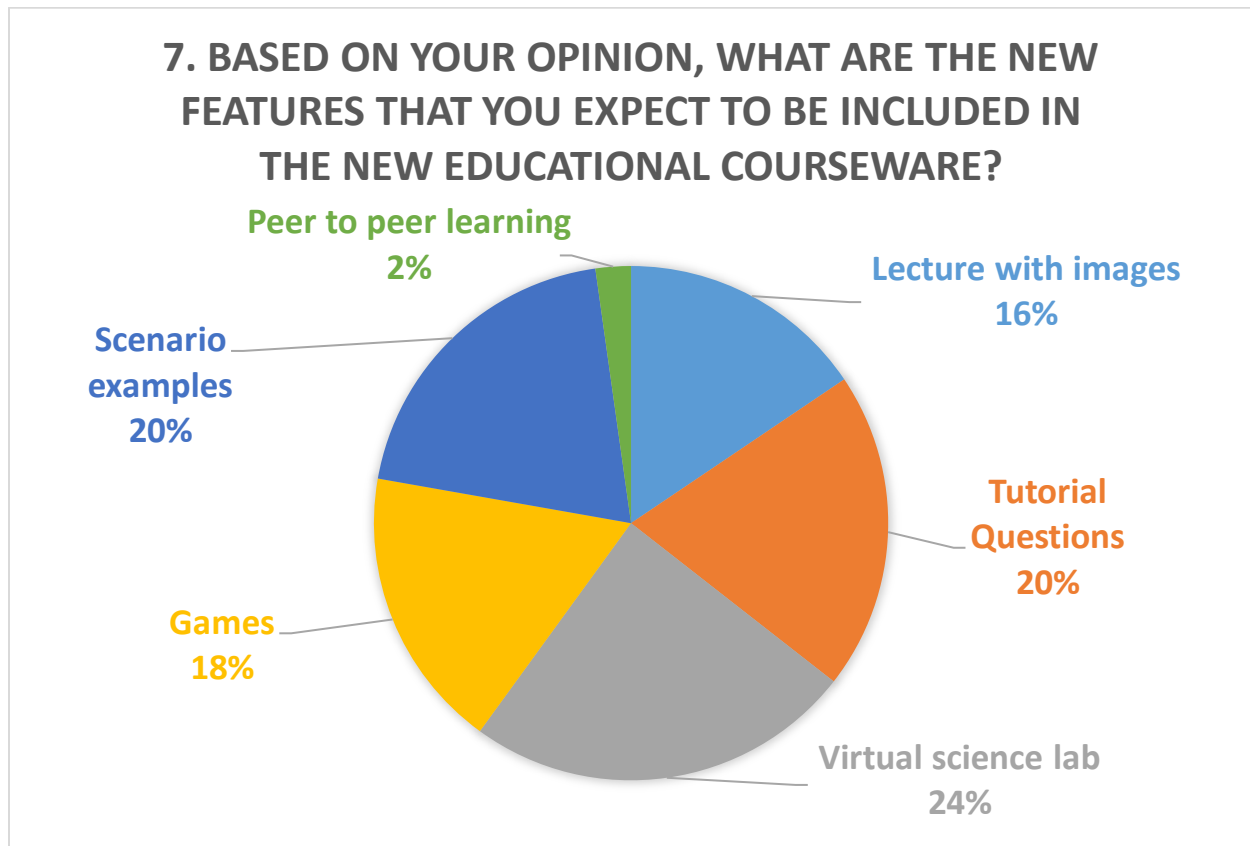


Figure 2.12 Pie chart of representing what students expect to have in new educational courseware

As refer to Figure, the chart shows that 24% of them wish to have virtual science lab in new educational courseware, 20% of them expect to include scenario examples and tutorial questions, 18% of them desire to have games while learning, 16% of them wish to have the basic lecture with images and only 2% of them prefer peer to peer learning. The new features that respondents mentioned based on their preferences can take it as consideration to develop a new courseware. An effective and useful courseware has to get rid of the traditional way which apply the one way delivery knowledge as it is not able to bring interest from students. Therefore, the interactivity between the courseware and users is crucial to encourage students during learning process.

8. Were you exposed to multimedia contents before?

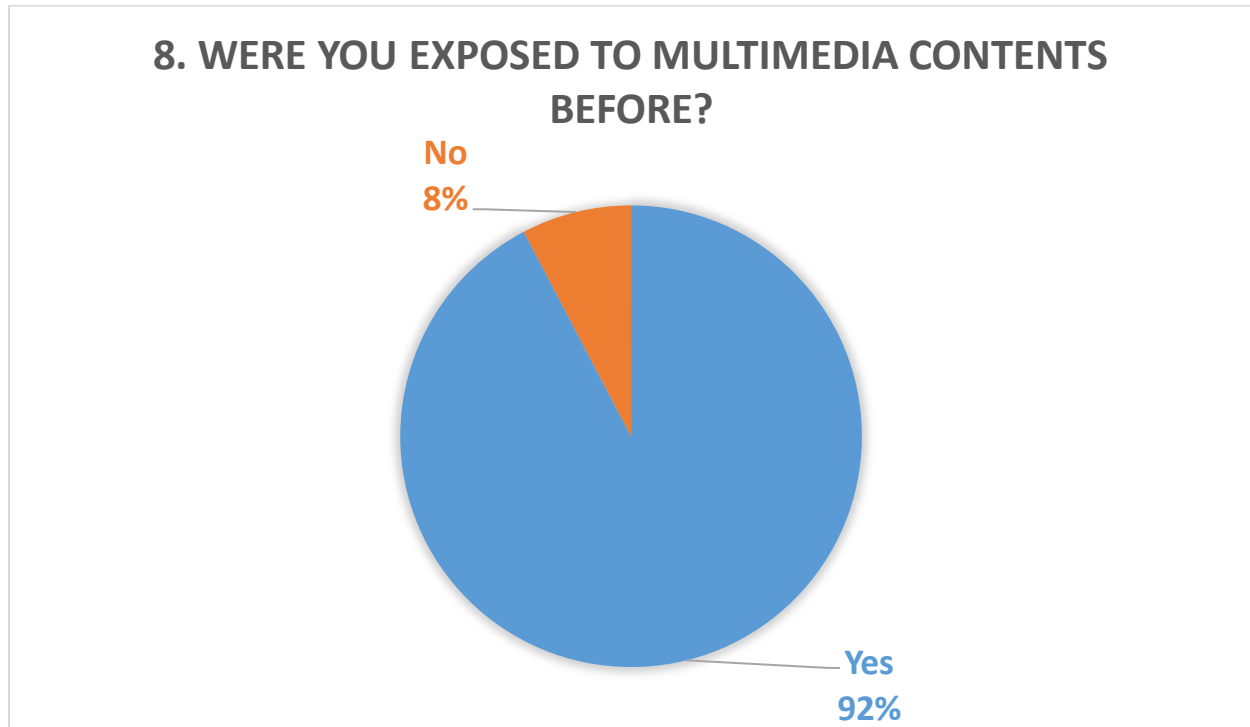


Figure 2.13 Pie chart of representing whether respondents exposed to multimedia contents

As refer to Figure, the chart shows that almost all of the students have been exposed to multimedia contents as multimedia acts important role in Information Technology which include 92% of them claims that they do exposed to multimedia contents but 8% of them states that they do not. Almost all of the respondents who do not have experience before using courseware claim that they exposed to multimedia contents before as the trend of technology since everyone owns at least one smart electronic device and exposed to any multimedia contents such as Facebook, Instagram, YouTube and Blogger.

9. If multimedia technologies are going to be used in the design of software to facilitate learning processes, is there any features that you anticipate to be incorporated into the software?

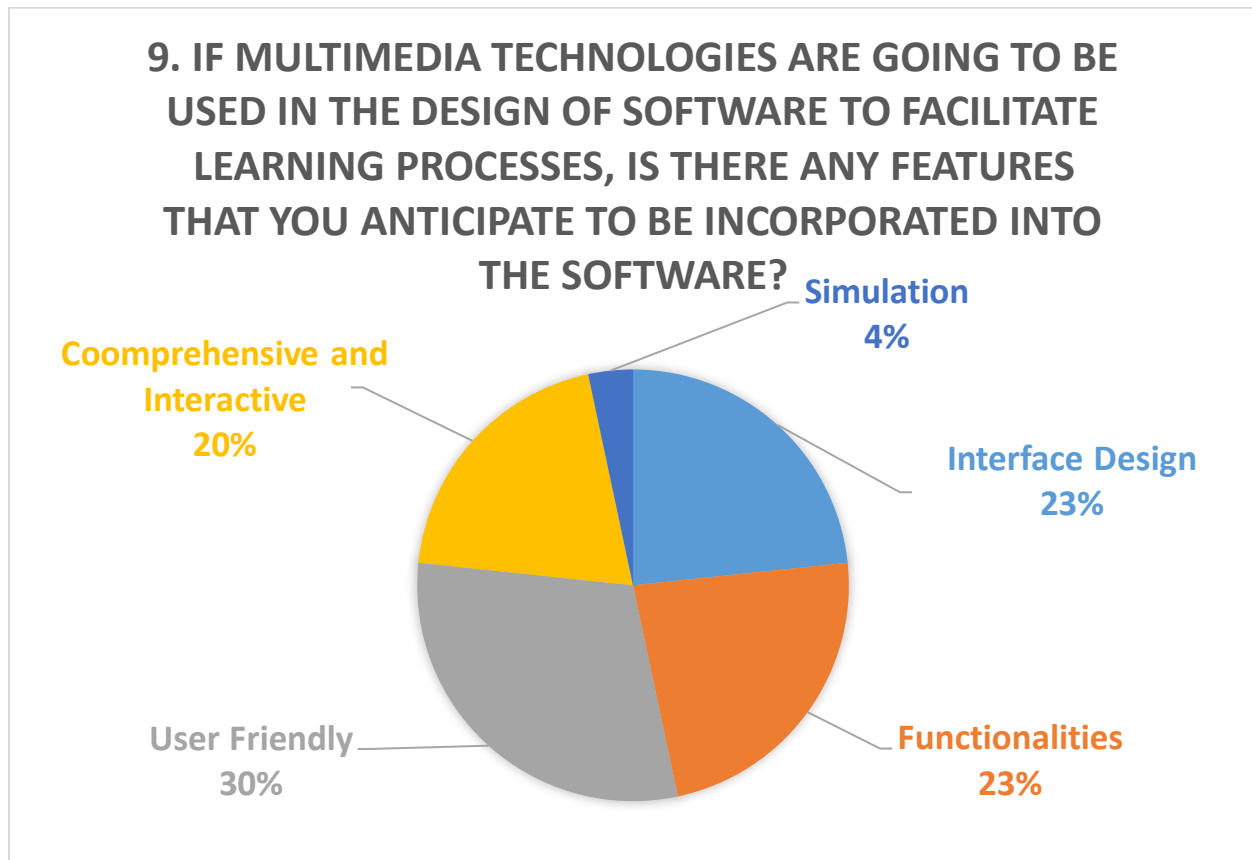


Figure 2.14 Pie chart of representing what features students expect to have into new develop courseware

As refer to Figure, 30% of the students think that user friendly is important while using educational courseware, 23% of them states that functionalities and interface design are significant for learning from educational courseware, 20% of them mentions that comprehensive and interactive have to include in the courseware, and 4% of them wish to have simulation to have better understanding on learning experience. For those respondents do not experience courseware before, they expect that software can be design in such ways to encourage more interest during the learning process. The chart shows that user friendly is always the priority while using a software or interface.

CHAPTER 3 Methodology and System Design

3.1 System Requirements

3.1.1 Hardware Requirement

Minimum Requirement:	Recommended Requirement:
Platform: Windows 7 Processor: 1GHz Intel Core i3 System type: 32-bit Operating System Memory: 2GB RAM Hard Disk Space : 2GB Graphics Cards : Microsoft DirectX 9 graphics device with WDDM driver	Platform: Window 10 Processor: 2.60GHz Intel Core i5-3230M System type: 64-bit Operating System Memory: 8GB RAM Hard Disk Space : 5GB Graphics Cards : Microsoft DirectX 9 graphics device with WDDM driver

Table 3.1 Table of Hardware Requirement

3.1.2 Software Requirement

Process	Multimedia Elements	Software	Description
Pre-authoring Process	Text	Microsoft PowerPoint	Microsoft PowerPoint can be insert texts and images.
	Video	Final Cut/ Adobe Premiere	Final Cut and Adobe Premiere can make and edit video with effects. Export in different file types as well.

	Audio	Adobe Audition/ ProTools	Adobe Audition help to edit sound and create sound effect. E.g. Sound can edit to be fade effects with different levels of volume.
	Graphic	Adobe Photoshop / Adobe Illustrator	Adobe Photoshop and Illustrator allowed to edit image, create text and save as different file types images and import to adobe director.
	Animation	Adobe Animate/ Future Splash Animator	Adobe Animate help to create 2D and 3D animation and export as video files. It is popular for develop video games and web applications.
Authoring Process	Authoring	Adobe Director	Adobe director similar to Adobe Flash and support lingo script and combine all the multimedia source which include audio, video, text, graphic and animation such as video players, 3D content players and Flash players.

Table 3.2 Table of Software Requirement

3.2 ADDIE Model

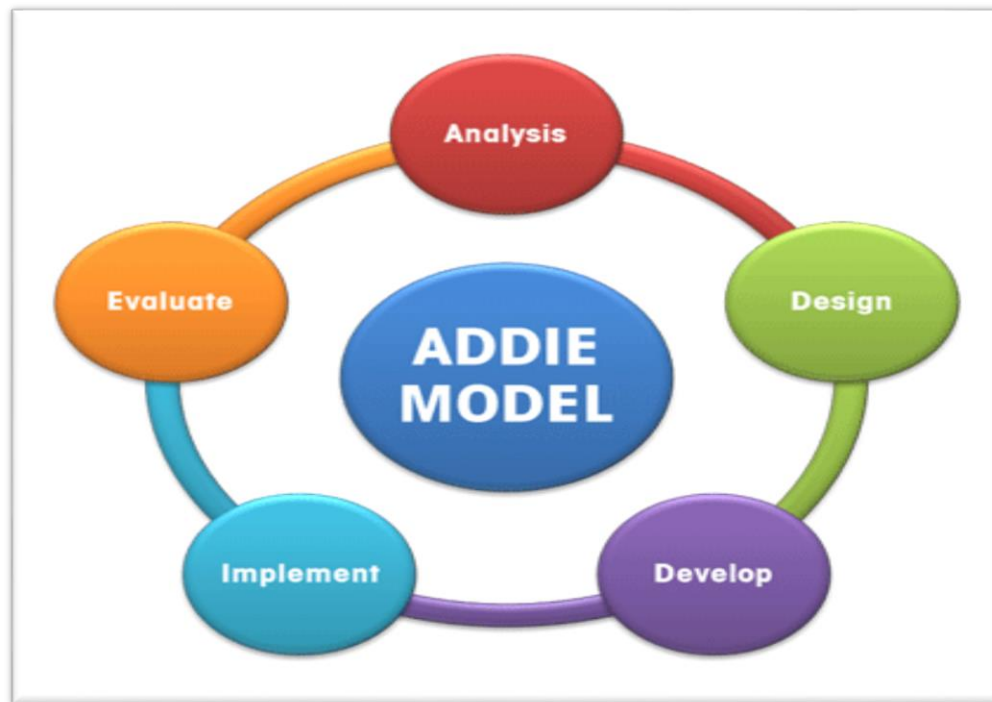


Figure 3.1 Diagram of ADDIE Model (Florida State University, 1980)

ADDIE model is a strategic planning for the instructional design process and also consider as a blueprint for learning design and development. Besides, ADDIE is a project management tool in order to helps organize the work flow and instructional design (Webanywhere.co.uk, 2017). Not only that, apply ADDIE model also provide feedback for continuous improvement as the model is able to provide a streamlined and focused approach. ADDIE model consist of 5 phases which are analysis, design, development, implementation and evaluation.

