FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION FOR PRIMARY SCHOOL IN STANDARD TWO

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BORANG PENGESAHAN STATUS TESIS

JUDUL: FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION FOR PRIMARY SCHOOL IN STANDARD TWO

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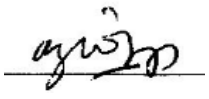

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FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION FOR PRIMARY SCHOOL IN STANDARD TWO

DHIYA ‘IZZATI BINTI AHMAD JAFAR

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

FACULTY OF INFORMATION AND COMMUNICATION TEKNOLOGY
UNIVERITY TEKNIKAL MALAYSIA MELAKA
2016

DECLARATION

I hereby declare that this project report entitled

FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION FOR PRIMARY SCHOOL IN STANDARD TWO

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : _____ Date : 25/08/2016
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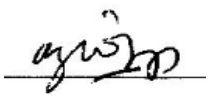
I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Interactive Media) With Honours.



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DEDICATION

To my beloved parents and family, thank you unconditional support with my studies. Thank you for giving me a chance to prove and improved myself and I'm very honoured to have you as my parents and family.

To my supervisor, Mrs.Norazlin Mohammed, thanks you for guidance and emcouragement during project implementation.

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This Final Year Project is the end of my journey to finished my degree in Universiti Teknikal Malaysia Melaka. This project has been complete on time with the support many of people including my supervisor, my friends and my family. At the end of my Final Year Project, I would like this opportunity to say thank you for all those people who willing to help and spend time for me in complete this project. Without them, this Final Year Project would not be finished on time.

First of all, I want to thank you great appreciation to my supervisor, Mrs. Norazlin Mohammed, who has supported and guided me along the progress of the Final Year Project with the patient and knowledge. Without her, this report and the product is not likely to be completed on schedule.

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Lastly, I would like to thanks my friend as well. Thanks for listening, offering me advice and supporting me throughout this entire semester. Thanks again for not stingy on sharing their knowledge and lending their hand for me.

ABSTRACT

In generally, this project was developed for children that in Standard Two for the chapter two and topic identify how animals reproduce one of them is frog life cycle. This project suddenly focused on how the frog life cycle on every stage. This is because these topics are not so overly focused on children and small in their textbooks. Other than that, this project is bases on Android phone platform by using Augmented Reality technology to deliver the information to the user. Furthermore, this project uses storybook as a tool that contains markers for technology Augmented Reality in this project. With it, a storybook also comes with a storyline that appeals to children or the end user. Therefore, this project describes each stage of the process life cycle of a frog. Wherein, each stage we need to know is to use the photos and descriptions to help children understand each process.

ABSTRAK

Secara amnya, projek ini dibangunkan untuk kanak-kanak darjah dua dalam unit dua iaitu bagaimana haiwan membiak. Projek ini, mengfokuskan pada bagaimana katak membiak atau tentang kitaran hidup katak. Ini disebabkan topik ini tidak begitu terlalu memberi tumpuan kepada kanak-kanak dan kecil dalam buku teks mereka. Selain itu, projek ini hanya menggunakan platfom telefon “Android” dengan menggunakan teknologi “ Augmented Reality” untuk menyampaikan meklumat kepada pengguna. Tambahan pula, projek ini menggunakan buku cerita sebagai alat bantu yang mengandungi penanda untuk teknologi “Augmented Reality” yang digunakan dalam projek ini. Dengan itu, buku cerita juga dilengkapi dengan jalan cerita yang menarik minat kanak-kanak atau pengguna akhir. Oleh itu, projek ini menerangkan setiap peringkat proses kitaran hidupan katak. Dimana, setiap peringkat yang perlu kita tahu adalah menggunakan gambar dan penerangan untuk membantu kanak-kanak faham pada setiap proses.

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CHAPTER I

INTRODUCTION

1.1 Project Background

Nowadays, many technology that can use in learning process either terms of all levels of society. It also more easily to attract the children to learn something new in their life. This project is via an Augmented Reality (AR) as a platform to deliver the information and using mobile phone and storybook as tools.

An augmented reality system generates a composite view for the user that is the combination of the real scene viewed by the user and a virtual scene generated by the computer that augments the scene with additional information.

Beside that, this project is about frog life cycle process via AR using mobile application to help primary school in standard two student to learn in science subject to be more understand about how the process will be happen. Moreover, this platform also will be develop because nowadays every children already exposed with mobile phone and this is one of the way to deliver all the information through the mobile phone.

This project also have storybook as a tool to using this project. The storybook will be content the multimedia element such as image, text and animation to attract the student in learning process at their class room. Therefore, this project also can be as a teaching aids to their teacher during learning process.

1.2 Problem Statements

In Malaysia, the subject of science are core subjects that should be taken by each student and must follow through their syllabus in the text book. However, there are some parts of this subject the children not very interested to learn because of some problem.

Firstly most of the children not very interested in this chapter. Because, sometimes butterfly life cycle more given approach to them. Beside that, information used in the text book is basic.

Secondly at the school they still using traditional method without using another teaching aids because the teaching aids is difficult to bring everywhere. Other than that, nowadays every children more interesting to mobile application and traditional method make children feeling bored.

Lastly, problem is sometimes when documentary about the frog life process for child be shown at the television but they can't watch because time of showing is not suitable for them.

1.3 Objectives

i. To develop 3D Augmented Reality for Frog Life Cycle Process to deliver the information.

ii. To create Story Book as a platform when using this project.

iii. To know the effectiveness of using this platform to deliver the information in testing phase.

1.4 Project Scopes

This project is primarily built for children that in Standard Two for the chapter two and topic identify how animals reproduce one of them is frog life cycle. This because suddenly this topic of Frog Life Cycle not very to focused to children and also too small in their text book.

Moreover this project focuses on mobile application only. This platform only use Android phone by using Augmented Reality technology to deliver the information to the user. These platforms require a minimum version of Android like Android version 4.4.2 (Gingerbread) or higher. Since the Augmented Reality is applied on this project, the identification ID marker is chosen to and implement at story book also as the tools for this project.

Other than that, this project is to explain every level of frog life cycle. Which is every level have the info that we need to know. This way is using an image through storyline to help the children to understand every process.

1.5 Project Significance

This project is suitable for usefulness at primary school in standard two in the chapter two at topic how animal is produce. It is develop to get the attention of students in the classroom and make this topic more interesting to learn. This is aim to help them to understand the process of frog life cycle and the teacher can use this application as teachings aids at their classroom.

Therefore, with Frog Life Cycle Process Of Frog Via Augmented Reality (AR) Using Mobile Application for Primary School In Standard Two can replace the documentary about the frog life process that be show at the television and also can watch anytime.

Other than that, by developing this mobile application, teachers more easily to teach about this topic to the student and also can help in attracting the attention of their students in the classroom.

Moreover, every parents also get the benefit with this application because they also can assist the student learn this topic at home. Therefore, with this application, this topic will deliver successfully to all user especially to the teacher and they will begin with new method in their lesson.

1.6 Expected Outputs

The expected result for this project is Frog Life Cycle Process Of Frog Via Augmented Reality (AR) Using Mobile Application for Primary School In Standard Two. Other than that, this application can function with the ID marker at storybook

Secondly, is Storybook as a platform when using this project. This platform can used as teaching aids for science teachers and also can help understanding their students to understand this topic. This storybook use an image and 3D model as interaction of explanation to every level of frog life cycle process.

Lastly, the interaction can function when the user can scanning by ID marker at the storybook. After that, an image or 3D model will overlap on the ID marker and the user can see the 3D model of every level of life cycle.

1.7 Conclusion

In conclusion, this project aims to develop an Augment Reality Android mobile application which names Frog Life Cycle Process Of Frog Via Augmented Reality (AR) Using Mobile Application for Primary School In Standard Two. This mobile application will facilitate the teacher as teaching aids in their class and can attract their student to understand this topic. Other than that, parents also can have this application by download at their own mobile phone for use at home. Therefore, this is a convenience mobile application and this topic will be more interested for the children and also can help the teacher at the school.

The next chapter will be explain the literature review and project methodology. The literature review will explain about the technology that will be used in this platform and technique that being applied on science subject. Other than that, project methodology is identified and used as a guide when develop this project.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

In this chapter will be discuss about the literature review and project methodology for developing this frog life cycle process via AR using mobile application. Literature review will be discuss about the fact finding in analysis for develop this project. For this project, most of reading source are from the science text book, article, internet and journal. The literature review will be done by searching the articles about the Android Software, previous method that use in school, reference book about a frog and their species and also journal about the Augmented Reality (AR) technology that will be use in this project.

In addition, project methodology for develop this project is Cyclic Waterfall methodology. This project methodology Cyclic Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Cyclic Waterfall" approach, the whole process of software development is divided into separate in seven phases. That are consist requirement gathering and analysis, design phase, implementation, testing, deployment and maintenance. Other than that, software and hardware requirement also will be show of each functionality in each details of software and hardware that be use in this project. Milestone of this project also be show l the end of this chapter to show the progress and duration of this project.

2.2 Domain

This application that will be develop is based on learning to assist the children to understand about the frog life cycle. Moreover, this application also for mobile application. It is because nowadays every people are posses the mobile phone as needs in their life. Than its more easier to the user use this application. Other than that, most every children also been exposed to the new technology in their school such as each student opportunities to use computers in the computer lab.

Augmented reality is one of another ways that can use in learning base to deliver the information. Its also can attract their children to learn the new technologies.

Domain for this application is augmented reality and using mobile application for the viewer and storybook as tool for this application to deliver the information of frog life cycle..

2.3 Facts and Findings

The facts and findings for this project include the definition and evolution of AR and AR types, what are the ways that have been used in schools in learning science subjects in standard two. In addition, the use of teaching tools used by teachers in school as well as the differences between the existing systems.

2.3.1 Augmented Reality (AR)

Augmented Reality(AR) is quite new technology that can use to deliver information or as a tools in learning based. Its also related to Virtual Reality(VR). VR typically defined in terms of a particular collection of technology hardware, include computer, head-mounted displays, headphones and motion-sensing gloves. (Jonathan Steuer, Stanford University, December 1992). VR is a fully three-dimensional computer generated world in which a person can move about and interact as if actually were in this imaginary place(Surg Endocs, 1993).

Augmented Reality is a new way to present something between the real world and technology. It is an emerging technology in which one's Real-time environment is enhanced by computer generated information such as graphic, content, audio or object which is displayed on the screen(Multidots, April 6, 2015). Augmented reality (AR) for assembly processes is a new kind of computer support for a traditional industrial domain. This new application of AR technology is called ARsembly (Stefan Wiedenmaier, Olaf Oehme, Ludger Schmidt & Holger Luczak, 2009). Augmented reality (AR) is a novel human–machine interaction that overlays virtual computer-generated information on a real world environment. It has found good potential applications in many fields, such as military training, surgery, entertainment, maintenance, assembly, product design and other manufacturing operations in the last ten years. This paper provides a comprehensive survey of developed and demonstrated AR applications in manufacturing activities(S. K. Onga, M. L. Yuana & A. Y. C. Neea*, Oct 2008).

2.3.1.1 Marker vs. Marker-less AR

In AR there are two basic types for implement the AR system which are can be either maker-based or marker-less. Maker-based AR uses a camera and a visual marker baked into the content that a marketer wants to present. The viewer holds up the content to the camera to see the AR in action. Basically this type of AR is capable to identify 2D images, bar-codes. Marker-based AR is the most prevalent and easiest to accomplish(Multidots, April 6, 2015).

While the Marker-less is uses a graphic instead of marker. As a result, AR implementation and use is easier; marketers can use existing graphics to present their AR ads and consumers can view them easily. Marker-less AR is often more reliant on the capabilities of the device being used such as the GPS location, velocity meter, etc. It may also be referred to as Location-based or Position-based AR(Multidots, April 6, 2015).

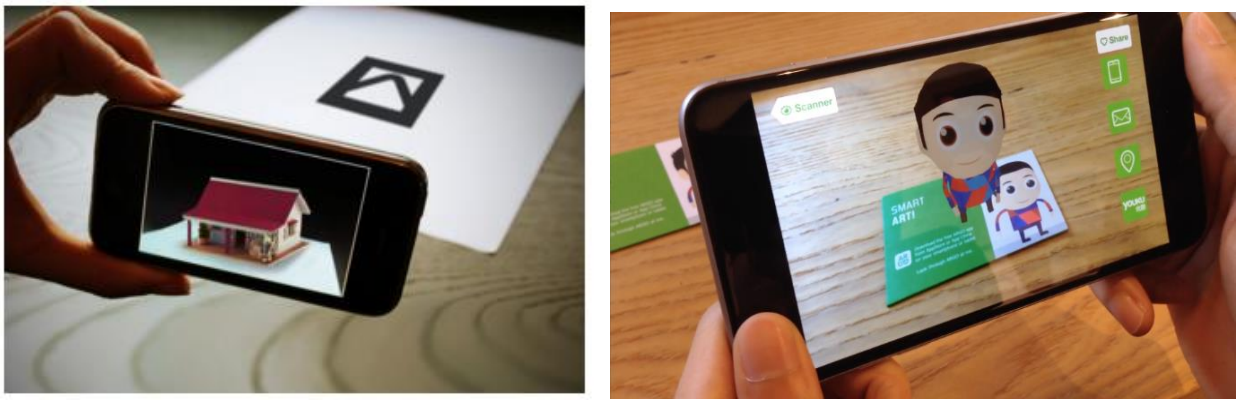
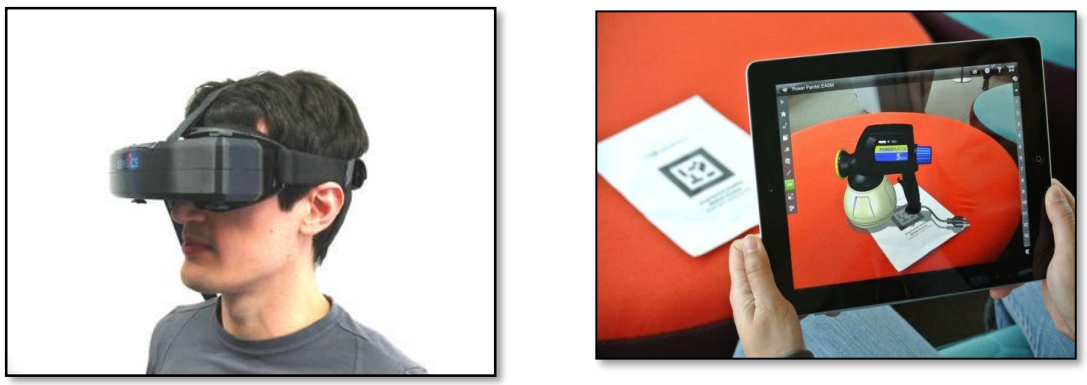


Figure 2.1 Marker-based application and markerless application

2.3.1.2 Hardware Components for AR

There are four main hardware components for augmented reality which are processor, display, sensors and input devices. There are also a lot of cool human computer interaction (HCI) projects coming from assistive technology that can be used to expand the AR experience. Alternative modes interaction include using eye tracking for input and sound to provide additional cues that improve the user experience. Head-Mounted Display (HMD), handheld display and spatial display are three major display techniques for AR. Other than that, the portable computing device needs some automatic way of finding out the locations such as digital cameras, optical sensors, Global Positioning System (GPS) and other technologies.



(a) HMD **(b) Handheld display**

(c) Spatial Display

Figure 2.2: Hardware components for AR

2.3.1.3 Application of AR

In the present, AR are widely used in any field, and there are different types of applications have been developed in their field such as medicine, education, interior design, tourism and sightseeing, navigation, entertainment and other fields.

Nowadays, many ways that can be used to convey information, for example the use of AR in education. In this way also, helps teachers as well as parents teach their children either at home or in school. In addition, many books, magazines and brochures contain AR. After that, students can enjoy playing around with the 3D object. This application aims to help students to more understand the information and to improve their memory for the specific subject. is more of interest to users and also one of the ways to introduce what is AR.

2.3.1.4 Animal Life Cycle

Animal life cycle is The course of developmental changes through which an organism passes from its inception through the stage at which it reproduces. Frog is the amphibians species which is have a slightly more complicated life cycle. They undergo a metamorphosis means have big change of every stage of life cycle. It is has several character which are they are born either alive from their mother or hatched from eggs, they spend their childhood

under water, breathing with gills and they grow into adults and move to the land, breathing with lungs. This all information are use in this project for deliver the information through the application that will be develop.

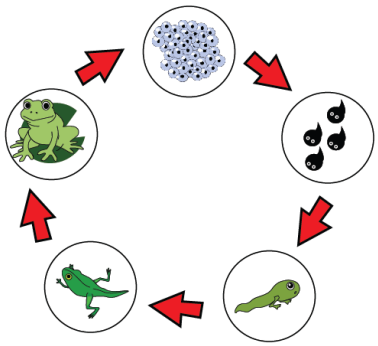


Figure 2.3 Frog Life Cycle Process

2.3.2. Other technique applied to know frog life cycle.

Many ways to get the information about frog life cycle other than through books or any learning application. They also can know the life cycle through the video to get the complete information. Beside that, the user also can find the video through the internet or watch on the television program. While nowadays that have many documentary program on television but sometime time of the television program are not suitable especially for the children. Meanwhile, through the video or television program the user can know the information more a realife because they can watch the physical process of every stage.

This technique also can attract the children to interested with the documentary program. Its also allow the children to explore to learn the new things in their life.

2.3.3 Existing System

Different types of mobile application for e-learning are available in App Store or Google Play Store which allow user to download and learn throught their device. Tagme3D EN Book1, are the examples of mobile application for e-learning.

2.3.3.1 Science Standard Two Text Book

Sciene text book already use at every school in Malaysia. This books also have the syllabus which are every student must follow the content. The content for sub chapter are simple and colorful. Its also know as traditional way and will assist with teaching aid and activity book. Beside that, in the text book also have many text that children must read. While sometimes the content not very interested and the children not very attracted with it.

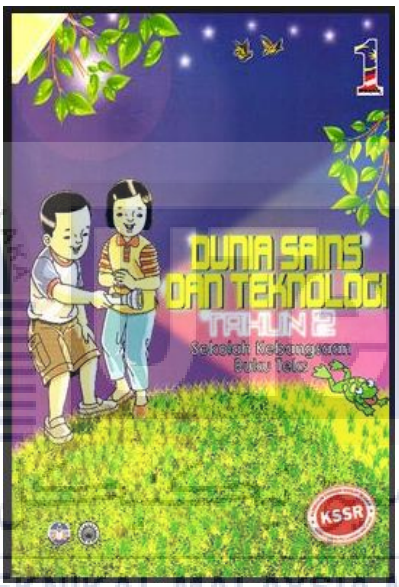


Figure 2.4 : Science Text Book

2.3.3.2 Tagme3D EN Book1

This application is an innovative educational application that makes learning English both simple and exciting. While this application was contributed by Victoria Han Farago. Other than that, this application uses emergent 3D and AR technology to combine spelling, phonics, and visual representation to help build the vocabulary. The children can have fun to play with 3D object while they're learning in this application. This application also, can scan the tags on each page and watch as 3D objects pop out of the book and onto the screen.

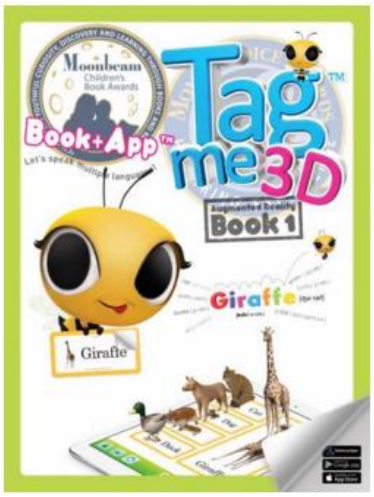


Figure 2.5 : Tagme3D application

2.2.3.3 SkyView® Explore the Universe

In this application, the sky complete with constellations, planets, and satellites. It also can touch planets, stars, and constellations to get more info and history at the bottom of the screen. An educational astronomy application that uses your location to overlay your view of the sky onto your camera view. Planets, stars, constellations, and satellites are magnified can "see" where they are during the day or night. Tapping on objects allows you to read numerous facts about them and track their movement through the sky. Beside that, it also search for objects that are above the horizon and follow an arrow on the screen to locate them. A few constellations come from myths that include violence or sex, but the descriptions are not lurid.

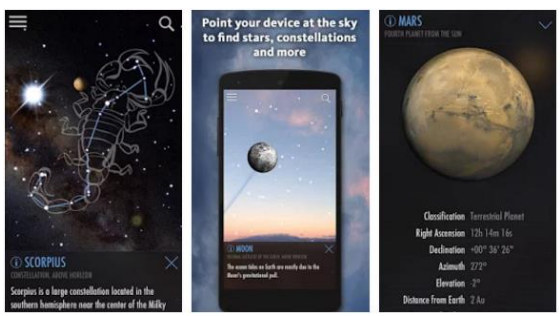


Figure 2.6 : SkyView® Explore the Universe application

2.2.3.4 English Flashcards For Kids

The application has 1500 sound flashcards with bright images which are divided into topics and learning games find picture. This application also, are an easy and interesting way for your child recognize the world around them. Approved worldwide by child psychologists, teachers and parents themselves, flashcards are ideal for very young children and those up to 7 years of age.

Figure 2.7 : English Flashcards For Kids application

2.2.5 Comparison of the Existing Application

The table below showed the comparison of the existing mobile application which related to e-learning in school subject. Categories that compared among three existing mobile applications are technology applied, AR's SDK used, tracking method, price, platform, content creation, additional features, pros and con.

Table 2.1: Comparison of the exiting mobile application

Categories	Tagme 3D EN Book	SkyView® Explore the Universe	English Flashcards For Kids	Science Text Book
Technology applied	AR	AR	AR	Tradisional Way

AR's SDK Used	Vuforia	Vuforia	Vuforia	No
Tracking method	Scan the picture in the book.	Based on natural feature tracking on the sky to identified the galaxy	Scan the picture in the book.	Based on the figure in the text book
Price	RM 20.55	RM 6.48	Free	Free or can buy at book store
Platform	Android, iOS	iOS, Android	Android	
Content creation	3D animation, Audio, Text	Images, Text	3D Animation, Audio, Text, Images	Based on KSSR which is follow the syllabus of Kementerian Pendidikan
Additional Features	Available for all user either at home			

Pros	• Learn English spelling and pronunciation • User can use the AR mobile application at home or when they go to anywhere. • Free for the iOS user.	• Can be in night mode or day mode. • Follow the sky track for any object to see it exact location on any date and time. • Wifi is not required when using the application	• Free to download and install on an Android device • It is interactive and interesting because it provides 3D view	• Provide to every student in standard school. • Have a activity book and teaching aids for learning process
Con	• This application needs to purchase for the next version. • Have many version and each version is quite same and also make the user confuse .	• This application needs to purchase before users can download	• Must buying the flashcard when using this application.	• The children didn't read after school. • No interactive.

2.4 Project Methodology

The methodology that will be in this project is using cyclic waterfall model. Cyclic waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In cyclic waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially. In "The Cyclic Waterfall" approach, the whole process of software development is divided into separate in six phases. All these phases are cascaded to each other in which progress is seen as flowing steadily downwards (like a waterfall) through the phases. The next phase is started only after the defined set of goals are achieved for previous phase and it is signed off.

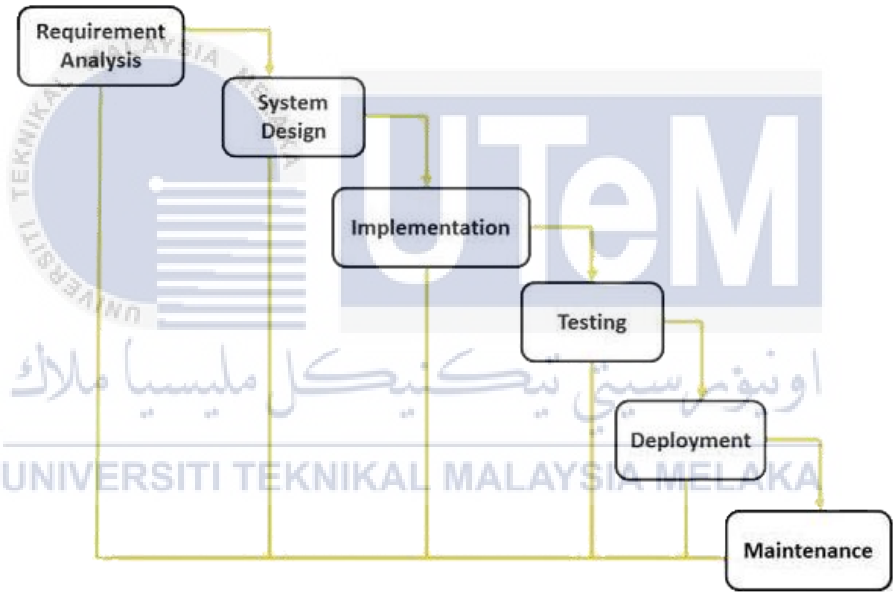


Figure 2.8: SDLC Cyclic Waterfall Model

2.4.1 Requirement Analysis

Requirement gathering and analysis, in this phase all possible requirements of the system to be developed are captured in this phase and documented in a requirements specification document.