In Analysis Phase, designer needs to identify the goal and objectives, problem statements, targeted audience, other existing references and technology before start a project. Before start a project, normally goal and objective come first in order to clearly specify what are trying to achieve and purposes to complete a project. Problem statements refer to the current issues which are happening and trying to be solved. Besides, it also relate to targeted audience who are facing the problems. Generally, start with series questions with: Who, What, When, Where, Why, How? And it is to construct an appropriate analysis with needs and plan.

Before developing this project, an analysis is conducted to identify the objectives, problem statements, targeted audiences of this project. The purpose of the analysis phase is to set a motive or intention to achieve which desire to achieve. With the analysis, the author will able to develop a high interactivity and functionality courseware which consort for all the criteria requested and desired from the students.

In Design phase, this stage is a systematic process of specifying learning objectives of the previous phase and apply it to construct practical decisions. This also includes a strategy, delivery methods, structure, duration, assessment and feedback. Normally, prototype will be involved in this phases. For example, detailed storyboards, graphic design, user-interface and content will be included in this phase. It can be consider as an initial testing phases for the prototype in order to move far forward in the process of ADDIE model.

Prototype is always follow by a draft which capture a roughly idea of what is going to develop. Therefore, in Design phase, the storyboards will be designed and the technology involved and implemented including software and hardware. By making use of them, a prototype is able to be developed based on the drafting and design from the storyboard as a reference.

In Development phase, designers and developers will be involved to assemble all the contents which described in the design phase. Furthermore, the working process will be heavily guided from the prototype or storyboard which designed in Design Phase. Development process should be iterative. Testing and Running steps are required to proceed over and over again to ensure there is without any errors and mistakes. Moreover, some changes against the initial design may be applied as well due to the dissatisfaction of the final outcomes.

As mentioned above, Development phase is extremely rely on the drafting of storyboard in Design phase. A prototype has to be developed according to what has designed early in the storyboard. Thus, storyboard is the guideline while developing the prototype. Moreover, numerous of running and testing will conducted in order to achieve zero errors and mistakes of prototype and provide users have the best learning experience.

In Implementation phase, considered as a delivery training process for the clients or users in anywhere. The action and procedure for them will be developed. By providing the materials and contents, client or user is able to learn how to manipulate the satisfied final product. The

stage consists of the course curriculum, learning outcomes, method of delivery and testing procedures. And the evaluation of the design will be constructed after the implementation.

After developing the prototype, implementing is also an important step as delivering the training process and materials to the users is crucial. A guideline and tutorial will be provided for the users in order to achieve high interactivity while using the educational courseware.

In Evaluation phase, the final stage for ADDIE model. As ADDIE model's main goal is provide a structured method of creating. Hence, in evaluation stage, it is necessary to focus on the feedback on the work done and determine whether the project meet the goals as set in analysis phase in order to improve and revise the content. It is a great way to get the feedback by surveying the end user with specific questions and aware of the problems that may not have thought of.

Implementation phase is not the end of this project, an evaluation will conduct as it is a last important stage for ADDIE model to focus the feedback from users and to determine whether the project meets the goals and objectives.

3.3 System Flow Diagram

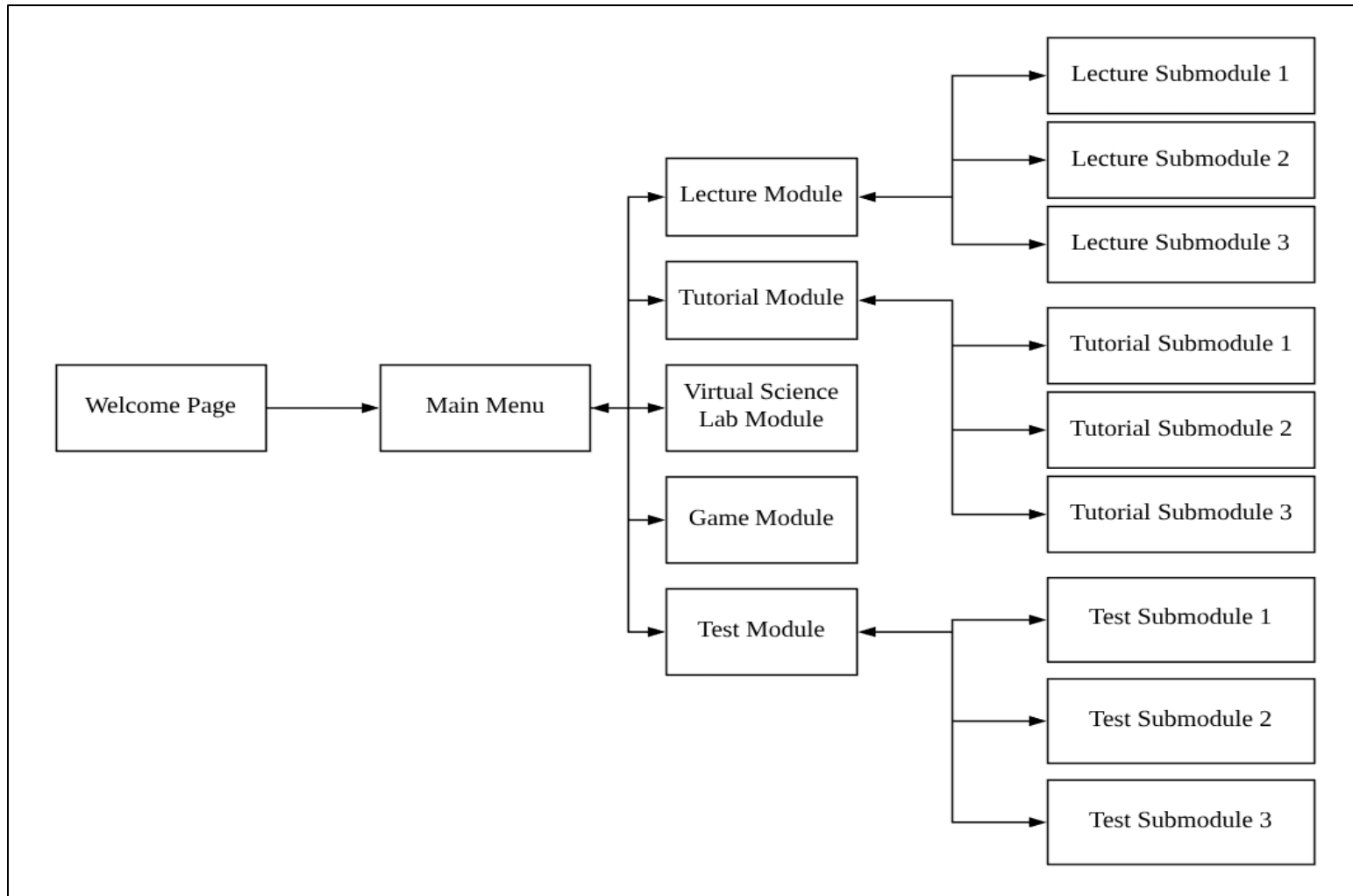


Figure 3.2 System flow diagram of Physics Courseware

3.4 Storyboarding Diagram

3.4.1 MAIN MENU STORYBOARD

Storyboard No: Storyboard 1

Topic: Main Menu

T(text), G(Graphic), Au(Audio), An(Animation),V(Video), B(Button)

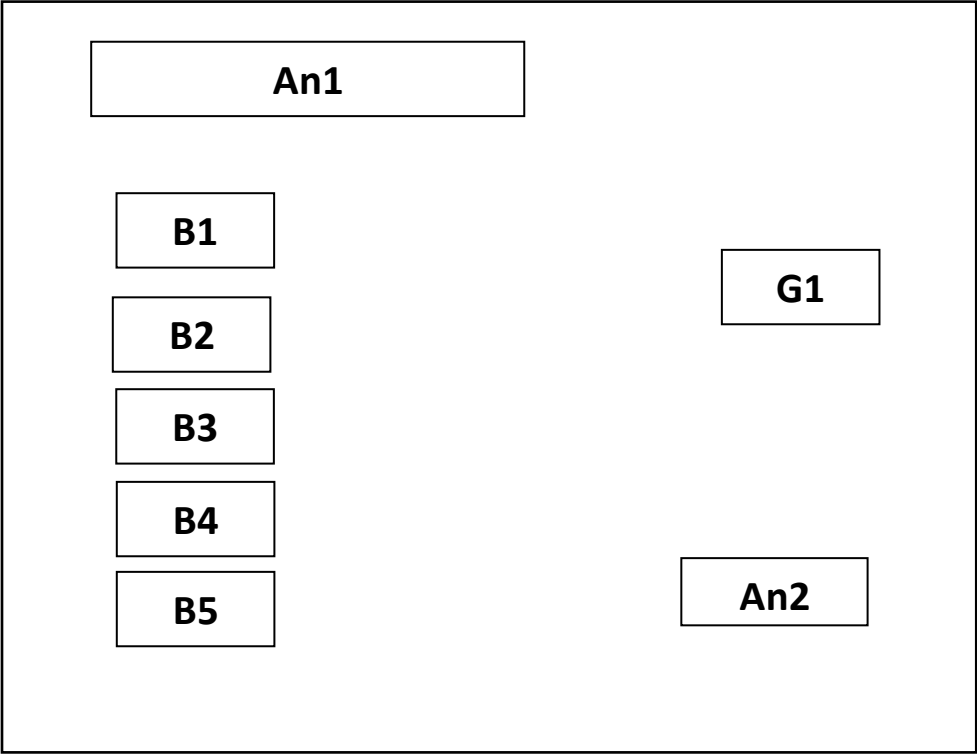


Figure 3.3 Main Menu page

Table 3.3 Description and Flowchart for Main Menu Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: G1 and A1 will be appear first on the screen. Then B1, B2, B3, B4 and B5 will be appear with transition. An1: Topic written in animation An2: Chopping wood animation G1: Background image in main menu B1: First preference for user B2: Second preference for user B3: Third preference for user B4: Forth preference for user B5: Fifth preference for user	<pre>graph TD; Start([Start]) --> Display[Display An1, G1, B1, B2, B3, B4, B5 and B6]; Display --> Click{Click on any B}; Click -- No --> Display; Click -- Yes --> Proceed[Proceed to any modules]; Proceed --> Exit([Exit]);</pre>

3.4.2 LECTURE MODULE STORYBOARD

Storyboard No: Storyboard 2

Topic: Lecture Module

T(text), G(Graphic), Au(Audio), An(Animation), B(Button)

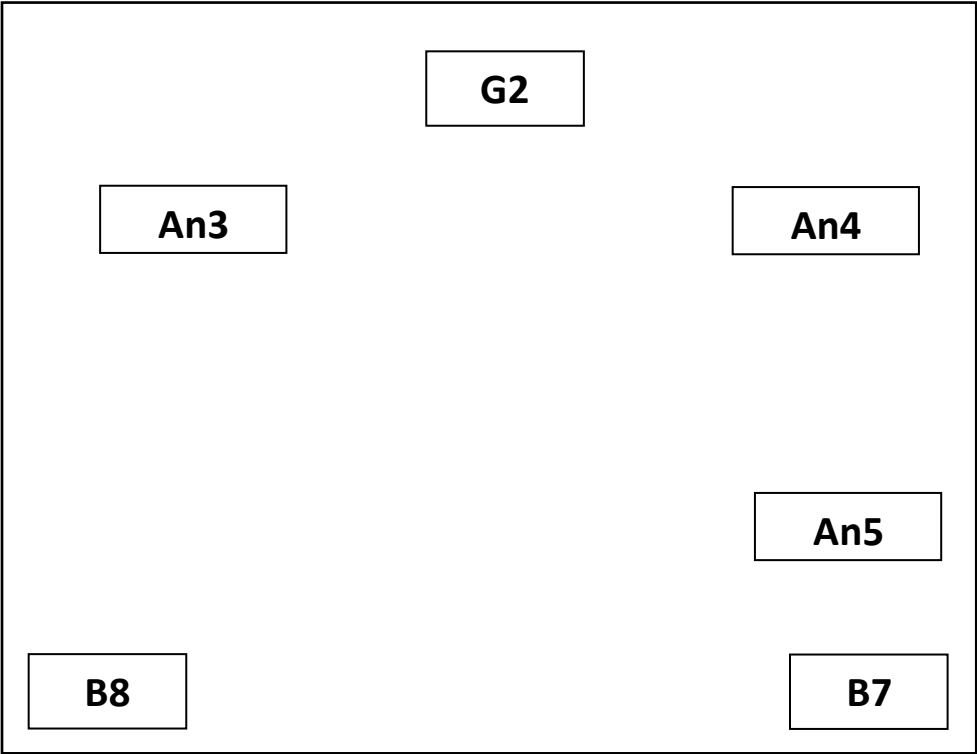


Figure 3.4 Lecture module page

Table 3.4 Description and Flowchart for
Lecture Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: G1, An2, G2 and T3 will be display first G2:Background image in lecture module An3: Animation for lecture 1 An4: Animation for lecture 2 An5: Animation for lecture 3 B7: Volume button for lecture B8: Back button to main menu	<pre>graph TD; Start([Start]) --> Display[Display G1, An3, An4, An5, B7, B8]; Display --> Contents[Display the lecture contents]; Contents --> Exit([Exit]);</pre>

3.4.3 TUTORIAL MODULE STORYBOARD

Storyboard No: Storyboard 3

Topic: Tutorial Module

T(text), G(Graphic), Au(Audio), An(Animation), B(Button)

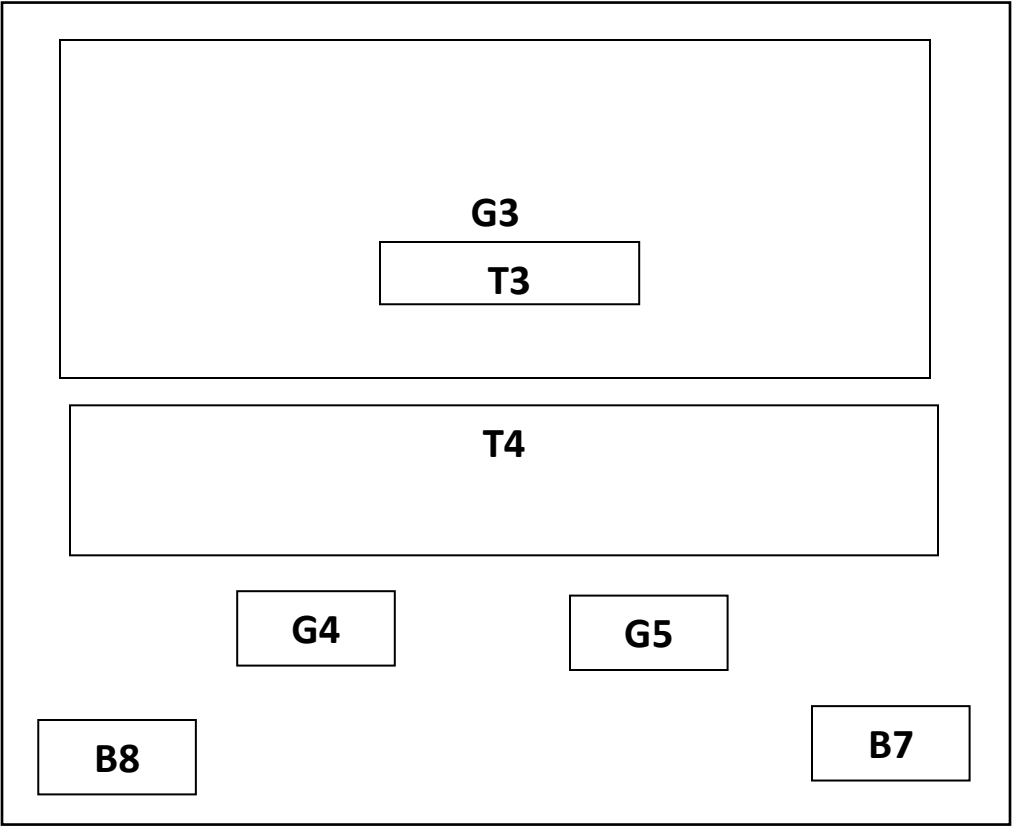


Figure 3.5 Tutorial module page

Table 3.5 Description and Flowchart for Tutorial Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: T3, G3, An3, T4 will be display first T3: Information in text for tutorial module G3: Images for the tutorial question T4: Question in text G4: Option 1 in graphic G5: Option 2 in graphic B7: Volume button for tutorial questions B8: Back button to main menu	<pre>graph TD; Start([Start]) --> Display[Display T3, G3, T4, G4, G5, B8 and B7]; Display --> Question[Display tutorial question and ready to answer]; Question --> Exit([Exit]);</pre>