2.4.2 System Design

In system design phase, the requirement specifications from first phase are studied in this phase and system design is prepared. System Design helps

in specifying hardware and system requirements and also helps in defining overall system architecture

2.4.3 Implementation

In implementation phase is with inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.

2.4.4 Testing

All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

2.4.5 Deployment

Once the functional and non functional testing is done, the product is deployed in the customer environment or released into the market.

2.4.6 Maintenance

There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

2.5 Project Requirements

Project requirements will be discuss about software and hardware requirements that used for developing the application.

2.5.1 Software Requirement

Software requirement is divided into two categories which are development tools and documentation tools.

2.5.1.1 Development Tools

i. Android SDK

Android SDK is a SDK that allows developers to build a mobile application for Android platform. Android SDK includes a debugger, emulator, documentation, development tools, and supported libraries.

ii. Vuforia

Vuforia refers to an SDK development kit for mobile devices that enables you to create applications that feature augmented real-world environments and elements. In other words, the platform is designed to recognize and track multiple targets images (print media) as well as 3D objects, in real-time. The job of the developers is to position and orient this type of virtual objects in relation to real world images.

iii. Autodesk Maya 2012

Autodesk Maya is 3D computer graphic software that enables developers to create object or character in 3 dimensional. In this project, this software is used to create artifacts in 3D with texture.

iv. Adobe Photoshop CS6

Adobe Photoshop is one of the professional graphic editing software that provides various types of effects and technique to edit the original image. This software is used to edit any original images that obtained from internet or capture and require used in the brochure.

v. Adobe Illustrator CS6

Adobe Illustrator CS6 is vector graphic editor or creator that allows developer to create a new logo or graphic. In this project, this software is used

for trace the image, create the logo or symbol and buttons that needed in the user interface.

vi. Adobe Captivate 6

Adobe Captivate is a rapid responsive authoring tool that is used for creating elearning contents such as software demonstrations, software simulations, branched scenarios, and randomized quizzes in Small Web Formats (.swf) and HTML5 formats. It's also known for its screen recording capability, but it can also transform to the PowerPoint presentations on any subject into interactive eLearning content, create high definition product demos, create application simulations and more.

vii. Unity 5.3.3

The Unity application is a complete 3D environment, use for laying out levels, creating menus, doing animation, writing scripts, and organizing projects.

2.5.1.2 Documentation Tools

i. Microsoft Office Word 2010

Used to prepare the documentation of proposal, report, questionnaire, and information required for brochure.

ii. Microsoft Project 2007

Used to prepare the Gantt Chart for the project in proposal and report.

iii. Microsoft Visio 2010

Used to draw the flow chart of the overall progress of the project.

iv. Microsoft Office PowerPoint 2010

Used to prepare the presentation slide for presentation.

2.5.2 Hardware Requirement

i. Laptop

Used to install the software that required for developing this project, to create 3D objects, to edit the original image, to design the brochure and interface and act as a platform to connect with smart phone

ii. Android Smartphone

Used to install the application and test the application for correct output.

2.5.3 Other Requirements

i. Hard disk

Used for extra storage and back up all the information and materials of the project.

ii. Printer

Used to print the proposal, report, questionnaire and storybook.

2.6 Project Schedule and Milestones

Project schedule plays important roles in developing of a system or product. It includes the tasks that needed to do and to be done within a certain time period. The existence of the project schedule is to ensure that the process of developing the product is work according to the time that planned and to make sure the product is completed in time.

Table 2.2: Milestone of the project

No.	Tasks	Start Date	End Date	Duration (days)
1.	**Requirement Analysis**	**22 / 2 / 2016** 23 / 2 / 2016	**25 / 3 / 2016** 2 / 3 / 2016	**24** 7

	1.1 Identify Project Requirement.	3 / 3 / 2016	8 / 3 /2016	4
	1.2 Identify Objective.	9 / 3 / 2016	16 / 3 / 2016	6
	1.3 Identify Project Scope	17 / 3 / 2016	25 / 3 / 2016	7
	1.4 Project Proposal			
2.	**System Design**	**28 / 3 / 2016**	**21 / 4 / 2016**	**19**
	2.1 Design Character	28 / 3 / 2016	5 / 4 / 2016	7
	2.2 Design Interface	6 / 4 / 2016	14 / 4 / 2016	7
	2.3 Media Selection	15 / 4 / 2016	21 / 4 / 2016	5
3.	**Implementation**	**6 / 4 / 2016**	**13 / 5 / 2016**	**28**
	3.1 Modelling Character	6 / 4 / 2016	25 / 4 / 2016	14
	3.2 Function coding	26 / 4 /2016	4 / 5 / 2016	7
	3.3 Develop Interface	5 / 5 / 2016	13 / 5 / 2016	7
4.	**Testing**	**16 / 5 / 2016**	**2 / 6 / 2016**	**14**
	4.1 Testing	**16 / 5 / 2016**	**24 / 5 / 2016**	**7**
	4.2 Fixed System	**25 / 5 / 2016**	**2 / 6 / 2016**	**7**
5.	**Deployment**	**3 / 6 / 2016**	**22 / 6 / 2016**	**14**
	5.1 Customer Evaluate	3 / 6 / 2016	13 / 6 /2016	7
	5.2 Documentation	14 / 6 / 2016	22 / 6 / 2016	7
6.	**Maintainance**	**14 / 6 / 2016**	**1 / 7 / 2016**	**14**

For the further understanding of the project progress, please refer to the Gantt chart at Appendix A.

2.7 Conclusion

In conclusion, this topic discusses on literature review and methodology to develop this project. The literature review was made based on the analysis and research on techniques and technology that has been used by existing applications. For the research too many applications that users can use but some application need for improvement to better application. Moreover, comparisons between the previous technique and the current technique are

carried out in this chapter to make a summary of each technique. This is important to compare the technique used in order to optimize the satisfaction of students.

Secondly, the chosen of project methodology is also important to make sure the every process will be accordance smoothly in every phase. All activities are divided and listed in the stage respectively. For the hardware and software requirement that used to develop this application also have listed and explained the details.

Lastly, activities that will be discussed in the next chapter are analysis. Chapter analysis is an analysis the product by identifying the requirement of the product and how it will be accomplished. Hence, next chapter will include user requirement, functional requirement, non-functional requirement, and system architecture of this project.

CHAPTER III

ANALYSIS

3.1 Introduction

This chapter will analyze the system by identifying the requirements and how it will be achieved. Phase analysis will find the best solution to solve the problem of existing system described previously. There are two parts of the phase analysis are current scenario analysis and requirement analysis. The current scenario analysis is about the flow of the existing scenario representation and information collected to determine the problems of existing systems. In addition, in the needs analysis, it will describe the problems of the existing system, the functions that are included in the current system and determine ways to collect information.

3.2 Current Scenario Analysis

Current scenario analysis is identified the flow chart and architecture of the three current existing mobile applications that stated in the previous chapter. Nowadays, there have different types of SDK for AR in mobile are available to download such as Metaio SDK, Vuforia SDK, String, Wikitude and much more. Hence, in order to understand the architecture and flow process of the current existing mobile applications, the types of the AR SDK that used by the current exiting mobile applications will be identified and explained in sub-section.

3.2.1 Analysis of Traditional Method (Science Text Book Standard Two)

Science Text Book Standard Two is a book used in schools in the learning process of science. In addition, this book contains some topics that should be studied by students of the school according to the syllabus that has been set. The text book also is the traditional method for this project.

Figure 3.1 is explained the flow of the traditional method of Science Text Book Standard Two.

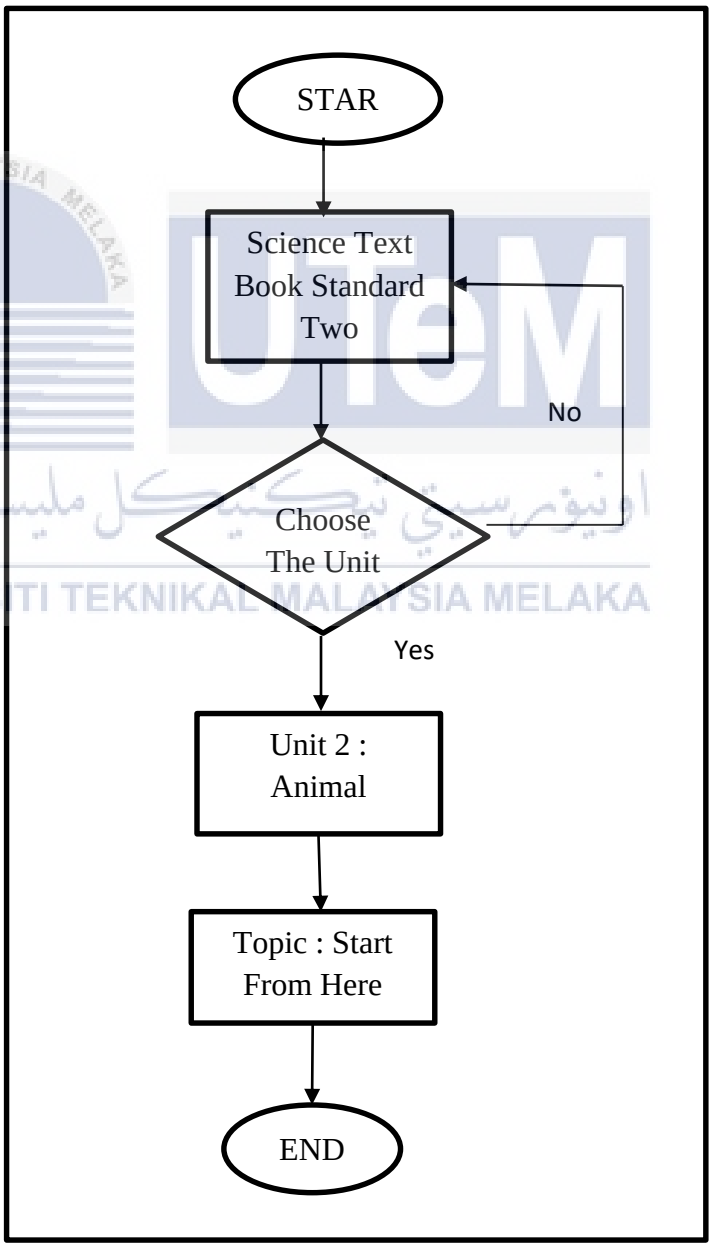


Figure 3.1 : Flow process of Traditional Method

3.2.2 Analysis of Tagme3D EN Book1

Tagme3D EN Book1 was using Vuforia SDK to implement AR technique. Vuforia SDK is for mobile devices that enables the creation of Augmented Reality applications. It uses Computer Vision technology to recognize and track planar images (Image Targets) and simple 3D objects, such as boxes, in real-time. Net languages through an extension for the Unity game engine. Vuforia supported for iOS and Android platform and also for Unity. Beside that, its also mobile application which specific for iOS platform only.

There have six options provided in Tagme3D EN Book1. Table 3.1 explained each function of the options and Figure 3.1 is explained the flow of the mobile application of Tagme3D EN Book1.

Table 3.1: Options in Tagme3D EN Book1

Options	Description
Instruction	Describe the how to use the application
Get Tags	Provide two ways to get the tags which are through the self print tags or the user can order the books.
Scan Tag	Provide two option, which are the user can choose one tag or multiple tags
Links	Provide the linkage to get the tutorials, get the tags and other application.
Coloring	This application provides a some of image that can be coloring. For the next image the user shall purchase the full version.
Parental Gate	Use for guider from parent when the kids use this application.

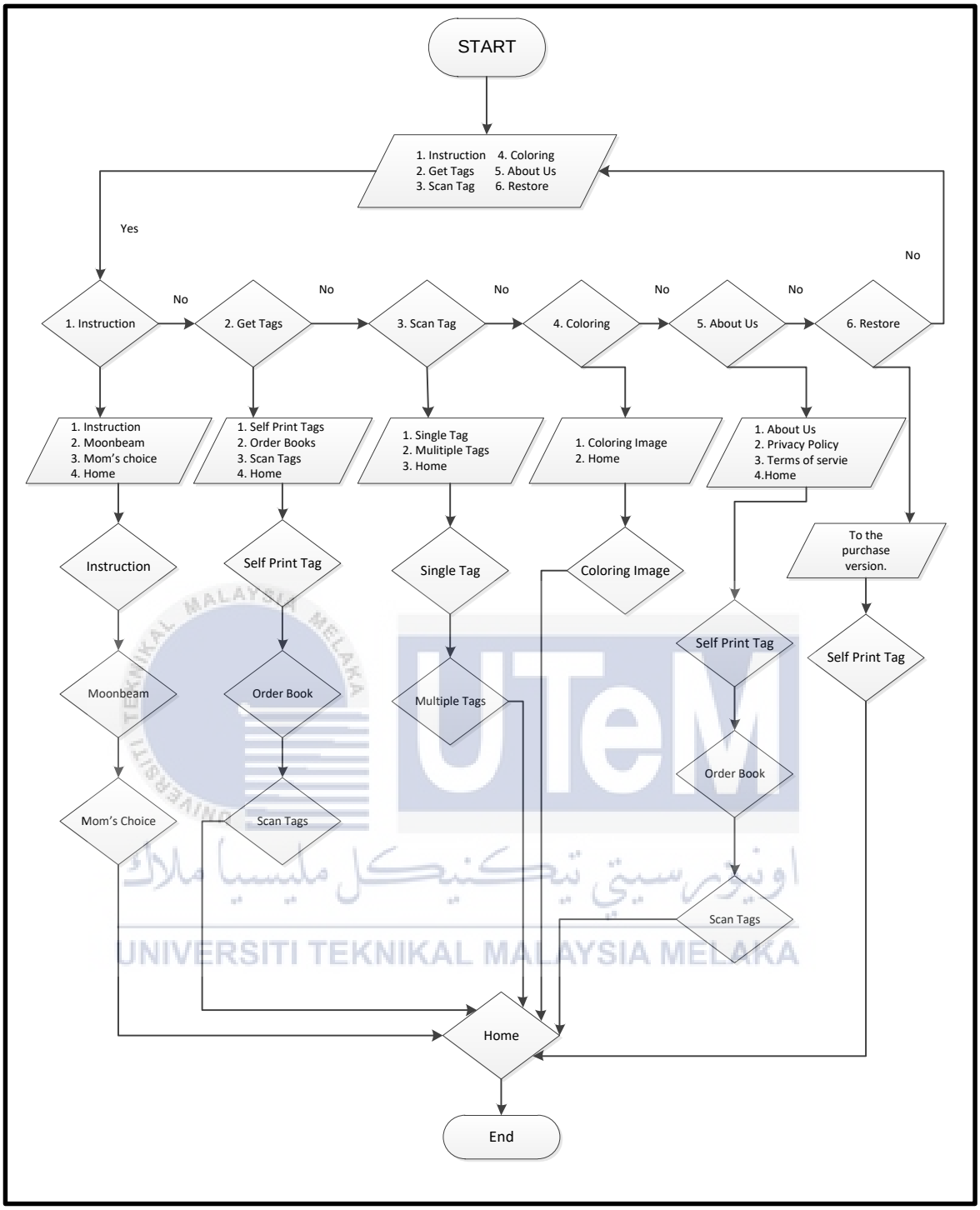


Figure 3.2: Flow process of the Tagme3D EN Book1

3.2.3 Analysis of SkyView® Explore the Universe

SkyView® Explore the Universe this mobile application is used String to develop the AR environment and is a simple detection from the marker provided. After marker is detected by the mobile device, it will display the images that make up the universe of thousands of images of the star that produces the constellation, solar system, galaxies and nebulae and etc.

Four options are provided in this mobile application which are "Camera", "Setting", "Info" and "Search". Explanation of each option is explained in Table 3.2 and the flow of the process of this mobile application is identified in the Figure 3.2.

Table 3.2 Options of **SkyView® Explore the Universe**

Options	Description
Camera	The user can snap and save the image when get the information.
Setting	User can change the date, setting the augmented reality camera, sound effect or sound, size of a star, size of planet, setting of sky object trajectories and view of the sky whether auto or manual.
Info	Describe the information of the star, solar system, constellations, nebulae and galaxies and so on the sky view when the solar system detected.
Search	Describe the function and types of every solar system

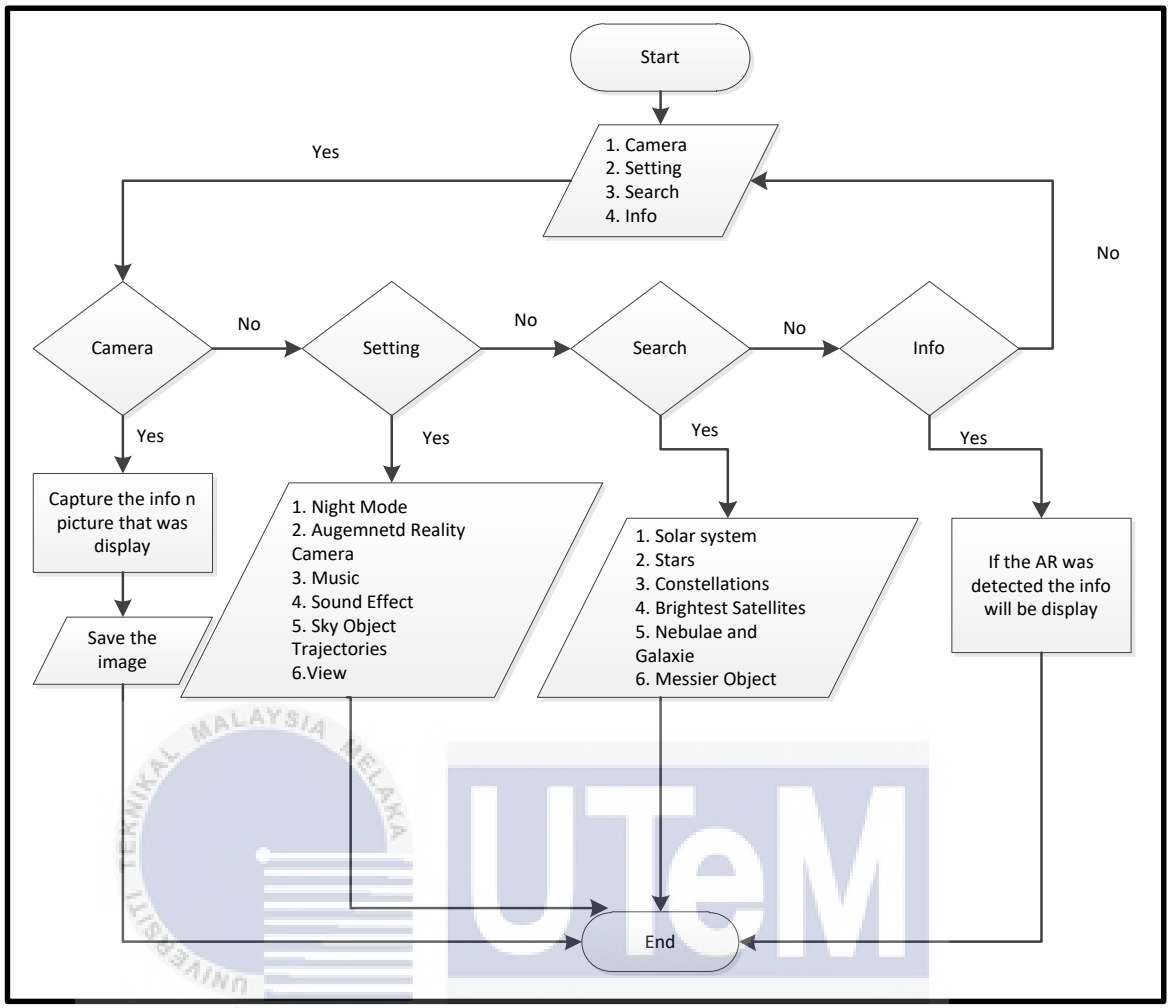


Figure 3.3: Flow process of SkyView® Explore the Universe

3.3 Requirement Analysis

In this part, is divided into several categories which are need analysis, user analysis, technical analysis, resource analysis and requirement gathering.

3.3.1 Project Analysis

Analysis of the problem will help to identify and define problems faced at existing mobile applications. There are several problems for the three existing mobile application which are listed in the Table 3.4.

Table 3.3: Problems of the existing system

Existing Mobile Application	Problems
Tagme3D EN Book1	• In this mobile application, just a few content has been in free version so the user cannot use applications completely. • Too many versions out there, this makes users confused which version is suitable for their children. • This mobile application is need to purchase for the next coloring activities.
SkyView® Explore the Universe	• The image not automatically save when the user snap the picture of the sky view. • There is no voice navigation when the solar system was detected. Its more suitable when this application have a voice navigation, because the children can more understand.
English Flashcards For Kids application	• Too many flash card and every the next flash card must purchase. • The purchse is only one type of flashcard and the price is quite expensive.

With existing mobile applications, mobile applications were intended to develop new mobile applications that includes augmented reality to improve the lack of existing mobile applications. In addition, the current mobile applications have been developed for students early teenagers. Therefore, it is easy to use is another target.

3.3.1.1 Need Analysis

From the three of the existing system that compared on Table 3.4, it is found that students need to pay for purchase the mobile application the key

before they can experience the augmented reality. Besides that, the fee that needs to pay is not cheap. Therefore, in order to let students can access the AR without any burden; a free mobile application will be develop for students to experience the AR. Besides that, this application provide the tags and the user can print the the page that have the tags by it self.

The content in the page have ID marker of the frog life cycle process. In addition, the page is free for everyone and the can print the page from the application before using the application. In this application, the user must match which the level that correct follow the frog life cycle.

3.3.1.2 User Analysis

This project is developed for Android and iOS platform. Every user especially students that possesses an Android device is able to install this mobile application as free. The purpose that this mobile application developed for Android device is because frequency of users use mobile device is higher compare to others. Mobile device will always bring along by them no matter where they went. Besides that, questionnaire was distributed for standard two students. From the result that collected and analysed, all the information that they required or want are obtain from Internet through mobile device rather than using Desktop or others. Hence, it can conclude that mobile application developed for frog life cycle process in the science text book in standard two and implemented in mobile device will attract the users especially students.

3.3.1.3 Resource Analysis

There have five stage are included in this AR mobile application. The 3D models of frog are modelled based on the physical appearance and follow the basic information. Besides that, the information also get from the text book, documentary video, fiction books and some journal.

3.3.1.4 Requirement Gathering

Requirement gathering will be done on the exiting mobile application to find out the better solution to develop this system. To gather the requirement from the exiting mobile application, method questionnaire is designed and distributed for the students.

A: Research Tool and Data Collection

The questionnaire (refer to Appendix B) consists of 14 questions which were separated into two parts. Part A is about the background of participant and Part B covers the issues of the which method the suitable for this system.

It is distributed randomly to consist 30 respondance which are 10 people between 7-9 years old, 8 people between 10-12 years old, 4 people between 13-15 years old, 3 people between 16-17 years old and 5 people between 18 years old and above.beside that the respondances also consist from primary schools which is Sekolah Kebangsaan Ayer Barok include student and teacher and public people. There have a short briefing about AR and explanation for the questionnaire before the questionnaire is distributed.

From the questionnaire that collected, the result was analyzed and displayed in pie chart form. Other than that, the result that obtained was calculated based on percentage to show a clear statistical view of the issues of frog life cycle through Augmented Reality.

Table 3.5 shows the profile of the respondents. Among the 30 students, 33.3% of them are belongs to the category of age 7 – 9 years old, 26.67% between 10-12 years old, 13.3% between 13-15 years old, 10% from 16-17 years old while 16.67% are belongs to the category of 18 years old and above. The students are from various backgrounds, age, and ethnic group.

Table 3.4: Profile of students

	Gender		Ethnic		
Age	**Female**	**Male**	**Malay**	**Chinese**	**India**
7 - 9	6	5	8	0	0
10 - 12	3	2	3	1	3
13 - 15	3	2	2	2	1
16 - 17	2	1	2	1	0
18 and Above	4	2	5	1	1

Besides the profile of the respondents, this questionnaire has designed to understand the basic information of the students (Questionnaire Part A, question 4 until 9).