3.4.4 VIRTUAL SCIENCE LAB MODULE STORYBOARD

Storyboard No: Storyboard 4

Topic: Virtual Science Lab Module

T(text), G(Graphic), Au(Audio), An(Animation), B(Button)

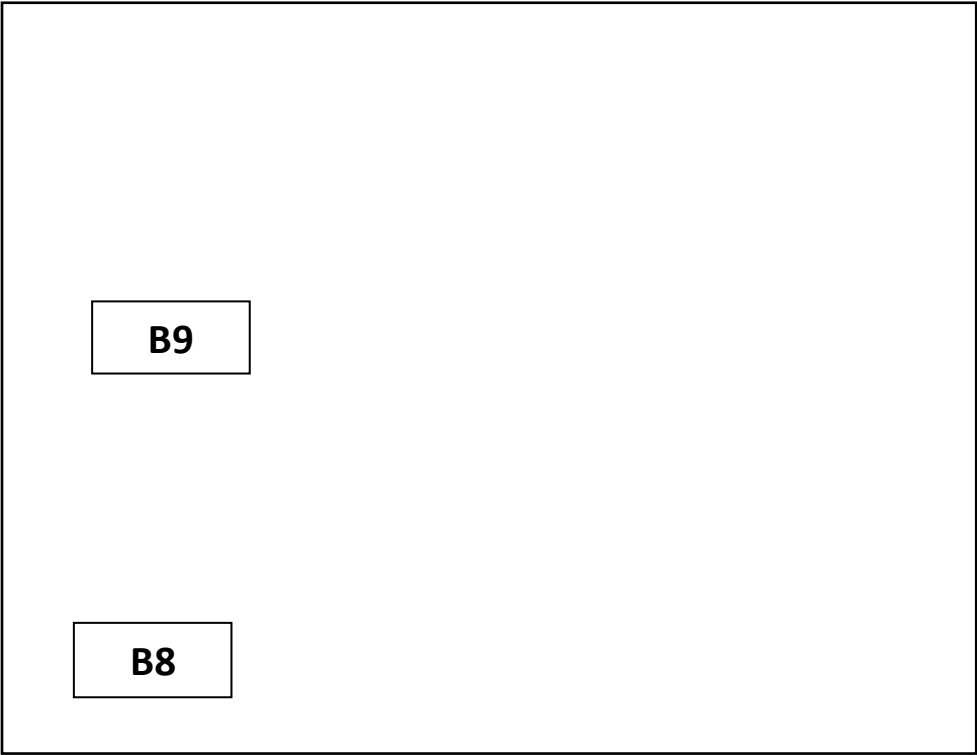


Figure 3.6 Virtual Science Lab module page

Table 3.6 Description and Flowchart for Virtual Science Lab Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: T5, G4, G5, An4, B9, B10, B11, B12, B13 T5: button in text to enter different map of virtual lab G4: Background Image in virtual science lab G6: Maps in graphic B9-B10: Button of choosing different map to enter B8: Back button to main menu	<pre>graph TD; Start([Start]) --> Display1[Display T5, G4, G5, An4, B9, B10, B11, B12, B13, B7, B8]; Display1 --> Display2[Display the virtual lab to learners]; Display2 --> Exit([Exit]);</pre>

3.4.5 GAME MODULE STORYBOARD

Storyboard No: Storyboard 5

Topic: Games Module

T(text), G(Graphic), Au(Audio), An(Animation), B(Button)

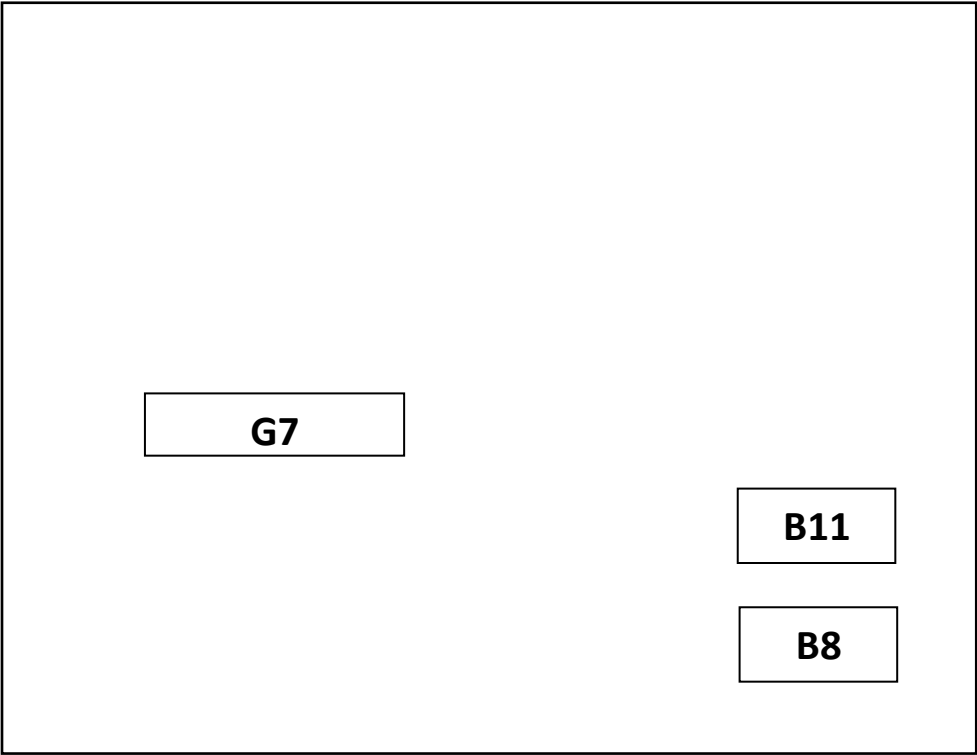


Figure 3.7 Game module page

Table 3.7 Description and Flowchart for Game Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: G6, G7, B11 and B8 will be display first G6: Background image in games module G7: Image of a character B11: Button to start game B8: Back button to main menu	<pre>graph TD; Start([Start]) --> Display1[Display G6, G7, B11, B8]; Display1 --> Display2[Display game platform for learners]; Display2 --> Exit([Exit]);</pre>

3.4.6 TEST MODULE STORYBOARD

Storyboard No: Storyboard 6

Topic: Test Module

T(text), G(Graphic), Au(Audio), An(Animation), B(Button)

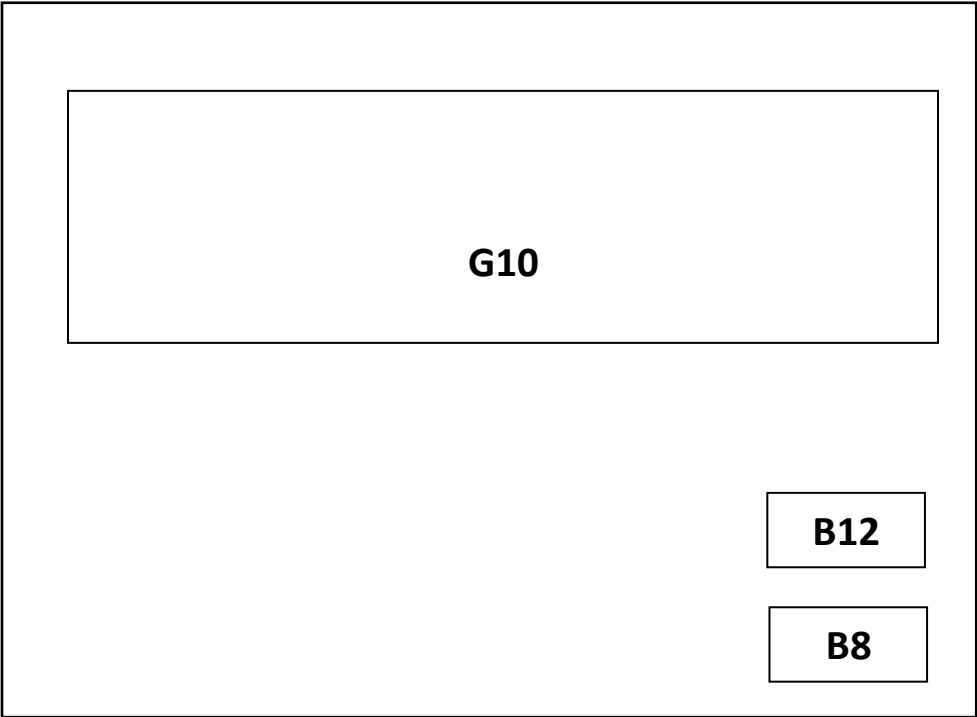


Figure 3.8 Test module page

Table 3.8 Description and Flowchart for Test Module

Instruction for Text, Graphic, Button and Animation	Flowchart for Text, Graphic, Button and Animation
An: G10, B12 and B8 will be display first G10: Background images of test module B12: Button to start the test B8: Back button to main menu	<pre>graph TD; Start([Start]) --> DisplayG10B12B8[Display G10, B12 and B8]; DisplayG10B12B8 --> DisplayTestQuestions[Display test questions]; DisplayTestQuestions --> Exit([Exit]);</pre>

3.5 Project Planning

3.5.1 Project 1

Task Name	Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Durations														
Project 1															
1.0 Analysis	49 days														
Analyze background study	1 day														
Reviews on Similar Applications	1 day														
Identify target audience	1 day														
Identify problem statement	1 day														
Identify project objective	1 day														
Determine project scopes	21 days														
✓ Lecture Modules															
-Introduction for certain topics	4 days														
-Design the teaching content	4 days														
✓ Tutorial Modules															
-Design the tutorial question	2 days														

-Checking for functionality of the question	2 days														
✓ Game Modules															
-Design the content of gamming	2 days														
✓ Lab Modules															
-Design lab experiment	3 days														
✓ Scenario Modules															
-Design the scenario questions	4 days														
Research of Methodology	1 day														
- ADDIE Model	1 day														
Evaluate on multimedia authoring tools	1 days														
- Adobe Director	1 day														
Evaluate on Pre-authoring Software tools	5 days														
- Adobe Animate CC	1 day														
- Adobe Photoshop	1 day														
- Adobe Illustrator	1 day														
- Adobe Audition CS6	1 day														
- Adobe Premiere CS6	1 day														

2.0 Design	31 days																
Determine and identify the system requirements	1 day																
Software that need to be used while developing	6 days																
- Using Adobe Director to construct the frames	1 day																
- Using Adobe Animate CC to create animation which need in prototype	1 day																
- Using Adobe Photoshop edit the design of images as materials	1 day																
- Using Adobe Illustrator create images as materials	1 day																
- Using Adobe Audition CS6 to edit the sound effect as materials	1 day																
Hardware as a minimum requirement to develop the prototype	4 days																
- Sound Card	1 day																
- Graphic Card	1 day																
- RAM	1 day																
- Hard disk	1 day																
Design system flow diagram	2 days																
Design Storyboard	3 days																

Design Interface and splash screen	3 days															
Include multimedia elements to the application	10 days															
- Create text for content for courseware	2 days															
- Create and edit the audio for courseware	2 days															
- Create and edit the graphics for courseware	2 days															
- Create and edit the animations for courseware	2 days															
Include Navigation control function	2 days															

3.5.2 Project 2

Planning for FYP 2																
Project 2																
3.0 Development	49 days															
Develop project timeline	3 days															
Develop authoring process	88 days															
- Pre authoring process	28 days															
o Prepare all the multimedia materials which need for developing																

- Authoring process	28 days														
○ Apply and develop the courseware by using the multimedia materials which prepared early															
- Post authoring process	28 days														
○ Run and Test the courseware to achieve zero error and bugs															
Develop complete contents	4 days														
4.0 Implementation	41 days														
Ensure application functionality	15 days														
Modification of contents	13 days														
Deliver of contents	13 days														
5.0 Evaluation	59 days														
Formative Evaluation	45 days														
Summative Evaluation	14 days														

CHAPTER 4 Development

4.1 Overview

The project has been separated into 2 parts which are final year project I (fyp1) and final year project II (fyp2). The project is implemented by using editing software with 4 multimedia elements, text, graphics, animations and audio. With the combination of these 4 multimedia elements, it is able to emerge an interesting and extractive educational courseware for the learners. Besides, this project is designed with a proper plan and schedule in order to complete before the deadline as all of projects did. In details, the project consists of 5 interesting modules for learners which are lecture module, tutorial module, virtual lab module, game module and test module. Each of the modules bring different scenarios for the learners that allow high effectiveness and efficiency of learning process and experience.

4.2 Development Process

As mentioned, the project has been separated into 2 parts. Thereby, the development process is complete 30% of the entire project in FYP1 and the remaining 70% of the entire project in FYP2. In FYP1, lecture module and tutorial module are required to complete including the functionality, designs and contents. Furthermore, the period for FYP1 is about 12 weeks including generating documentations, create, design, and testing the education courseware and same to FYP2. However, FYP2 consists of the final step which is finalizing the documentation by adding 2 more chapters in order to complete the entire complete project. The project is also advised by the writer's supervisor, Dr Lee Chen Kang. He provided many useful advises and recognitions for the entire development process.

4.2.1 Pre-authoring Process

4.2.1.1 Process of creating and editing text

Text represent meaningful contents which allow learners to extract knowledge but not too much. Full of texts on screen bring frustrating and boring to learners as textbook did. Besides, the design of the text is important as a good design of text, learners may found interesting and fun to extract the knowledge as fast as they read while manipulating the educational courseware. Since, the storyboard has been designed early, the text has been prepared in a text file before develop the software. Meanwhile, different texts represent different purpose in the software, for instances, main menu title, text on a button, and also navigation button also hold texts which allow users easily to understand how to manipulate the software. In details, the texts are designed and generated by Microsoft Power Point and CoolText Online Generator as the pattern and design is suitable for the project which is much more related to cartoon theme.