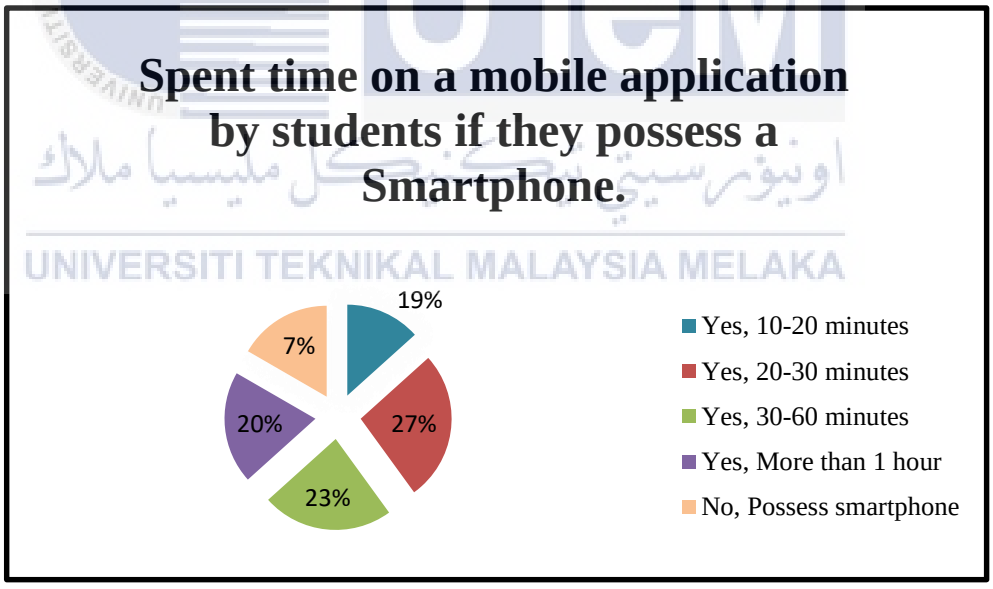


Figure 3.4 : Statistic of spent time on a mobile application by students if they possess a smartphone

Nowadays smartphone is one of the important device that everyone will bring along to everywhere. This project it is implement in mobile phone. As shown in Figure 3.3 above, this shows that 93% have a mobile phone and only

7% only that do not have a mobile phone. In addition, a total of 27% who use mobile phones in 20 to 30 minutes for the application on your mobile phone. Meanwhile, 23 percent spend up bersam their cell phone for 30 to 60 minutes. Beside that, 20% for more than an hour and just 19% for 10 hingg 20 minutes. This also shows the application on mobile phones are more interesting to them.

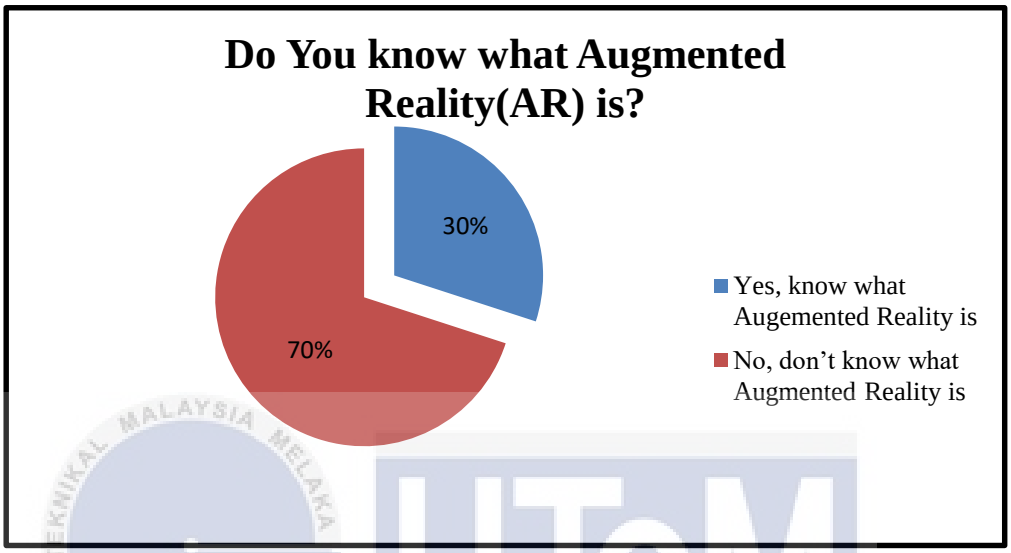


Figure 3.5 : Statistic of awareness to Augmented Reality

AR is one new technology nowadays and this project using AR as a main. But this technology is not all students know about it. This shows that 70% of students do not know what is AR and only 30% only taking know what it AR. Additionally, in 30% only 20% a menggukan application that have a technology ar. AR technology shows need to be developed and introduced to students as new knowledge and new things for them.

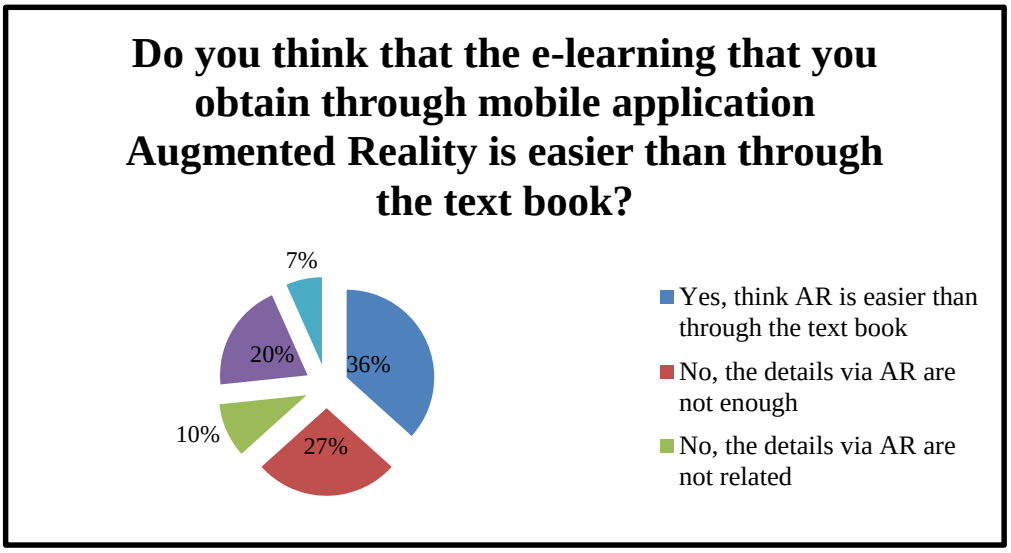


Figure 3.6 : Statistic of that the e-learning that you obtain through mobile application Augmented Reality is easier than through the text book.

In this part, almost the respondant not agree AR technology easier than use text book. This is more apparent because 64% disagree with this statement. In addition, they also have the reasons why one of them amounted to 27% say information using AR technology is not enough. Meanwhile, 20% said information used in AR uninteresting. This causing the use of textbooks more major and are considered more complete than other technologies.

B : Finding

The aim of this project was to determine the issues of lern in frog life cycle via AR using mobile application and interactive based on storyline. First of all, the issue that analyse who did student read the storybook and what kind of storybook that they prefer like result that showed in figure 3.6 and figure 3.7.

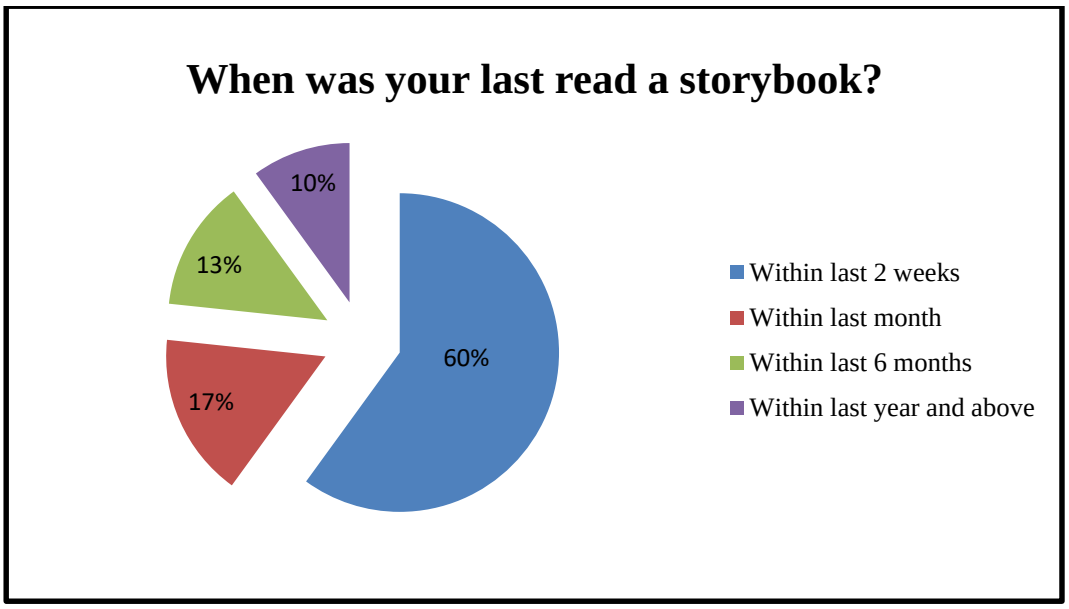


Figure 3.7 : Demonstrated the when they last read a storybook

From figure 3.6, its obviously showed that 60% of student are interesting in read the storybook. This shows that 60% of students more frequently read story books in two weeks ago. But few students also are rarely read and can be viewed when some students just read story books in the previous year and above.

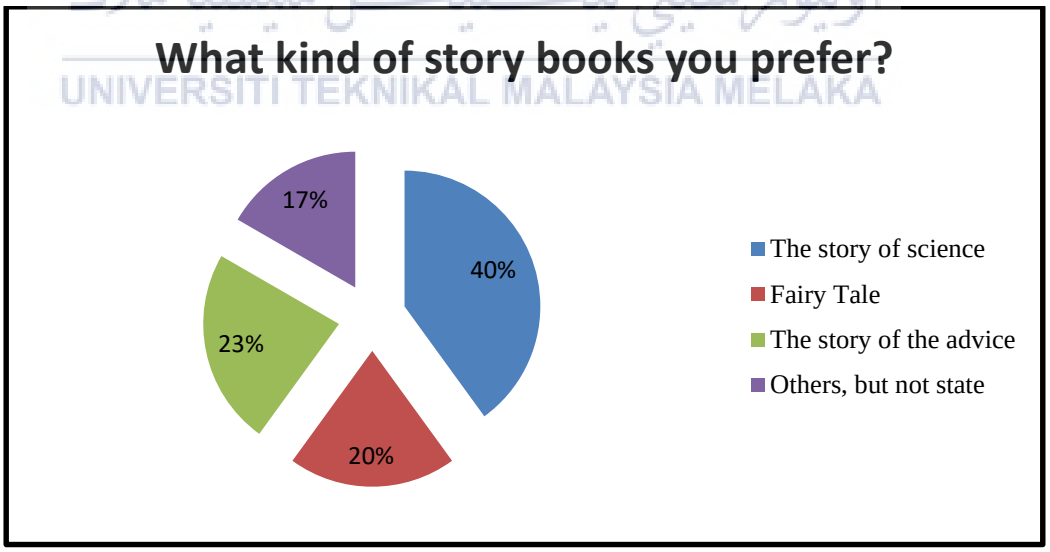


Figure 3.8 : Demonstrated the types of story book they prefer

In this diagram, showing a wide range of story books read by students and children. Among them is a story based on the fairy tale, science-related advice, and so on. In this analysis, most students prefer a story based on this science can be seen by 40% as compared to the rest of the story-related advice of% and fairy tale of 20% only.

C: Summary

As a summary, the questionnaire that distributed and filled by the the students provide a lot of important information for the developer. From the result, most of the student are interesting with some kind of storybook through time that they have. This because they have their on main reason which are they more prefer to see pictures on story books only, to increase the focus and concentration, training concept and to think and analyse and they just to fill their leisure time. Another issue is analyse about AR technology. AR is still new because based on the result thar gathered form student that the result obtained from questionnaire has showed that they do not have any knowledge and experience of using the AR application. Hence, AR will be the main element in this project while the mobile application and interactive book will be develop to attract the student to understand the information of the frog life cycle.