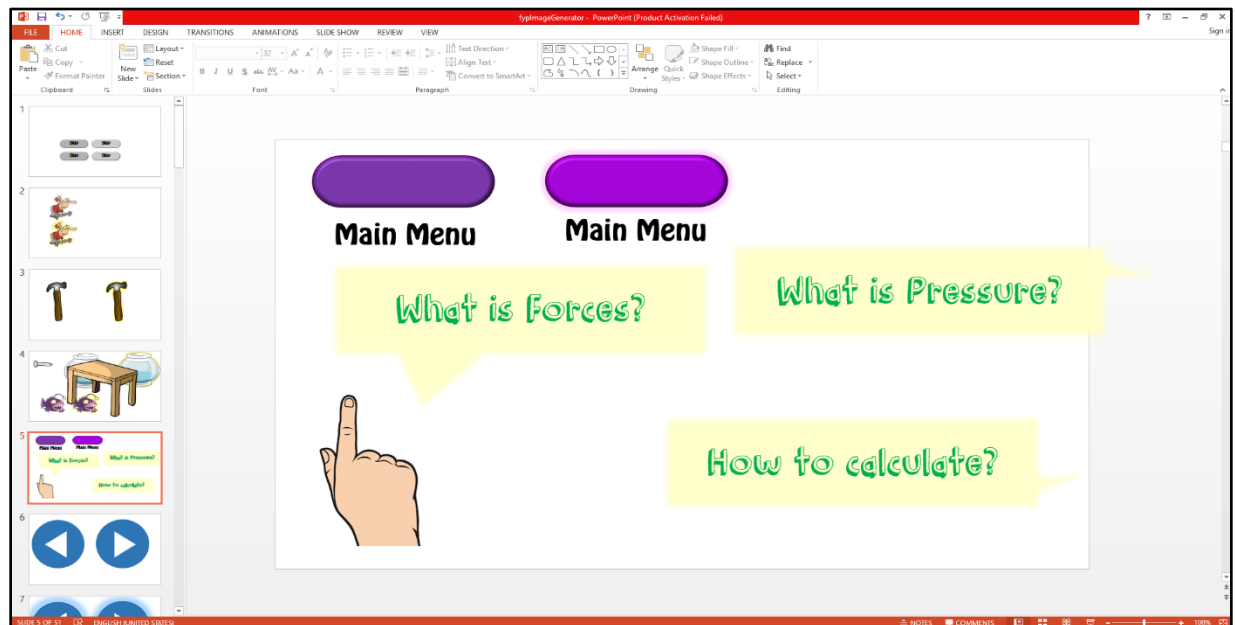


Figure 4.1 Screenshot of creating and editing text in Microsoft Power Point

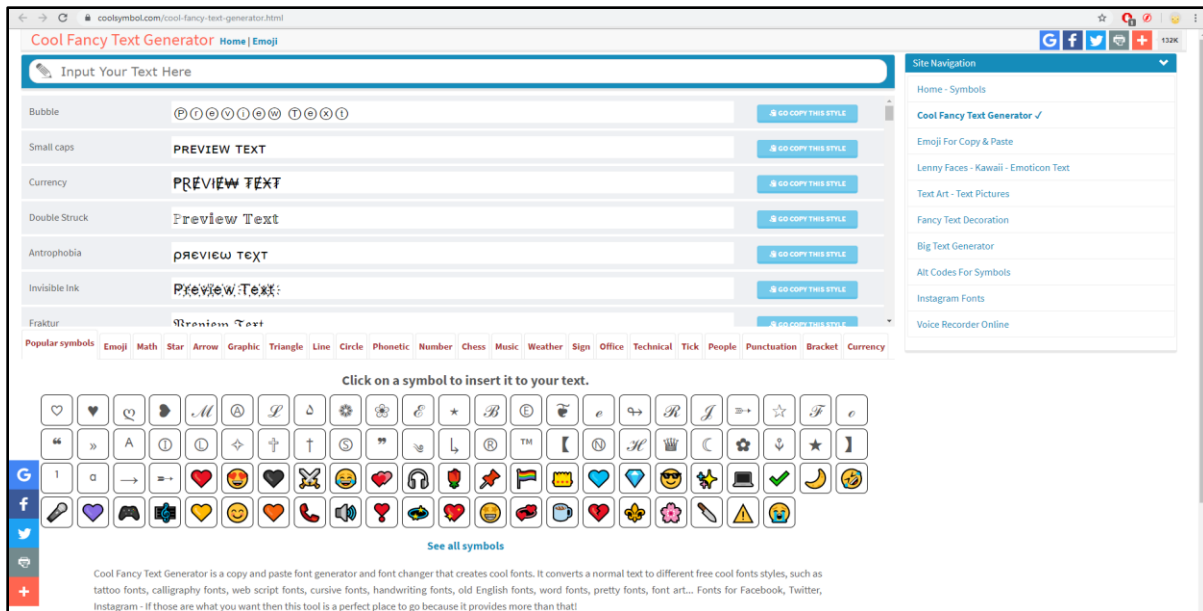


Figure 4.2 Screenshot of creating and editing text in CoolText Online Generator

4.2.1.2 Process of creating and editing graphics

A graphic worth than thousand words and it is always more favorited by users, users love to see a picture rather than reading tons of words. Graphic may represent a scenario which is very meaningful without any further explanation. Thereby, graphic is crucial and act as an important role while developing this project. The graphics which included in this project have different role and definition on the screen, background image, button shape, arrow and character are also graphics that bring interests for the learners. A good design and contrast of images may allow learners to extract knowledge easily by giving a virtual scenario instead of imagining the scenario without any helps. The graphics that created and designed in this project by Microsoft Power Point and Paint. Microsoft Power Point provides strong functionality as a downloaded image is able to be edited with removing the background into a transparent image. Transparent image is always important while developing the software because it allow a well combination between the background image and the functionality image or the character image. Not only this, an edited image can saved in different file type and been used into the project. Besides, Paint is been used to create the character in the game module named as Peter.

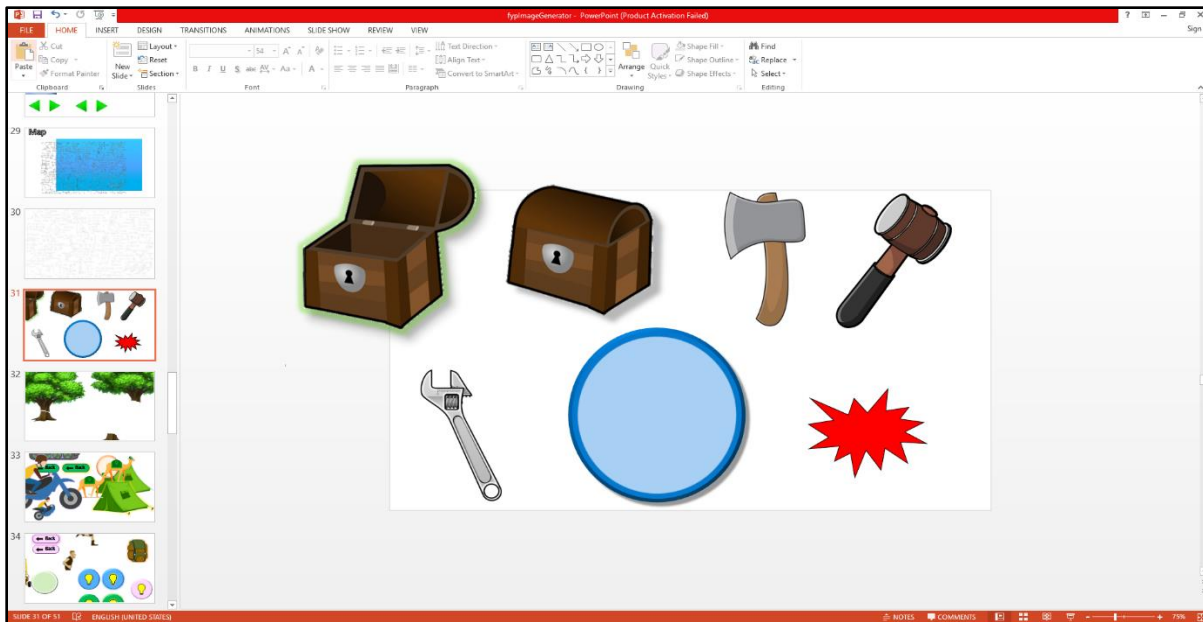


Figure 4.3 Screenshot of creating and editing graphics in Microsoft Power Point

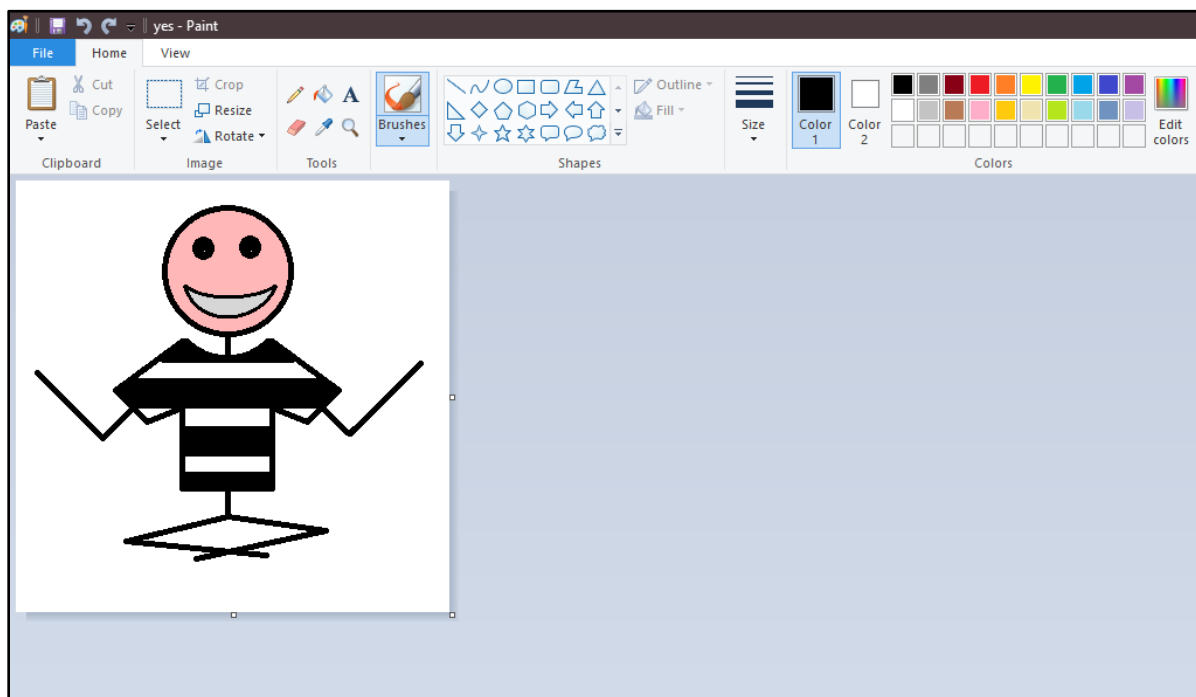


Figure 4.4 Screenshot of creating and editing graphics in Paint

4.2.1.3 Process of creating and editing animations

Animation defined as motion with a series of images which allow users to have a visualization movement. Animation may bring joyful for learning experience and make an interface lively, for instance, background image moving left and right, a man is thinking, or even eyes blinking are able to make the interface more attractive. However, the animations in this project are downloaded and implement directly into the software. Besides, the animations with transparent background are more preferable as they are able to combine onto the background images and create a likely virtual scenario.

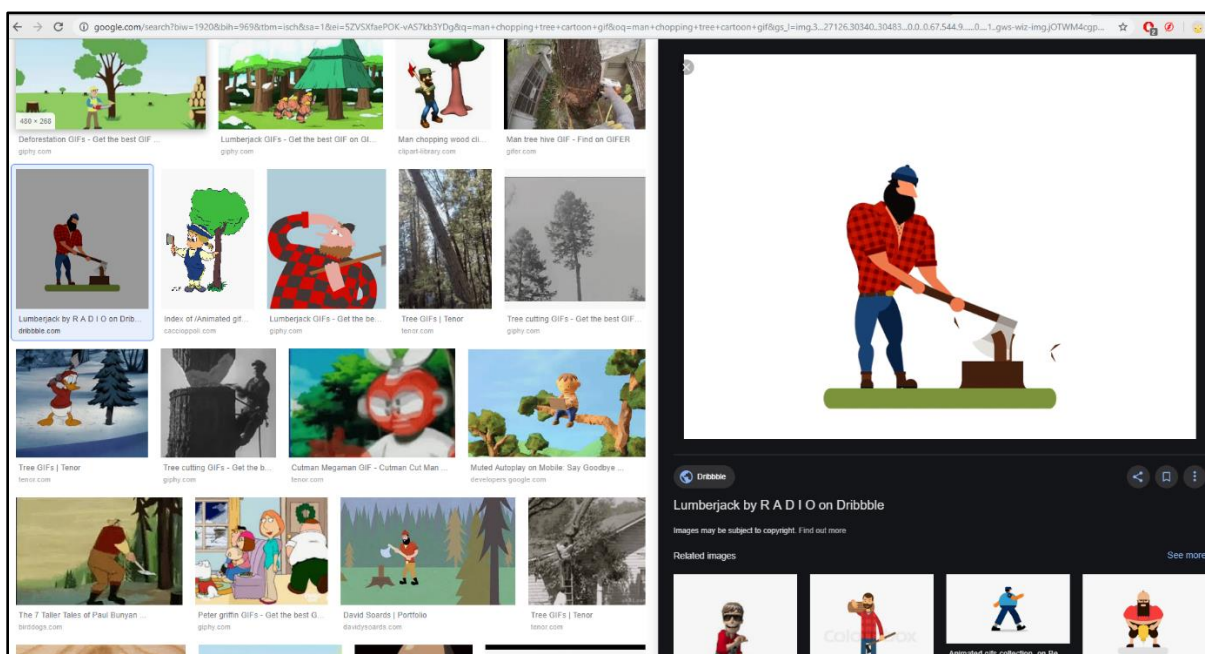


Figure 4.5 Screenshot of downloading animation sources on the Internet

4.2.1.4 Process of editing audio

Audio represent background music and sound effect in the project. Interface with audio brings the scenario distinctly and enhance the users learning experience. A software without audio is boring and difficult to strengthen the imagination of users. Thereby, audio multimedia elements is necessary to implement into the project. In this project, audio is been applied as background music and sound effect. Most of them are acquired from the internet directly and edit into the appropriate length and effect by using Audio Trimmer Online. Moreover, audio is also been

applied as explanation in lecture module of the project. This audio is generated by Animaker Voice Online Generator and it is totally free. For example, chopping wood sound effect, joyful background music and navigation button sound effect.

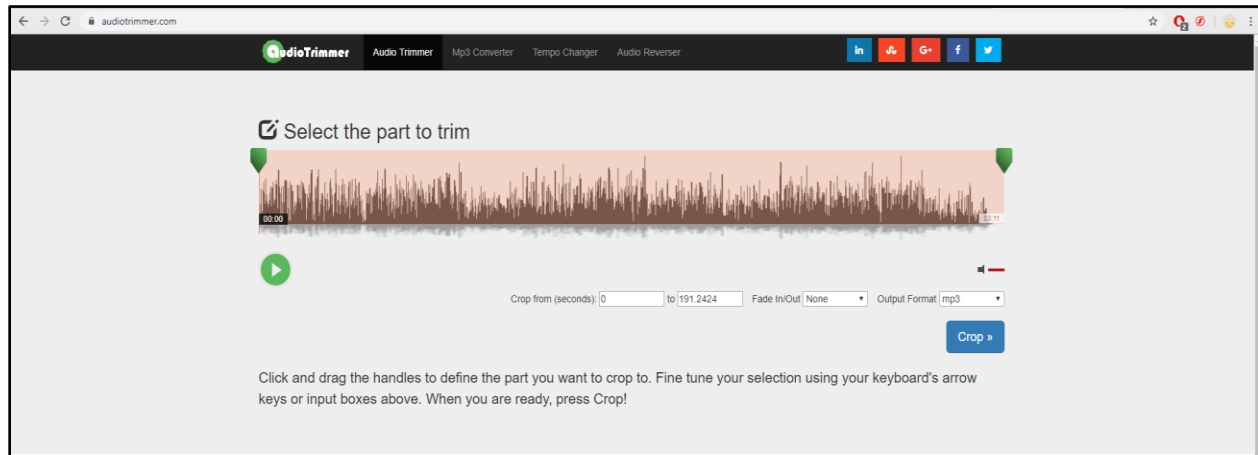


Figure 4.6 Screenshot of editing audio in Audio Trimmer Online

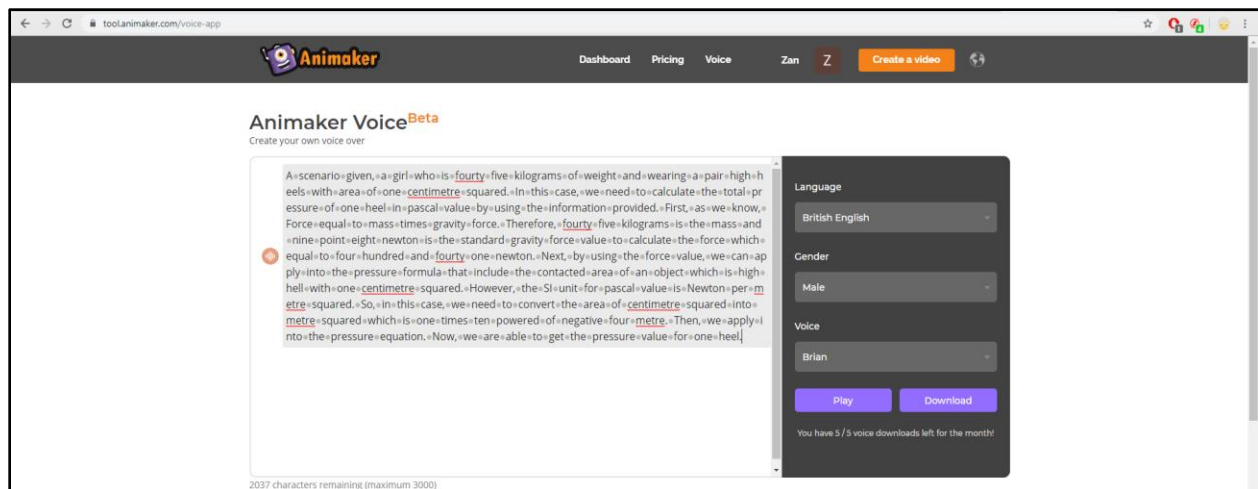


Figure 4.7 Screen of creating audio explanation in Animaker Voice

4.2.2 Authoring Process

4.2.2.1 Main Menu Module

Once users execute the educational courseware, the main menu will be displayed in the very first interface. Main menu is important with giving users the first impression to determine it has a good visualization and functionality. A good main menu may lead users desire to look forward the software and willing to hand on practice. In the project, the main menu includes 5 module buttons which may navigate into different functionality with different learning experiences. The buttons are arranged neat and clean on the main menu interface. Besides, a GIF animation is implemented on the right side of the screen with a man chopping wood. Most of the images are edited by Microsoft Power Point with combination of text and image and generate into background image and button.