3.4 Conclusion

In conclusion, in this chapter consists of two main parts discussed the cuurent scenario analysis and requirements analysis. Analysis of the current scenario analyzes in mobile application availability during which are Tagme3D EN Book1, SkyView® Explore the Universe and English Flashcards For Kids application . In addition, the process of designing and developing new mobile applications to solve the shortage of existing mobile applications.

While for requirement analysis, system requirements that need to be developed. Functional requirements of mobile applications that are compiled from questionnaires. From requirements gathered from the questionnaire, it was divided into several types of analysis such as the analysis of user needs analysis and resource analysis. As a summary, AR in mobile applications is a new technique and a new type of platform that can engage students in the learning process and help teachers as teaching aids.

For the next chapter, the activities that will be developed is the design phase. The design phase deals with the architecture and flow mobile applications. In addition, the design of the user interface of mobile applications will also be included in the next chapter.

CHAPTER IV

DESIGN

4.1 Introduction

This chapter describes the system architecture, interface design and the start of the design. This application was developed for the second year students and teachers in science subjects. Therefore, interface design and the content discussed is based on the needs of students and teachers. In addition, a preliminary design is to produce an interactive book design for mobile applications. The next part is to develop the design of the user interface.

4.2 System Architecture

System architecture is that shows the design concept of mobile applications. In this application, the main platform used to develop mobile applications is Unity for Java Developer. In addition, this application developed for Android smartphone by using AR technology. Therefore, Unity has two types SDK to develop applications that the Android SDK and Vuforia SDK. Vuforia SDK is used to create an environment AR on smartphones. In addition, the Vuforia SDK was selected because of the source is free and has the tutorial on the Vuforia Website. Furthermore, for the beginner developer also can find the video tutorial on YouTube as one way to develop the AR technology. Voforia SDK also easier to use for beginner to learn.

This mobile application is an application based on AR marker on interactive book. In addition, without an interactive book, students cannot use the mobile application because of a marker printed on interactive book. Therefore, they need to get an interactive book before using the mobile application. Figure 4.1 shows the architecture of the system Frog Life Cycle.

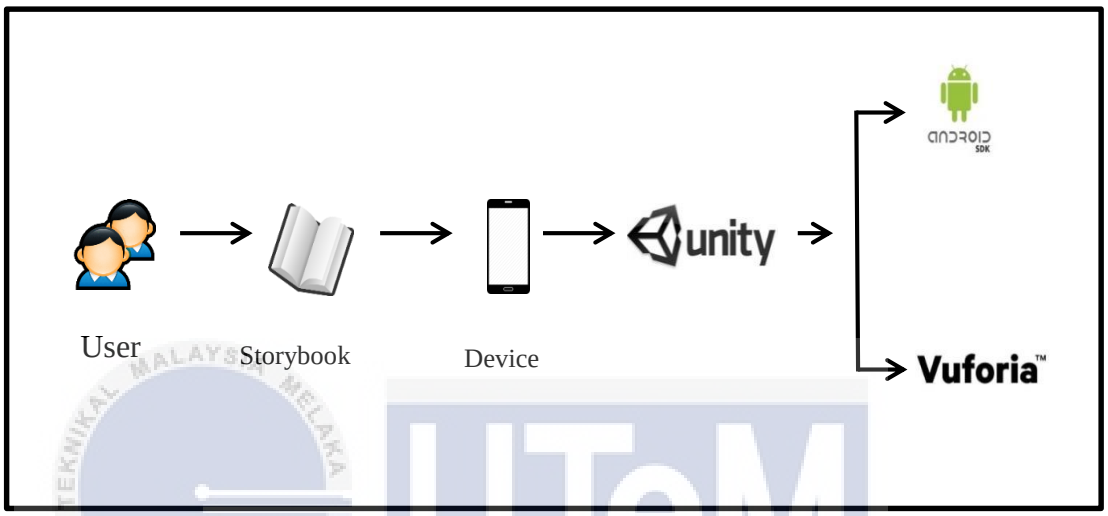


Figure 4.1: System architecture

4.3 Preliminary Design

Preliminary design is of the sketch storyboard containing representatives of system. The preliminary design phase is important for developers when developing mobile applications to ensure developers build mobile applications in the right way and meet the needs of students. In this phase, the design needed to develop applications and systems such as flow design storyboards.

4.3.1 Flow Chart

The overall flow chart for mobile applications is shown in the flow chart. This flow chart is used as a guide to developers to develop mobile applications. Figure 4.2 is a major process flow for this application.

This application starts by displaying the main menu, followed by three buttons of "Start" button, the "About", and the "How To Use". When entering the "Start" button, the interface will be displayed environment of AR and has three buttons, namely the "Change View", the "Back" button and "Exit". In environment AR interface that have the marker that can view the 3D object can change the display using the "Change View". However, on the "About" there is information about the mobile application and if want to continue the process of using this application can go to the "Back" button to the main menu. In addition, in the "How To Use" also contains information on about how to use this mobile application and can go back to the main menu by clicking the "Back" button to proceed with the other process.

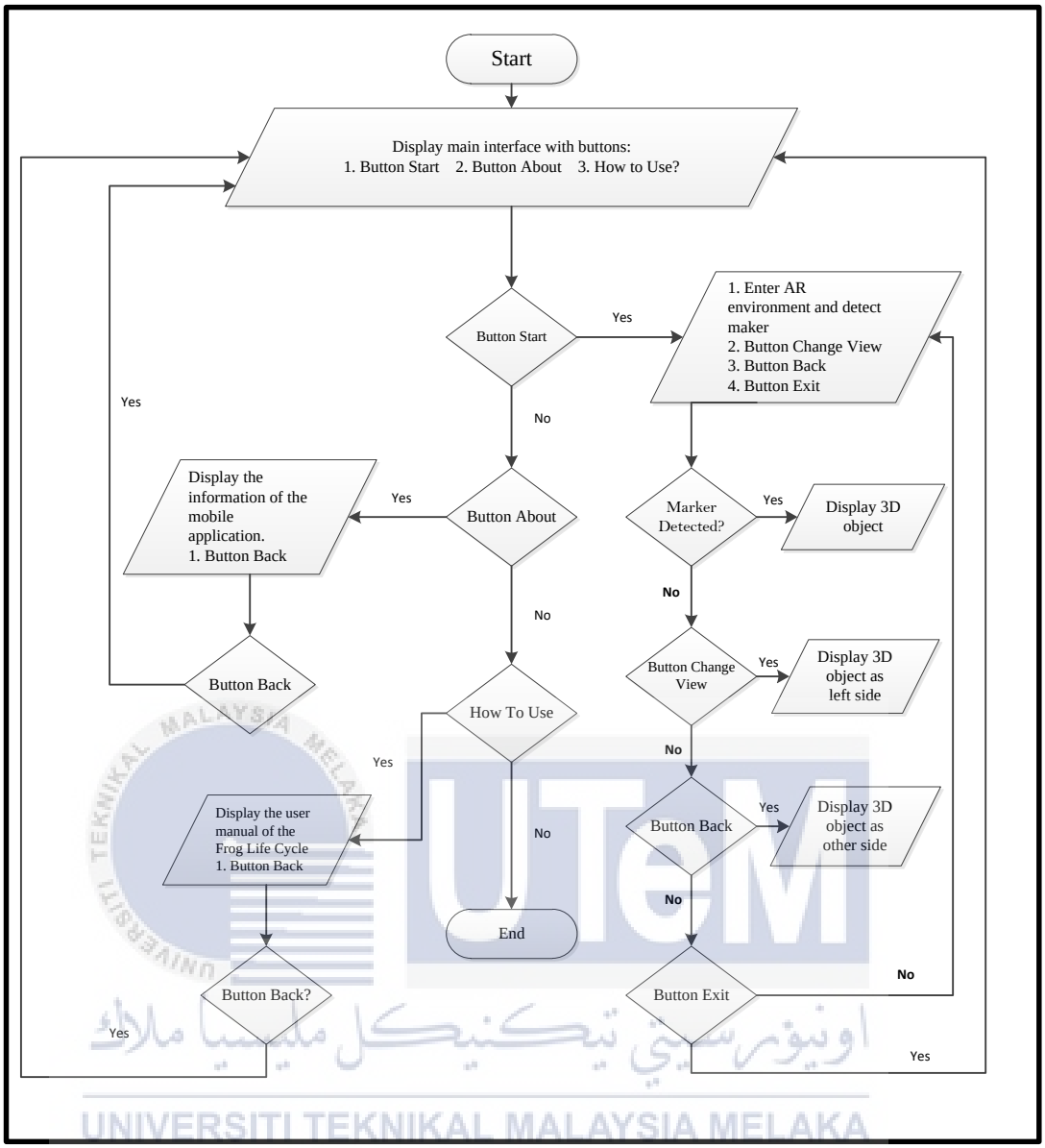


Figure 4.2: Flow chart of main process of the Frog Life Cycle application

4.3.2 Storyboard Design

The design of the storyboard is an overview for illustrations or sequence displayed on this application for the purpose of pre visualize the flow of an application. In addition, the storyboard will help developers visualize of the end product as expected. The illustrate of storyboard design can refer to Appendix C.

4.4 User Interface Design

In this part, its is divide into several designs which are storybook design, navigation design and input and output design and icon design.

4.4.1 Storybook Design.

For this mobile application, the storybook the main important role. Its design using Adobe Photoshop and Adobe Illustrator. The Storybook is used to attract the student to use the Frog Life Cycle mobile application. Other than that, its consist of the original image and ID marker that represent for each process. In addition, without storybook, the mobile application will not display any information regarding to the Frog Life Cycle. The design of this storybook storyboard will be at Appendix D.

4.4.2 Icon Design

Every mobile application has its own icon as a representative for the application so that users can differentiate with other applications. Therefore, this project, has designed an icon to represent the frog life cycle were show in figure 4.3.

Figure 4.3: Icon design

The idea of this icon for this application is based on process of frog life cycle. There are three arrows describe the process at any stage of the life cycle of a frog. In this icon, the color blue was chosen as background for design icon. In addition, a frog in the middle of a process describes the life cycle of frog there will be a frog.

4.4.3 Navigation Design

Navigation design is a basic flow that provides a logical flow of the whole system. This application is a mobile application which provides interactivity for userto access the information. Figure 4.4 shows the navigation of Frog Life Cycle mobile application.