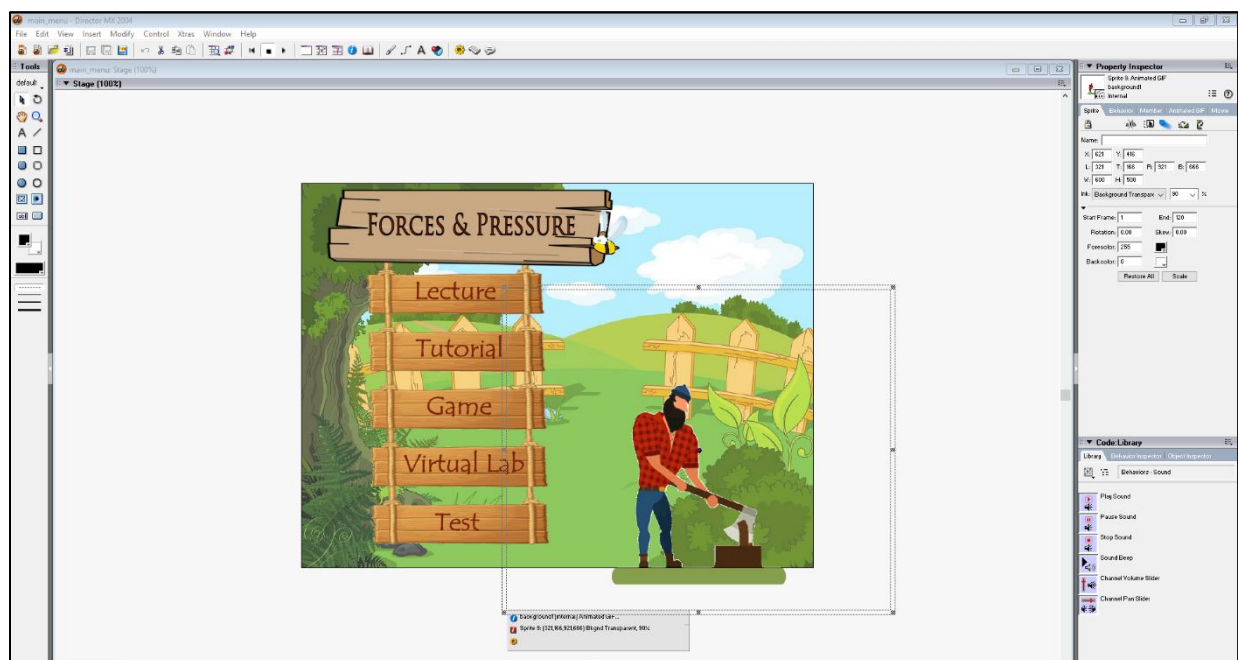


Figure 4.8 Screenshot of Editing Main Menu in Macromedia Direction

4.2.2.1 Lecture Module

Lecture Module contents the physic knowledge that corresponding to the project title. Since the goal of the project is to allow student to extract knowledge easily compare to textbook, lecture module implements 4 of the multimedia elements except video to allow student enhance their

[illegible]

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4.2.2.3 Tutorial Module

Tutorial Module is a module that refreshing learners what they had learnt from the lecture module. Three simple tutorial questions are arranged in tutorial module. Similarly, text, graphic, animation and audio also applied in the tutorial module to create and enhance the interests of the learners. In details, after importing the image from the computer, drag and drop into channel which u desire to place, and adjust the suitable size, then insert the key frame which allow the image presents differently in each of the key frame. While the movie is playing, the image is able to perform a motion with different position or size and make the image is moving visually. Not only that, the tutorial module also provides multiple choice question for learners. Assuming the user clicked wrong answer, the wrong scenario also provided in the tutorial module by alert the users with a big red cross and a faulty sound effect. It is designed in a way that the wrong answer will navigate the users into the designed wrong scenario sprites and the wrong scenario will automatically jump back to the question scenario that forming a loop environment and users only can proceed to the next question by clicking the right answer.

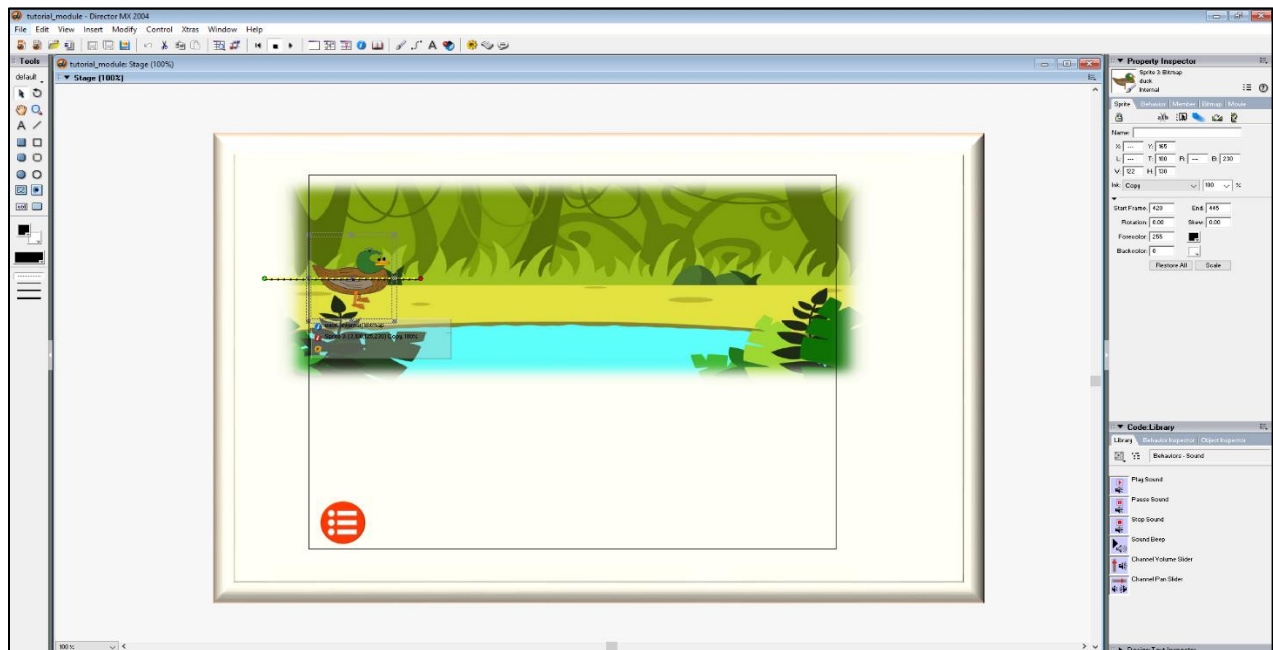


Figure 4.11 Screenshot of editing the animation path of an image

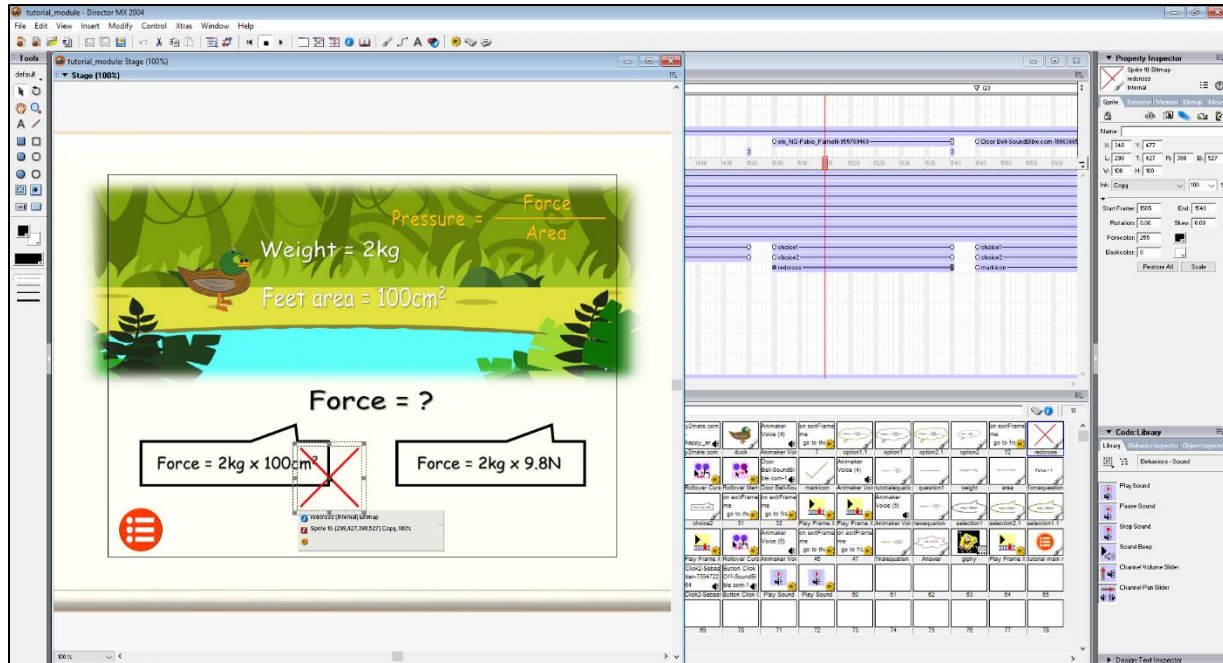


Figure 4.12 Screenshot of editing a wrong answer scenario looping

4.2.2.4 Virtual Lab Module

The purpose of virtual lab module is to strengthen the concept or idea of the physic knowledge for the learners. Users are able to simply click on anything which may lead different scenario. As the topic is relate to pressure physic concept, the virtual lab implements an idea with the objects whether will sink on different surface. Virtual lab module considered as a casual manipulating way to allow learners more options or choices to practice hands-on. Lingo script is required into the objects which allow users have clickable and movable objects. Thereby, a set of lingo scripts has been implemented into every object which allow users to drag and drop.

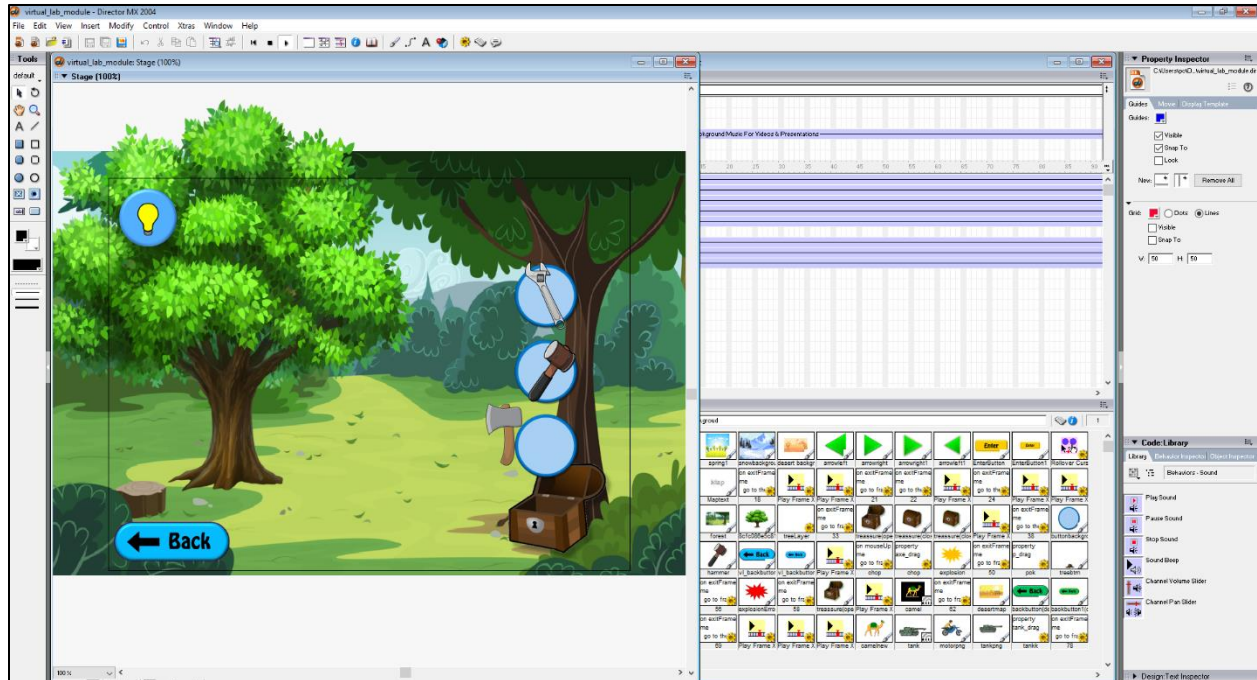


Figure 4.13 Screenshot of editing a clickable and moveable object

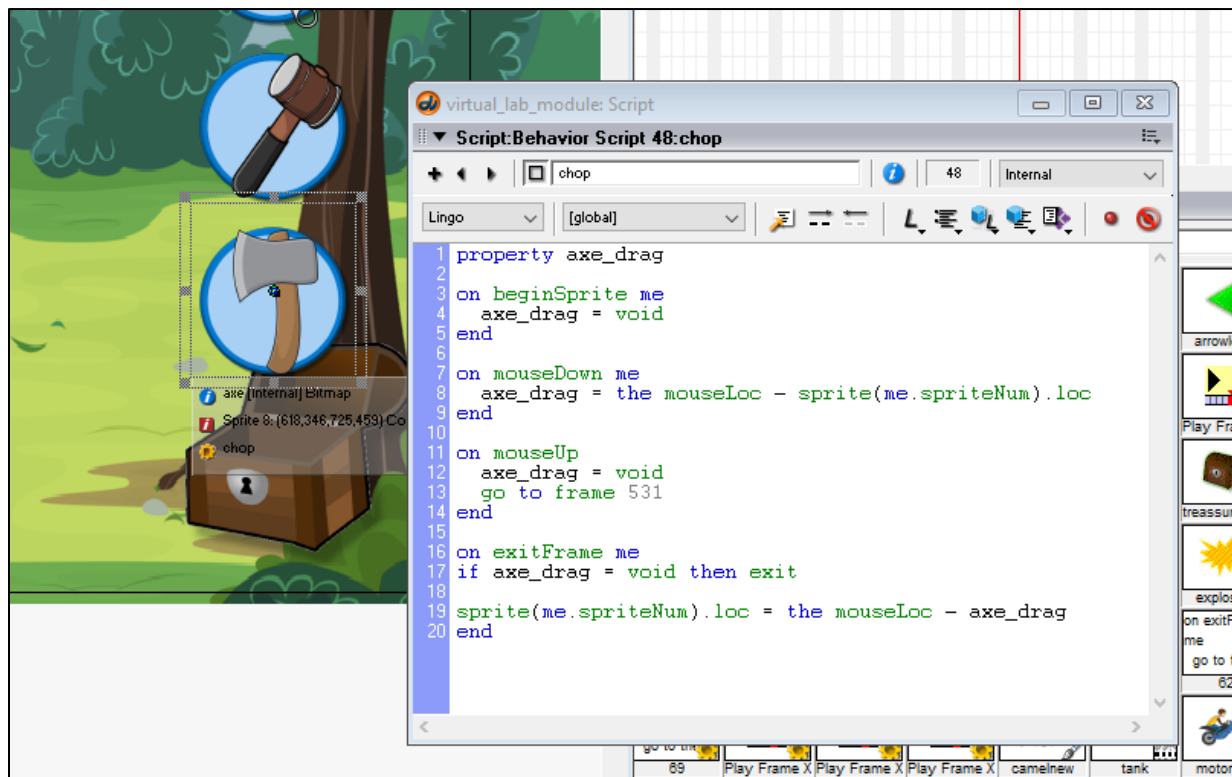


Figure 4.14 Screenshot of applying Lingo Script for a clickable and moveable object

4.2.2.5 Game Module

The game module is developed in story mode based. It is about a man get fired by his company and get caught because of robbing a rich man's house, users are required to apply physic concept to assist him to escape. In order to design a specific character, the game module is required the images of the character with different expressions and motion such as walking, thinking, laughing, sneaking and sitting. Therefore, using Paint computer software is able to create and edit the images independently instead of downloading images from the internet as internet does not provide any similar expression and motion in a single character.