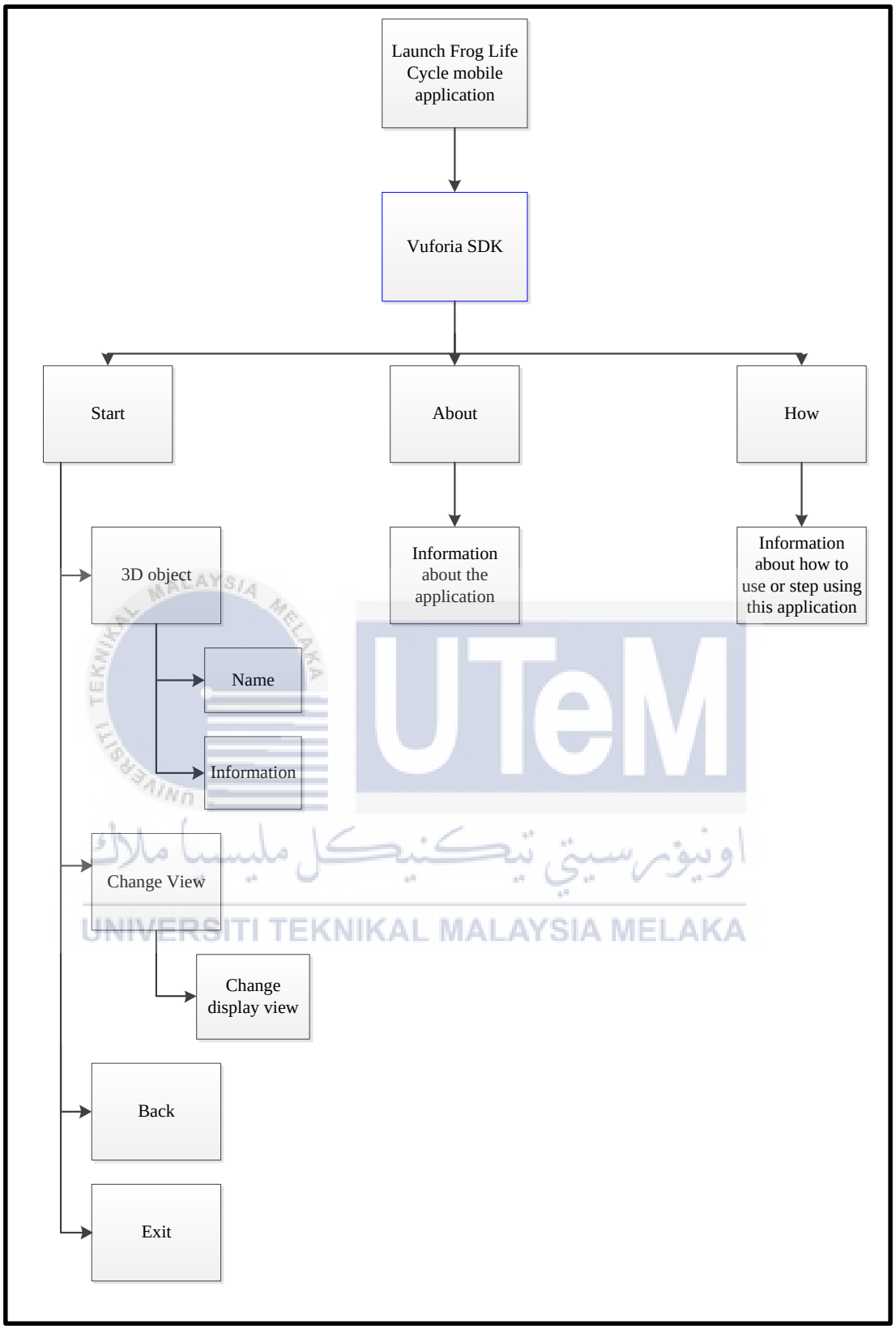
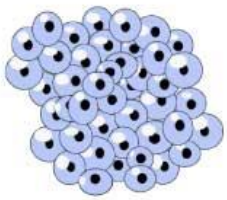
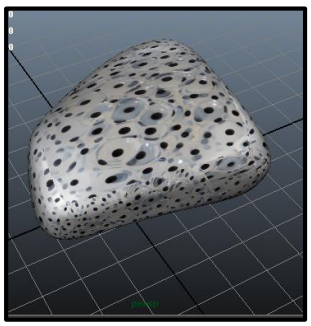
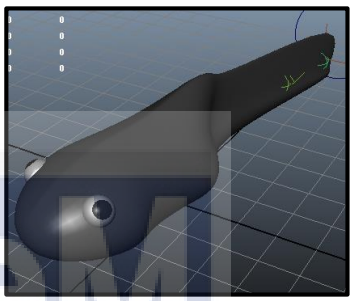
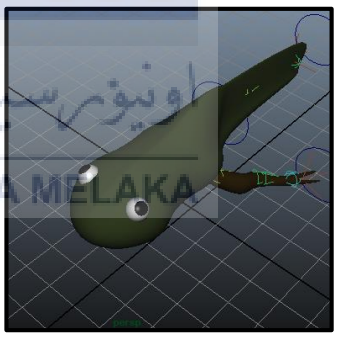
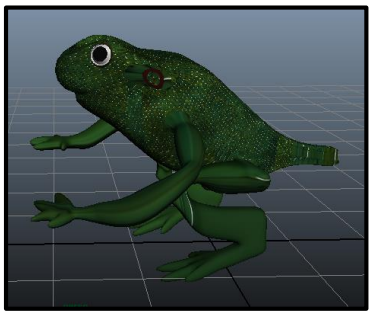


Figure 4.4: Navigation design

4.4.4 Input output Design

Input Design (Marker)	Output Design
	
	
	
	

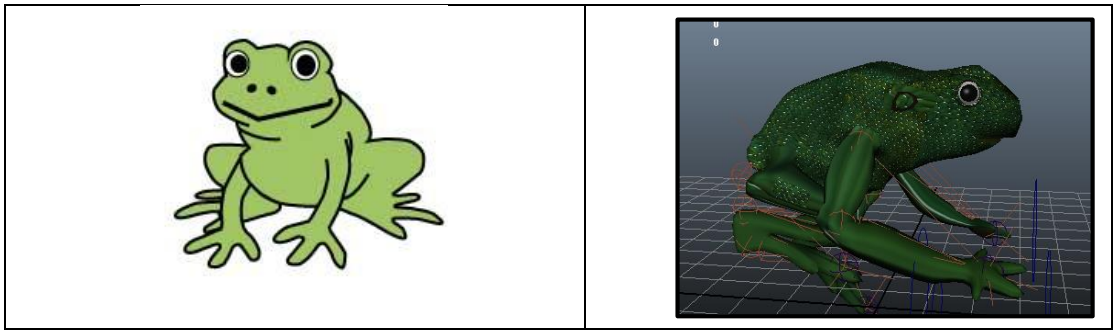


Figure 4.6: Maker In the Storybook

4.5 Conclusion

In conclusion, this chapter summarizes the design used in order to develop the mobile application includes system achitectures, flowchart design, storybook design and navigation design. In system architecture, tells about which platform this application used. Besides that, flowchart is also discussed about the process of the application. In addition, the navigation design is clearly layout with the navigation control in the flow chart.

CHAPTER V

IMPLEMENTATION

5.1 Introduction

In this implementation phase, it will be discuss about the issues of the quality of creating the multimedia element such as animation, audio, graphic and text. This phase will be include the media creation, media integration, production configure management and implement of status of this project. In media creation is determine all the media content for this project. While, media integration is about of the process of the every content of media and for the product configuration management are about the software configure setup and lastly is about the implementation status of this project.

5.2 Media Creation

In this part, are focus on the process of media content which are text production and graphic production, animation production.

5.2.1 Production of Text

The text used in this application to ensure the user understand when to use it this application. Its consist the type of the font, font size and color of font

are suitable and more clear. Other than that, its also the main important element for this application because this application contain the storybook as the tools.

Table 5.1: Productions of text

Material	Type of Text	Font Color
Storybook		
• The storylines	San Serif: Comic San Ms	Black and red
Interface of Museum Artifact		
• Main Menu		
o Tittle of storybook	San Serif: Retrohand	Black
o button START	San Serif: Comic San Ms	Black
o button ABOUT	San Serif: Comic San Ms	Black
o button HOW	San Serif: Comic San Ms	Black
• Interface for About Frog Life Cycle		Black
o Content	San Serif: Comic San Ms	Black
o button BACK	San Serif: Comic San Ms	
• Interface for How To Use		Black
o Content	San Serif: Comic San Ms	Black
o button BACK	San Serif: Comic San Ms	

5.2.2 Production of Graphic

In this project, vector graphic is used to store all the images that need to used. Other than that, in part of editing the image are used the Adobe Photoshop CS6 and Adobe Illustrator CS6 to clear the background, resize the image to follow the performance of the mobile application, and tracing the image that download on the internet as based to draw the cartoon. The image are saving in PNG and JPEG format.

Beside that, this application have three main button on mobile application that create using Adobe Illustration CS6 and Adobe Photoshop CS6. The file will

saved or exported to PNG file. Figure 5.1 is show the process of graphic production for this project.

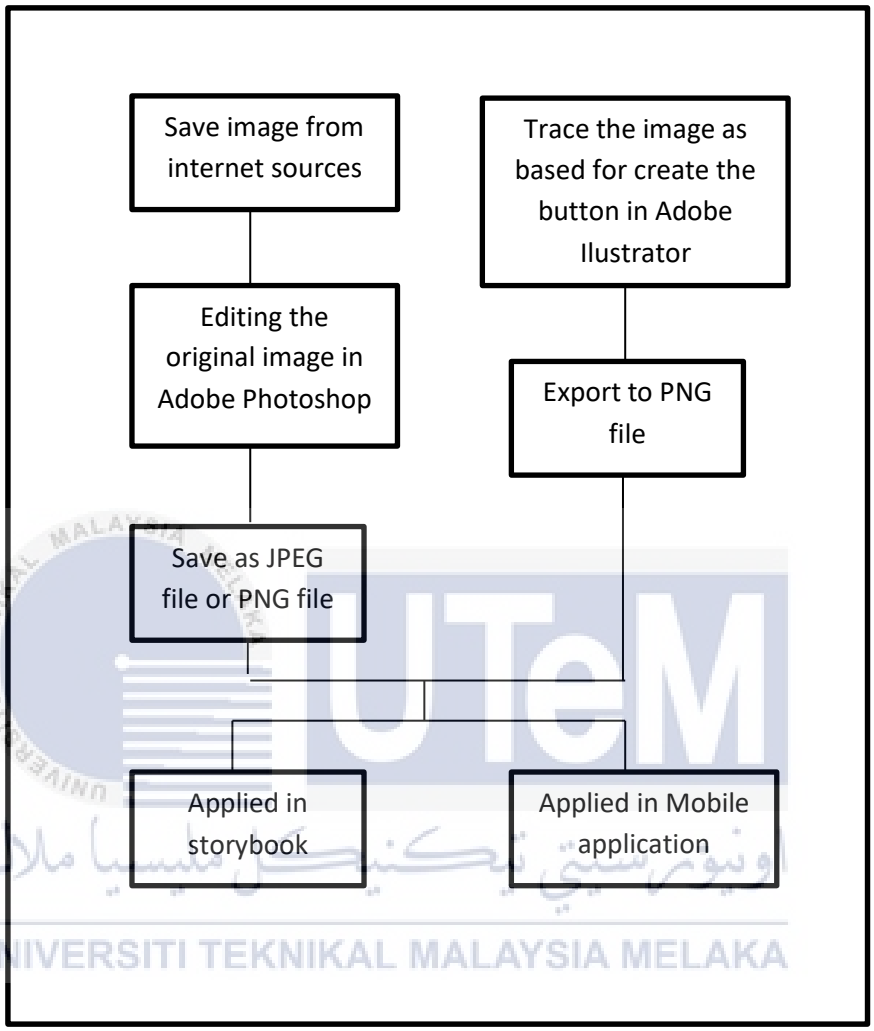


Figure 5.1 : Process of graphic production

For 3D modelling process is also the main graphic process in the graphic production. This application have five which are the frog spawn, tadpole, tadpole with 2 legs, froglet and frog. The modelled are using by Autodesk Maya 2012 and export to FBX file. All this process will be show in Figure 5.2.

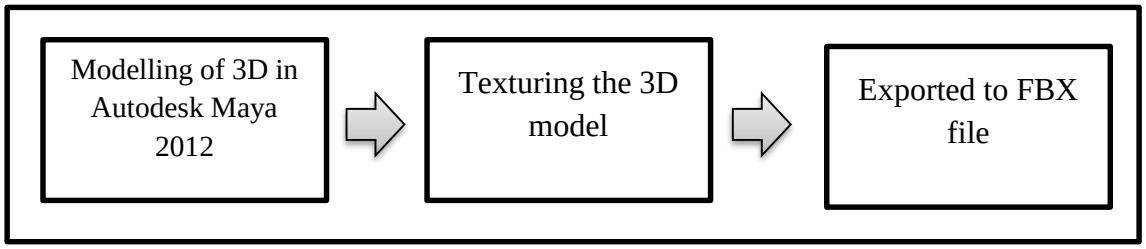


Figure 5.2 : Process of modelling 3D model

5.2.3 Production of Animation

This application applied the simple animation for each model. The simple animation that created is simple movement of like the movement of legs of frog and their tails. The simple animation is created using Autodesk Maya 2012. The process will be show in Figure 5.3.

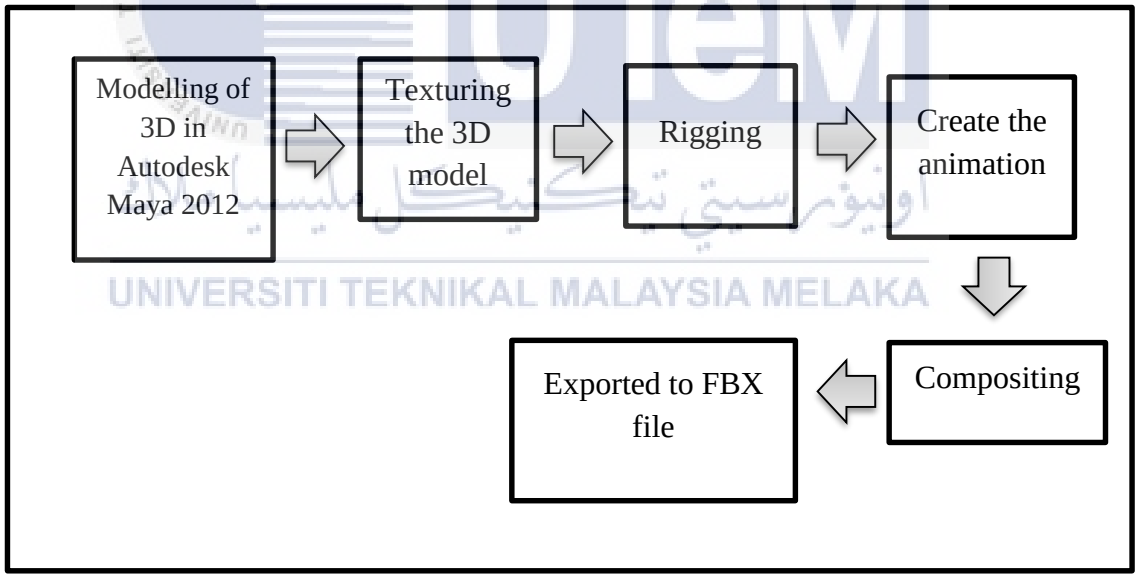


Figure 5.3 : Process of 3D animation

5.3 Media Integration

In media integration is about the process that combine all the media creation. All the element of every process has been explained in previous part

which in media creation. In this part also will be explain how to integrated all the component for this project.