Figure 4.15 Screenshot of the images created by Paint applied into Game Module

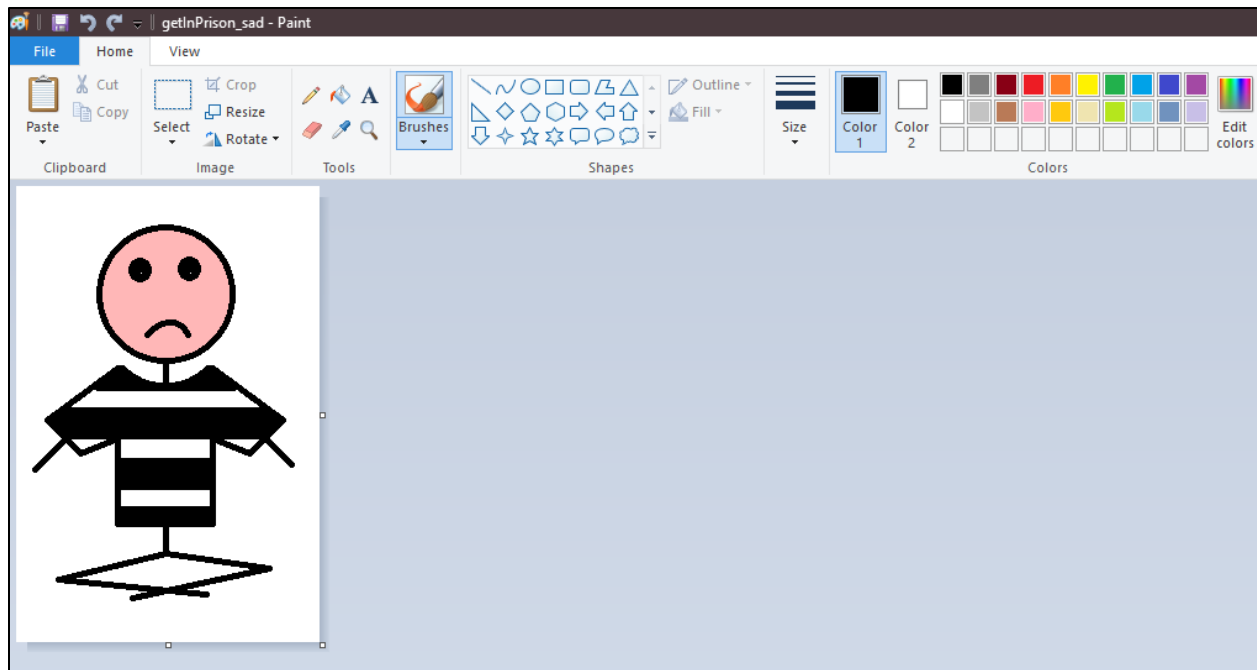


Figure 4.16 Screenshot of drawing and editing a character images by Paint

4.2.2.5 Test Module

The existence of test module is to determine whether the students extract the knowledge by giving 10 questions include the definition of the physics concept and calculations. Test module is different compare to tutorial module as test module provides a scoring functionality to identify the marks that users gained. The questions are not designed to allow undo the answers until the users reach the correct answer. Besides, it is much difficult compare to tutorial module as it provides 4 options for the users to select and reverse thinking way to allow users reach the correct answer. In order to develop the scoring system, it required lingo script to allow an image object from string data type turn into integer data type. Lastly, the final score will be generated and represent as the user's marks and grade.

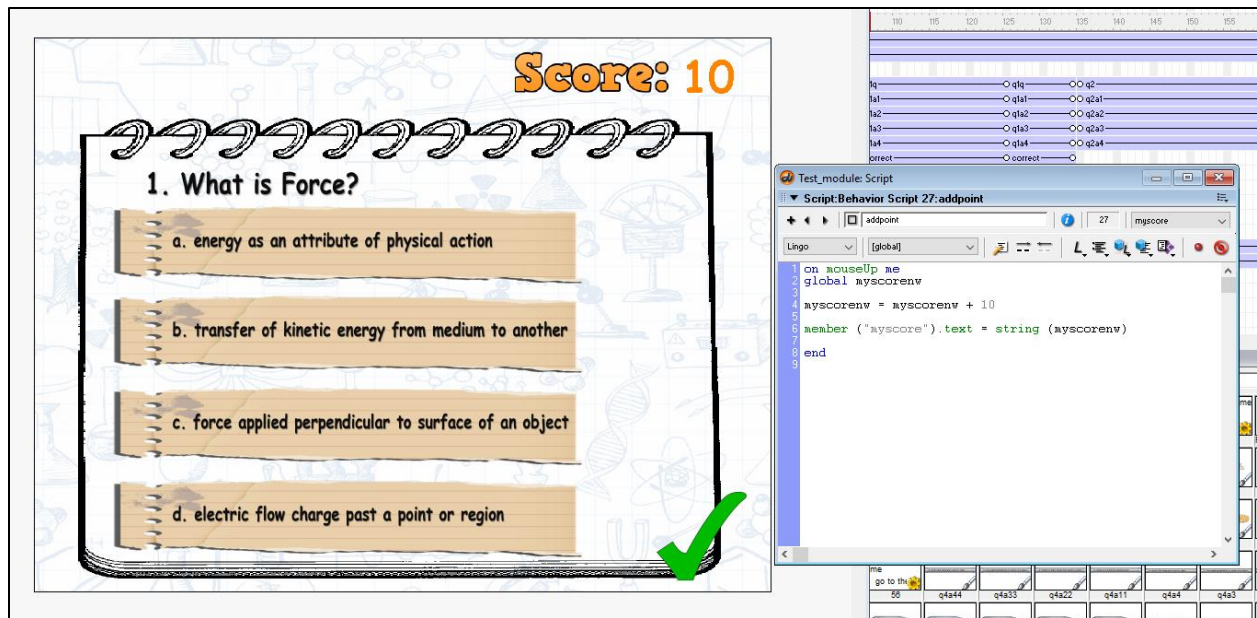


Figure 4.17 Screenshot of adding score by using Lingo Script

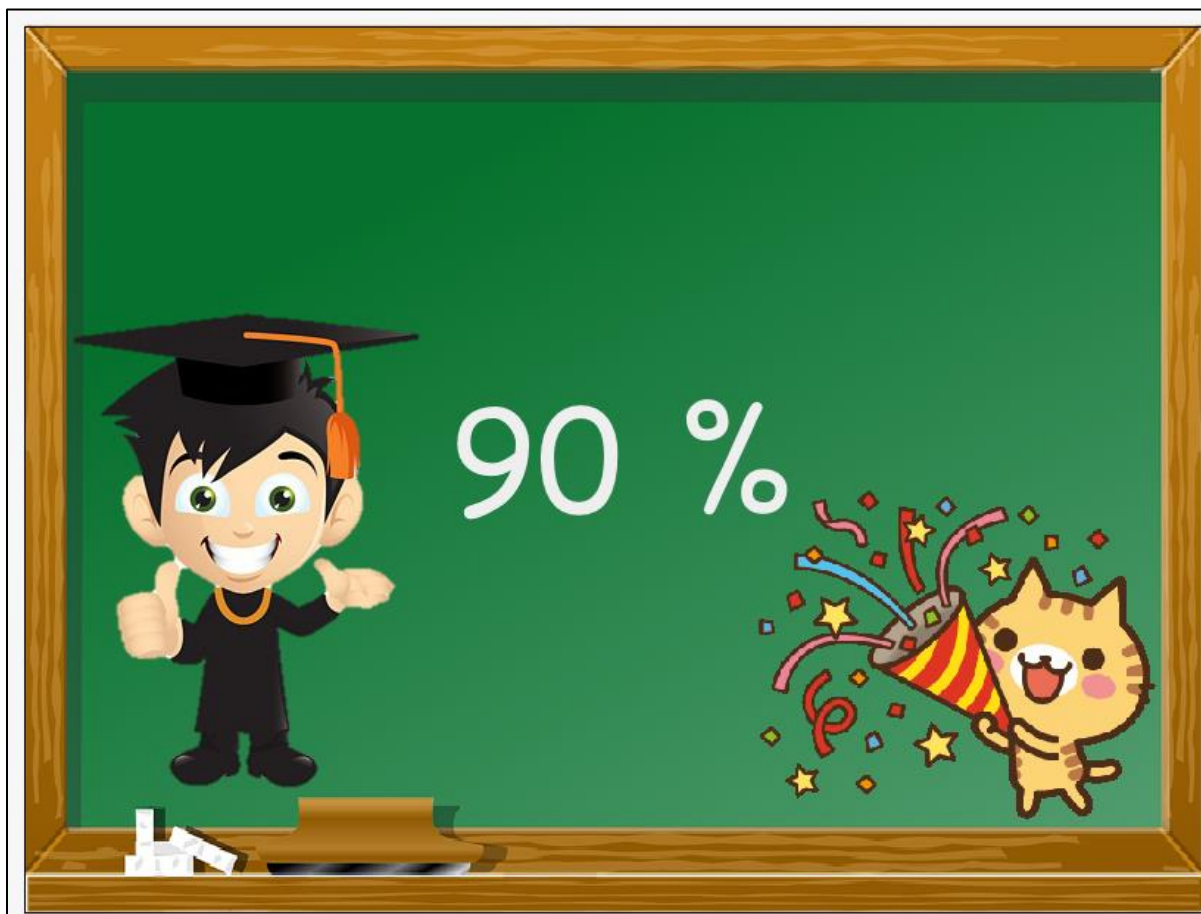


Figure 4.18 Screenshot of the final score after user completes the test

4.2.3 Post-authoring Process

Before ending the pre-authoring process, it is necessary to link all the module director files which is haven't published as execute file by applying the Play Movie X behavior in to the buttons on main menu and also the exit buttons on every modules. It may allow to provide users a clear navigation between the main menu and all the modules.

After place and arrange all the navigation behaviors, the final step is to publish the director file into an execute file which allow users to run with a simple double-click. Since the resolution has been set 800px x 600px in early stage, the publish setting is required to follow the resolution which leads a proper and good visualization software. Specifically, the animation files are required to import in every director files as animation files usually are GIF files which are very sensitive based on the issue of copyright. After importing all the GIF files into every director files, it only able to publish the execute file without any errors and inexistences of images or animations. Finally, the post-authoring process has been done after publish all the combined director files.

CHAPTER 5 Testing, Results & Discussions

5.1 Overview

After published the director files into execute file, it is required to test and do analysis based on users' feedback in order to improve, correct and achieve zero error for the educational software. It is necessary to receive feedback or advice from the users as the software is developed for the users. Besides, according to ADDIE model, evaluation and analysis are also 2 of all the important steps when developing a software or project. Therefore, testing and evaluating will be carried out against to the selected target audience similar as beta testing. Users may provide many solid advices and recommendations as different people have different preferences that also lead the educational course into more effective learning software for all the learners.

5.2 Method of Testing

The method will be applied is summative evaluation as it is able to evaluate the student learning at the end of an instructional unit by comparing it against some benchmark. The participants are provided with the new educational courseware which developed early. They also requested to go through the entire software and playing around. After been through the software, the samples of questionnaire will be tested about 30 users with 8 questions related to the feedback after using the software. Afterwards, data collection will be applied in order to acquire useful advices and recommendations from the users for improvement of the system in the future.

Besides, quantitative method is applied to collect the data from the samples as quantitative research is able to focus on describing and understanding the reality by discovery of "laws" (Beverley Hancock, Elizabeth Ockleford, Kate Windridge, 2009). Data will be used to generate graphs form for detailed research and further discussion for the improvement of educational courseware.

5.3 Testing Analysis

In order to analyze and acquire the testing result and feedback, questionnaires has been conducted by 30 respondents who are secondary students that refer to targeted audience. It is necessary to investigate the texting outcome for improvement of the educational courseware system. An online survey has been implemented by google form for data collection and analysis.

The question has designed and attached as Appendix at page H.

1. How would you rate the overall appearance of the application?

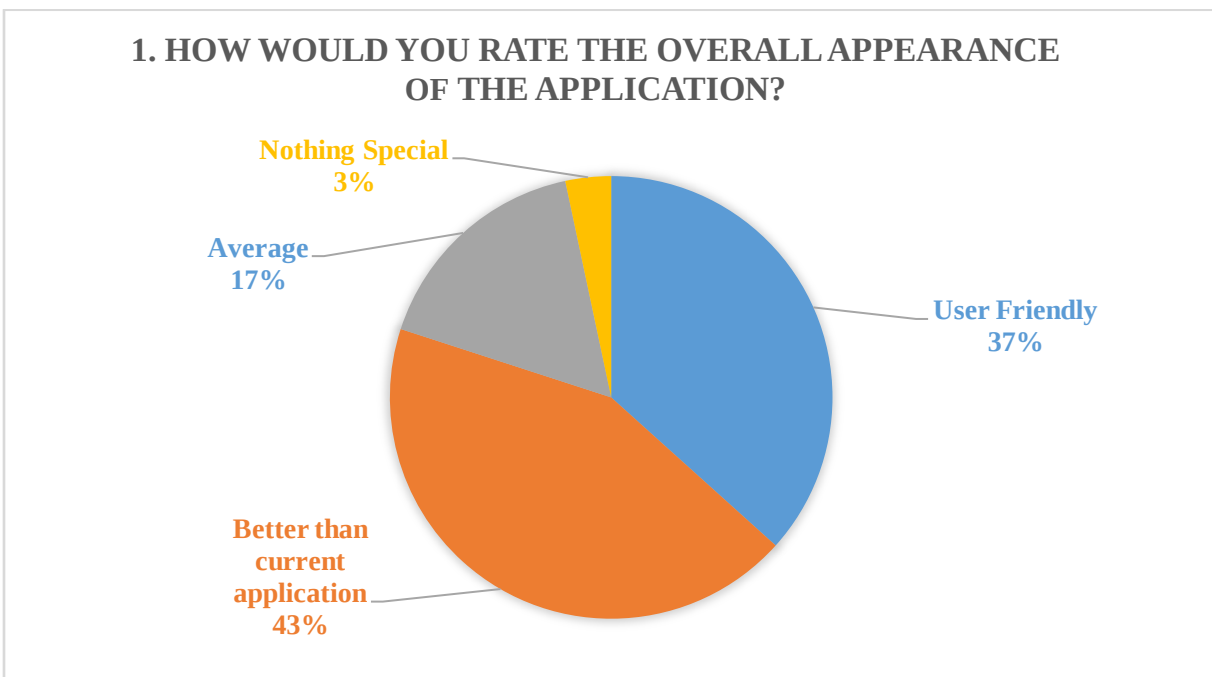


Figure 5.1 Pie Chart of representing the rating from users after using the application

Based on the question asked, 30 of the respondents have answer the question about the overall appearance of the application as it assists to determine the users think about the design or appearance whether suitable for an educational courseware. 43% of the respondents stated that the application which they go through is better than the current application and 37% also stated that it is user friendly. And yet 17% of the respondents and the remaining think it is average and nothing special for the new developed application. Based on the results, it can justified as majority of the users think the appearance of the application is considered good looking and able to bring interest while using the educational courseware.

2. Do you feel irritated or uncomfortable when using the application?

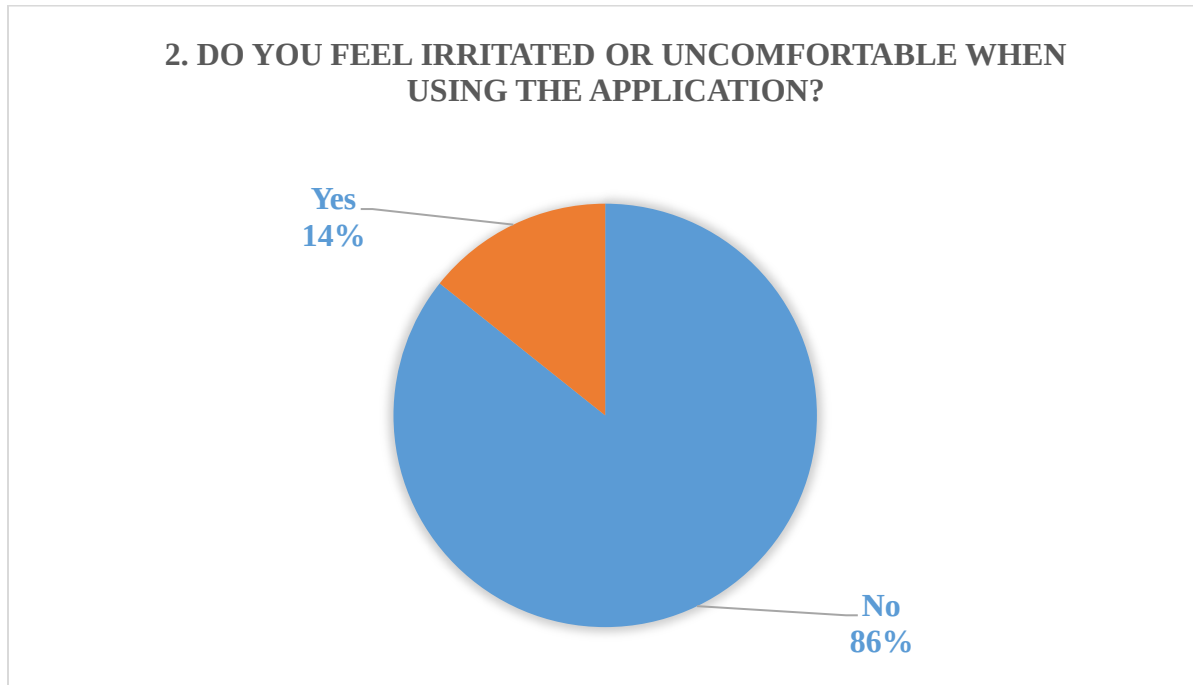


Figure 5.2 Pie Chart of the expression and overall feeling after using the application

The following question is asking how the user feels while using the educational courseware. The overall using experience is crucial as it is a key element to determine whether it helps the users to extract the knowledge in effective and efficient way. 86% of the respondents state that they are not feeling irritated or uncomfortable while using the application. However, 14% of the respondents state that the applications is causing them irritated and uncomfortable after using the application. Based on the evidences above, the application applies a good design structure and combination of colours which lead many users feeling comfortable while using it.

3. Is the application is different from the current educational courseware?

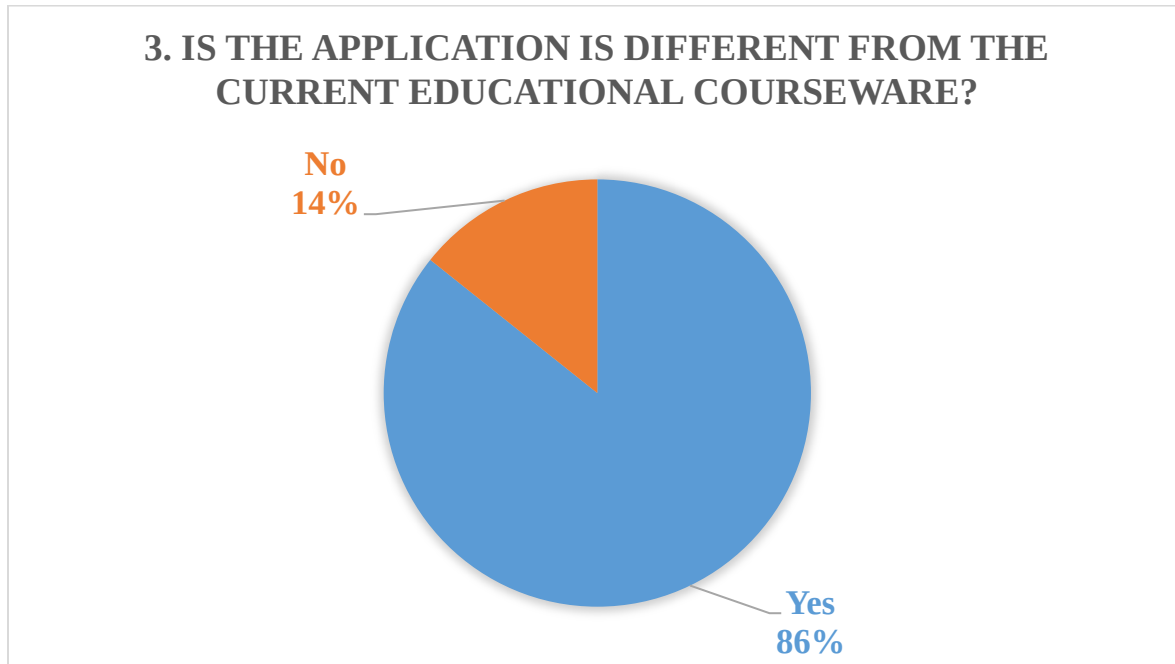


Figure 5.3 Pie Chart of the feedback whether is different from the current application

After been through the survey for the current educational courseware, most of the respond state that the existing application does not designed well due to the design structure and uses of colours. Thereby, the new developed educational courseware is designed in a way of new idea and implementing more multimedia elements to enhance the quality of educational courseware. As this question asked to determine whether the new developed application is different from the existing application. 86% of the respondent state agree for the statement which is expected but the remaining 14% claims that there is no differences between new developed and existing application.

4. Does it helps you to enhance your understanding in physics concept?

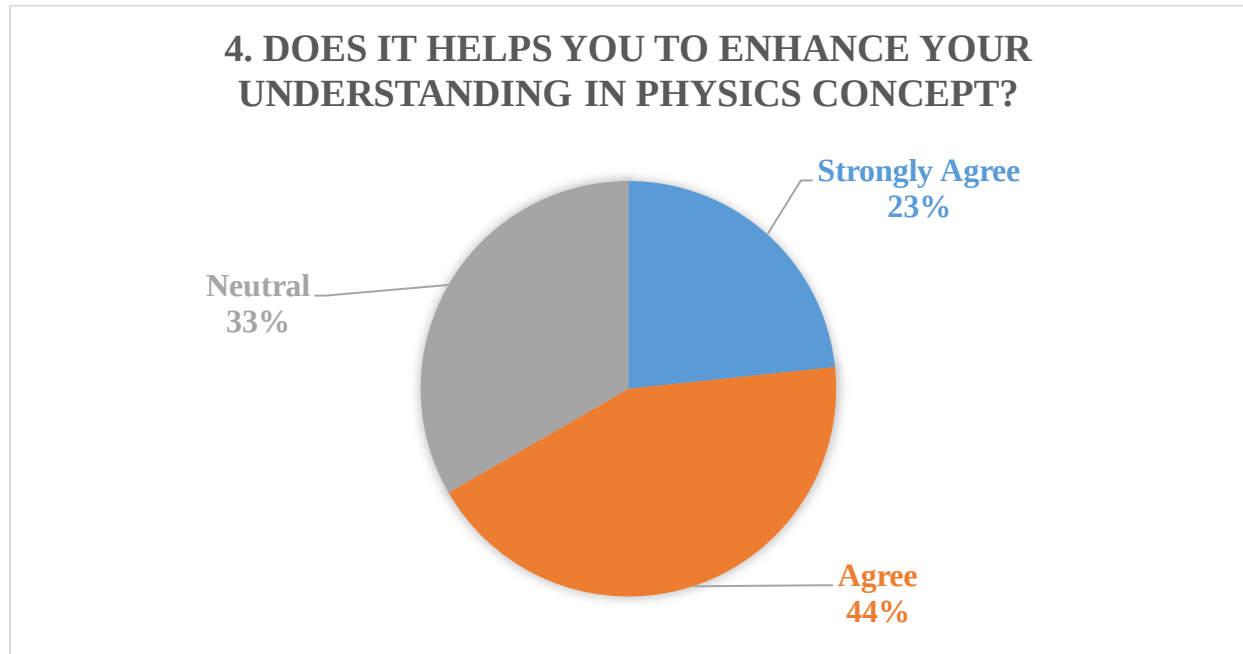


Figure 5.4 Pie Chart of the agreement of users on enhancing their understand in Physic concept

As the main purpose of developing the educational courseware is to assist and enhance the students learning experience, thus the understanding from learners on the content provided is crucial or else it is fail to deliver the main object of the educational courseware. In fact, this question is to determine the agreement of users whether the application is aiding their understanding in physics concept. Majority of them agree that the application is helping them to enhance their understanding as 23% of them selected strongly agree and 44% of them claims agree. Lastly, neutral which refer to normal level claimed by 33% of the respondents. The result of this question is expected as the main objectives is to develop a brand new idea of educational courseware in order to enhance the quality of learning experience.

5. Which part of the educational courseware do you think is useful in assisting you to understand the content?

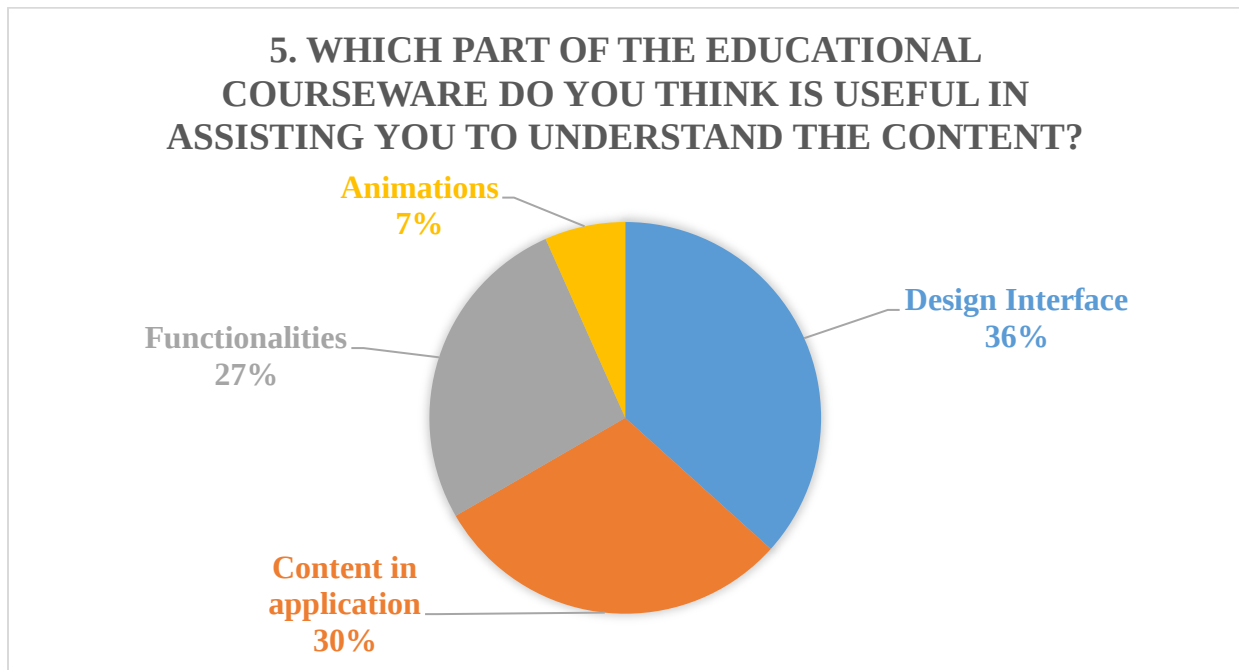


Figure 5.5 Pie Chart of representing which parts are aiding users to understand the content

On this question, it is to determine which parts that allow users have more interest and impressive first images of the application that defined as the excellence of the application and lead the application achieve the goal. 36% of the respondents claim the design interface is useful, 30% of the respondents stated that the content in application is useful to understand the physic concept, 27% of them pick the functionalities part and the remaining 7% says the animations. Based on the result, it can conclude that the combination of design interface and content create valuable and advantage situation in order to assisting learns more effective way. Making wise use of multimedia elements can increase the quality of learning experiences.

6. How well do you think the application is effective in educating people about Physics knowledge?

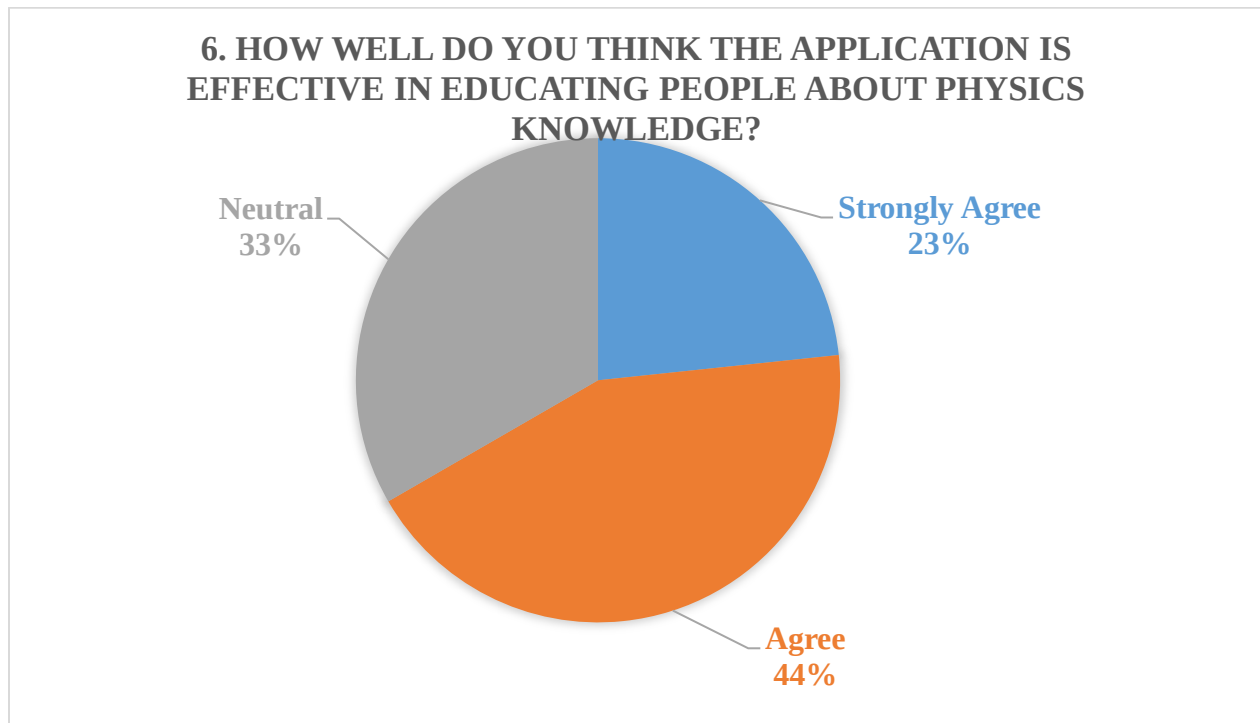


Figure 5.6 Pie Chart of the effectiveness that users think in educating people after using the application

After been through the application, the users are clearly understand the structure of the application and identify whether the application is effective in educating learners about physic knowledge. 23% of the respondents strongly agree this statement and 44% of them claims agree only. However, there is 33% of the respondents are saying the effectiveness in educating learns about physics knowledge is neutral. Based on the result, it can be justified as the majority of the users think the application is helpful in order to extract the knowledge easily from the educational courseware.

7. Does the application is presenting the physic knowledge in an effective way?

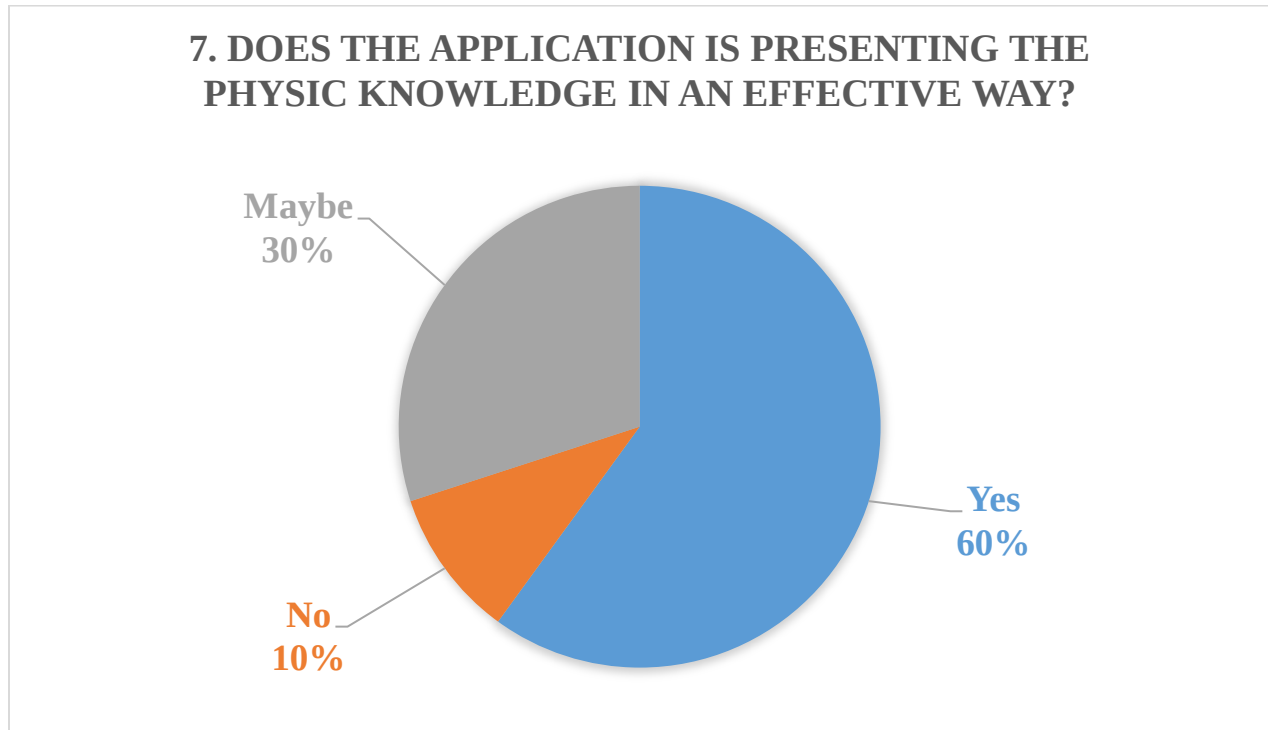


Figure 5.7 Pie Chart of the agreement of users for the application presented knowledge in effective way?

By applying the use of multimedia elements is to develop an interesting educational courseware instead of reading textbook which is very boring and frustrating learning process. However, the content and knowledge that developed in the application are required to be in way of precise and rich. Therefore, it is important to determine whether the application is presenting the physic knowledge in an effective way and accurately. 60% of the respondent agree that the application is presenting the knowledge effectively and 30% of them are claiming maybe which refer to uncertain situation after using the application. However, there is minority of the respondents do not agree that the application is presenting in an effective way. Based on this result, the application is required to improve with modifications even there is only minority of the users do not agree. Advices and feedbacks are always crucial to improve an application.

8. What do you think on how could we improve or enhance the application in future in order to provide better learning experience?

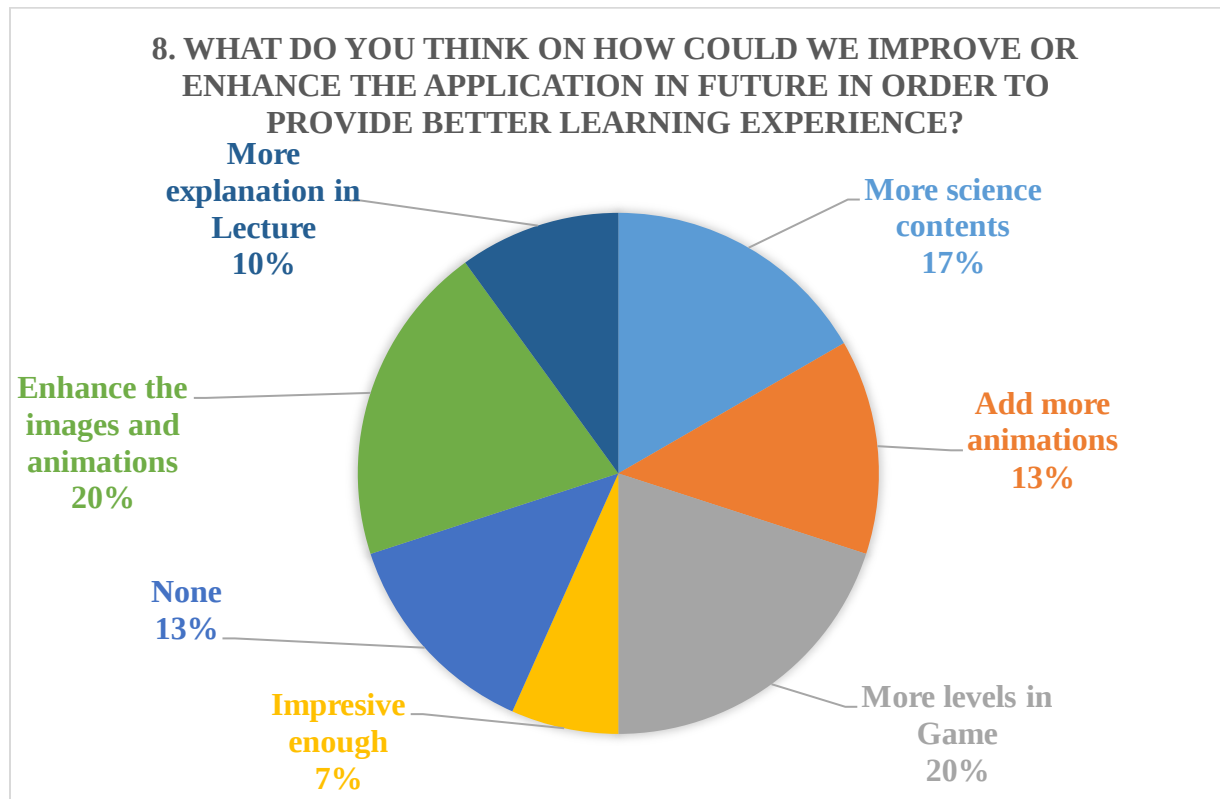


Figure 5.8 Pie Char of the advices or opinions provided from the users

Since there is minority of users do not agree the presenting way is effective, it is necessary to collect ideas and advices from users. More specification conditions on the feedbacks are required in order to modify and improve the educational courseware. The result as above shows that there are different opinions from different users may assist the educational courseware in advance to achieve better quality of learning process. The opinions included more explanation in lecture module, more science contents, add more animations, more levels in game module and enhance the quality of images and animations but some of them claims that impressive enough and no feedback provided. Based on the opinions that users provided, there are valuable and worth to follow up for improving the educational courseware.

5.4 Results and Discussions

Based on the survey, it can conclude that most of the objectives of the project were achieved as the main objectives in the project are high interactivity of the application, delivery of educational contents and enhance the learning experience. Based on the survey, majority of the respondent agree that the new developed educational courseware is different with the existing courseware by improving a better visualization and quality to assist learners extract knowledge in effective way.

Moreover, the survey is conducted by 30 respondents including students and also teacher who are really understand the situation that applying multimedia elements is able to enhance the learning process. Most of the results from the questions are considered stick to the plan which developed early. However, there is a result which is really need to take note and aware about which is the opinions from users. The feedbacks are directly reflect the using experience from the users that consist of problems and requirement based on their expectation and preferences. Therefore, the feedbacks from users are important to save and keep it as references in order to improve and modify the educational courseware.

CHAPTER 6 Conclusion

6.1 Overview

Multimedia courseware is a strong tool to educate learners and allow learners to extract knowledge effectively and efficiency. Thereby, the purpose of this project is to develop a multimedia courseware for the upper secondary school students who are involving in Physics. This is because the multimedia courseware is able to bring interest and provide motivation for the students compare to the traditional teaching method. With high interactivity between multimedia courseware and users, users able to achieve better learning experience as hands on works is better to absorb the knowledge from the multimedia courseware instead of just listening the teachers. Hence, the author is desired to design a multimedia courseware which suitable for users. In order to achieve that, data collection and analysis are needed to conduct as the user requirement is crucial to develop a good multimedia courseware. The multimedia courseware also include new ideas with Virtual Science Lab module and Game Module. It is to allow users have better understanding and more interest during learning process with their own creative.

6.2 Research Findings

Before developing the project, research and findings are required in order to understand and determine how the existing educational courseware perform and how well the project can be developed in order to achieve high quality of learning experience for learners. Therefore, to study the usage of multimedia in education is the main objective in order to identify how multimedia applied in educational to provide ease for students and also teachers. In fact, the existing educational courseware has been used broadly to allow students have better imagination and understand on the knowledge of science. Besides, research and findings have been conducted which related to science or physic materials are worth to revise and identify. After been through the research and reviews, most of the existing courseware consists of different problems which allow users to have bad learning experiences. One of the reason is the interactivity between user and application is low, it may resulted in users do not have much interest to practice with application. Furthermore, it is important to evaluate students learning experience while using multimedia courseware. Therefore, a simple survey conducted able to identify how the students interact with the application and what will the result is. From the data

analysis, the users are found very interesting while using the application as the application applied many multimedia elements which able to bring interest easily with a good visualization.

6.3 Problems Faced

After the completion of the project, the author notices that there are few problems faced while developing the project. First of all, nowadays technology is improving in advance, along with many multimedia editing software developed, the barrier of getting editing skills is much lower compare to the past. However, different editing software provide different functionalities and quality of the outcomes. Not only that, the multimedia sources which are images or animations are difficult to be found and suitable for the project. A new plan has been applied before which is trying to create the images by own drawing and yet it is fail to be conducted as the drawing skill is considered bad. Therefore, the plan still stick to the early which is downloading multimedia materials from the internet. This situation consider as lack of multimedia editing skill that lead the quality of the images developed in the application is lower.

6.4 Knowledge Gained

In order to develop an attractive and interesting application, images and animations are the key elements to help learners create more interests on learning process. Although the multimedia sources are came from the internet, however there is also required some editing skills after downloaded from the internet.

This process help the author to enhance the knowledge of multimedia elements and editing skills while the project is in progress. The author considered keep practicing how to create and edit the multimedia elements to develop a better visualization and learning experience for the learners. Not only that, learn how to write lingo script is also the knowledge gained while developing the project. Lingo script is required in the project to perform advance functionality such as allow objects to be moveable and create a scoring system for the learners to determine their grades.

6.5 Limitations

As the problems stated above, bad editing and drawing skills will lead the educational courseware does not fulfilled alike as expected. Adobe Illustrator is the most suitable editing software to create and edit images for the project. However, Adobe Illustrator considered an advance editing software which create high barrier for beginners. Even though tutorials for learning the software are provided on Youtube but it takes time to learn and explore how to manipulate the function to create and edit images. Furthermore, it may also lead to a problem which is taking more time to explore and search for the suitable materials for the project. Suitable materials are not always ready to be capture, then the appearance and design of the project that planned early will consists of many changes after developing the project.

6.6 Future Enhancement

Advance creating and editing skills are important to develop an educational courseware. An advice needed to be take note which is taking course or class for learning about how to manipulating an editing software before developing the project. By applying this step, the project can be reduce the time consuming and also increase the confidence of fulfilling the requirement of the project which planned early.

In order to develop an application that able to achieve satisfaction from users, it is important often to explore the existing application for getting more ideas and motivation. By exploring, the ideas will be generated easily in creative and innovative ways and able to inspire user and attract their attention while learning.

Besides, patience is crucial while developing the project as it includes many editing and arranging process. Patience normally is following interest and a good interest brings patience while developing. Thereby, it is able to develop a high quality of application by applying patience as good product is always take time to create. Lastly, learning is not an achievement but a process. Learning process never end as students and creator are also learners. By applying the editing knowledge learned early, the project will has higher quality and better performance to achieve the main objectives of the project.

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Appendix A: Final Year Project Biweekly Report

Appendix B: Plagiarism Check Summary

Appendix C: Form iad-FM-IAD-005

Appendix D: Poster

Appendix E: Sample of Questionnaires

Survey Questionnaire (User Requirements Gathering)

Dear respondent,

I am a final year student pursuing Bachelor of Information Technology (Hons) Business Information Technology from University Tunku Abdul Rahman (UTAR), Perak.

The purpose of this survey is to investigate the perception of upper secondary school science stream students on the current educational courseware. Thereby, your participation in this survey is highly valued and appreciated.

Instructions:

1. There is **ONLY ONE (1)** section in this questionnaire. Kindly answer **ALL** the questions.
 2. This questionnaire might take about 5-10 minutes to complete.
 3. All information that you provide will be treated as PRIVATE and CONFIDENTIAL and used solely for academic purpose only.
-

Please answer the following questions:

1. Gender:

Male ☐ Female ☐

2. Do you experience educational courseware before for your learning?

Yes ☐ No ☐

If no, please proceed to Question 8.

3. Do you think educational courseware is very effective to assist current learning programmes?

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

4. Does it helps to enhance your understanding in science subjects?

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

5. Which part of the educational courseware do you think it is useful in aiding you to have a better understanding in science subjects?

6. What are the problems that you can identify in the current educational courseware?

7. Based on your opinion, what are the new features that you expect to be included in the new educational courseware? (Can choose more than one option.)

Lecture with images ☐ Tutorial Questions ☐ Virtual science lab ☐ Games ☐
Scenario examples ☐ Others ☐

For Choosing “No” in Question 2

8. Were you exposed to multimedia contents before? (Multimedia contents include text with images, video and audio.)

Yes ☐ No ☐

9. If multimedia technologies are going to be used in the design of software to facilitate learning processes, is there any features that you anticipate to be incorporated into the software? (e.g. interface design, functionalities etc.)

THANK YOU FOR YOUR COOPERATION

Survey Questionnaire (User Feedback Gathering)

Dear respondent,

I am a final year student pursuing Bachelor of Information Technology (Hons) Business Information Technology from University Tunku Abdul Rahman (UTAR), Perak.

The purpose of this survey is to collect and analyse the feedback of upper secondary school science stream students after using the new developed educational courseware. Thereby, your participation in this survey is highly valued and appreciated.

Instructions:

1. There is **ONLY ONE (1)** section in this questionnaire. Kindly answer **ALL** the questions.
 2. This questionnaire might take about 5-10 minutes to complete.
 3. All information that you provide will be treated as PRIVATE and CONFIDENTIAL and used solely for academic purpose only.
-

Please answer the following questions:

1. How would you rate the overall appearance of the application?

Better than current application ☐ User Friendly ☐ Average ☐ Nothing special ☐

2. Do you feel irritated or uncomfortable when using the application?

Yes ☐ No ☐

3. Is the application is different from the current educational courseware?

Yes ☐ No ☐

4. Does it helps you to enhance your understanding in physics concept?

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

5. Which part of the educational courseware do you think it is useful in aiding you to have a better understanding in science subjects?

6. How well do you think the application is effective in educating people about Physics knowledge?

Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐

7. Does the application is presenting the physic knowledge in an effective way?

Yes ☐ No ☐ Maybe ☐

8. What do you think on how could we improve or enhance the application in future in order to provide better learning experience?

THANK YOU FOR YOUR COOPERATION