Beside that, for develop the mobile application is using by Android studio. Moreover for the implement of AR also using Unity 3D where it is used to handles the importing and redering the modeled into AR environment.

Figure 5.4 will show the process of integration of frog life cycle application. The process will start with text production by follow with graphic and animation are done. After that, the process will be through importing, arraging and scripting using Unity 3D and next linking to the AR interface also using Unity 3D.

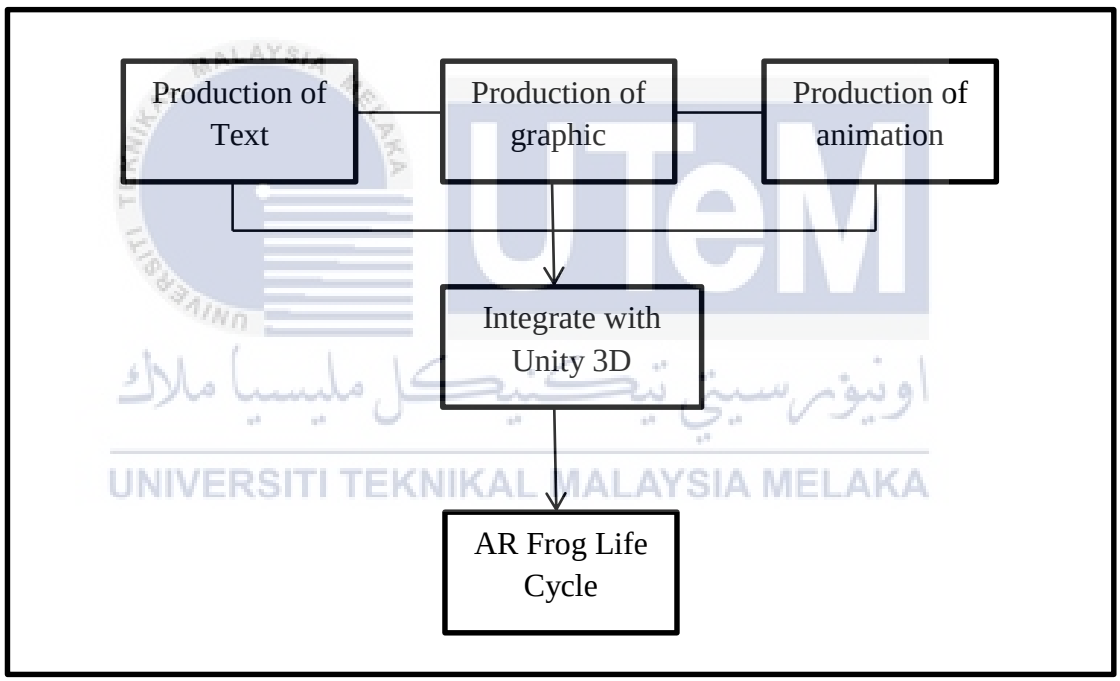


Figure 5.4 : Process of Integration

5.4 Product Configuration Management

In this part, the configuration environment setup and version of control procedure will be disscuss clearly. In configuration environment management setup explain about the software requirement tools and how the developer design and install it. Beside that, for version control procedure is about the step for the

testing the application to end user and to make sure the application will be deliver smoothly.

5.4.1 Configuration Environment Setup

For this part have a lot of the development tools are used and need to be configured but there have two development tools that important for develop this application which are Unity 3D and Autodesk Maya 2012.

5.4.1.1 Installation of Unity 3D

For develop this application to create an augmented reality environment is to download and install the Unity 3D for create the AR environment and also for the publish setting.

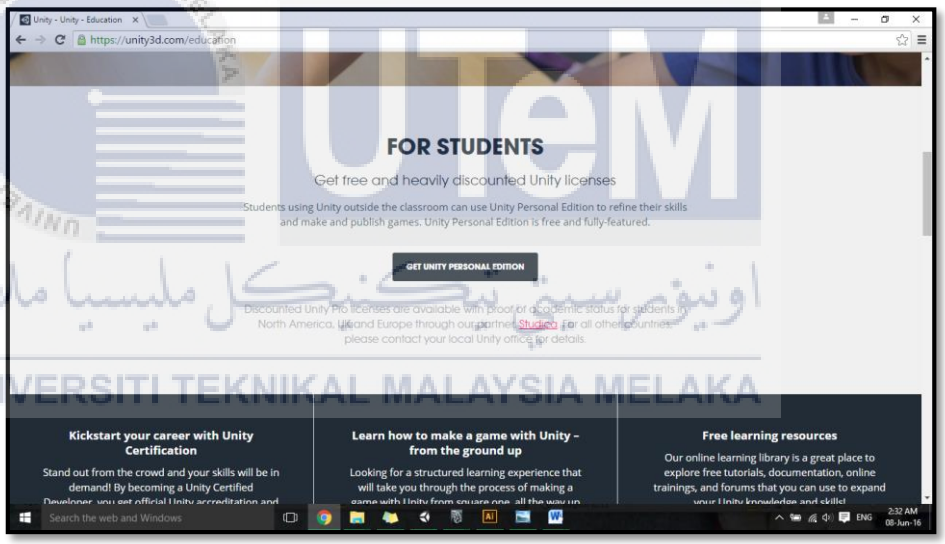


Figure 5.5 : Unity 3D installer in Unity 3D website

1. Go to the official web site of Unity 3D, register as a member and get download the installer.
2. Double click to the installer icon of Unity 3D in Figure 5.6
3. Click to the NEXT button to continue the installation. Refer to the the figure 5.7.

Figure 5.6 : Installer of Unity 3D

Figure 5.7 : Unity 3D setup

5.4.1.2 Installation of Autodesk Maya 2012

The next step is download the Autodesk Maya 2012 that can use for creating the 3D model and animation of the model. Go to the official web site for the Autodesk Maya to get the installer and also need to register as a member to get the product ID.

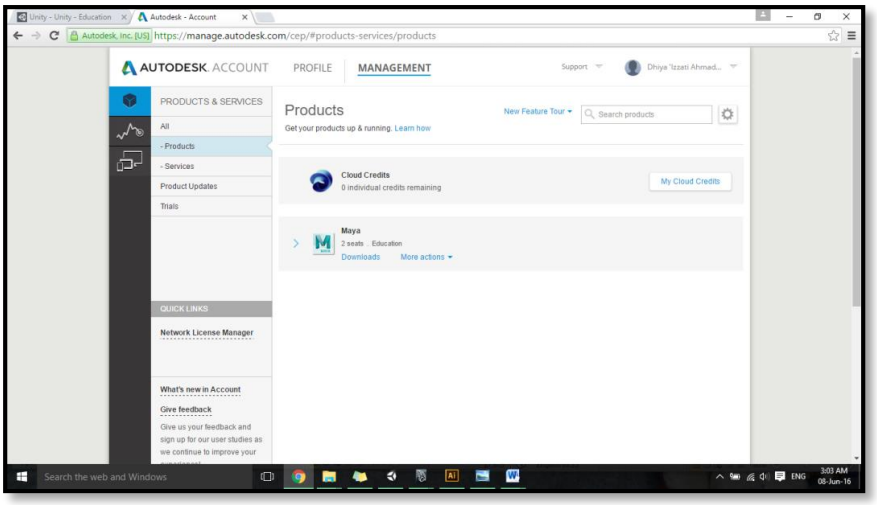


Figure 5.8 : Official Website of Autodesk Maya

5.4.2 Version Control Procedure

Version control procedure are carried out to determine the effectiveness or the developer can improve of the application. This part have two types of version control which are the alpha testing and beta testing.

5.4.2.1 Alpha Version

In this section the developer tested the application to find out the error before the product will be delivered to the user as the Beta version. For the Alpha version, there have six versions Table 5.2 shows the version that control the procedure and the details for every version.

Table 5.2 : Version control procedure and details

Version	Details
Version 1.0	Complete the 3D model without texturing.
Version 2.0	Crate the black and white AR maker to test in AR environment.

Version 3.0	Import all related component to the first 3D tadpole into the AR environment
Version 4.0	Apply the 3D animation on the model with texturing.
Version 5.0	Apply the graphic maker that will be use in story book.
Version 6.0	Add virtual button in AR environment for used in application

5.4.2.2 Beta Version

Beta testing will be conducted to the end user which is this part a prototype was create and will test with the evaluator during of Final Year Project 1 and to the primary school and their teacher.

5.5 Implementation Status

Implement status is disscuss about the development of progress for every stage which is the managed in order to finish the task according to milestone. Table 5.4 shows for the status for every task.

Table 5.3 : Implementation status

No.	Tasks	Start Date	End Date	Duration (days)	Status
1.	**Requirement Analysis**	**22 / 2 / 2016** 23 / 2 / 2016	**25 / 3 / 2016** 2 / 3 / 2016	**24** 7	 On Time
	1.5 Identify Project Requirement.	3 / 3 / 2016 9 / 3 / 2016	8 / 3 /2016 16 / 3 / 2016	4 6	On Time On Time
	1.6 Identify Objective.	17 / 3 / 2016	25 / 3 / 2016	7	On Time
	1.7 Identify Project Scope				

	1.8 Project Proposal				
2.	**System Design**	**28 / 3 / 2016**	**21 / 4 / 2016**	**19**	
	2.1 Design Character	28 / 3 / 2016	5 / 4 / 2016	7	On Time
	2.2 Design Interface	6 / 4 / 2016	14 / 4 / 2016	7	Delayed
	2.3 Media Selection	15 / 4 / 2016	21 / 4 / 2016	5	On Time
3.	**Implementation**	**6 / 4 / 2016**	**13 / 5 / 2016**	**28**	
	3.4 Modelling Character	6 / 4 / 2016	25 / 4 / 2016	14	Delayed
	3.5 Function coding	26 / 4 /2016	4 / 5 / 2016	7	Delayed
	3.6 Develop Interface	5 / 5 / 2016	13 / 5 / 2016	7	Delayed
4.	**Testing**	**16 / 5 / 2016**	**2 / 6 / 2016**	**14**	
	4.3 Testing	**16 / 5 / 2016**	**24 / 5 / 2016**	**7**	On
	4.4 Fixed System	**25 / 5 / 2016**	**2 / 6 / 2016**	**7**	progress

5.6 Conclusion

In the nutshell, the implementation is the major phase for the developing this application because consist the details of every creating process. Beside that, its also explain of the details of production of text, graphics and animation. After the media creation was finish, the process on integration of product also explain clearly. In configured management are discuss about that particular software that been used by developer. Lastly, the implementation status for every task also has been show to know the progress for this application.

CHAPTER VI

TESTING

6.1 Introduction

The final phase of Frog Life Cycle Via Augmented Reality Using Mobile Application is testing. The purpose of testing is to know the effectiveness of using this platform to deliver the information to the target user.

In this testing phase will conducted in two ways, which are the black box testing and user acceptance testing. Black box testing will test the functionality and content of the mobile application and the accuracy of information. While for the user acceptance testing is about how the target user can use the application. This chapter also explains how this testing process is planned and implemented.

6.2 Test Plan

In this testing phase are conducted with the proper planning need to be done to make sure the operation runs smoothly and obtain accurate data collection. However, the test plan is the first of the testing phase. Its important in document detailing a systematic approach to test a mobile application. It's the documentation of the strategy that will be used to ensure the mobile application reach the objectives, design, specification and other requirement. In this plan, test organization, test environment and test schedule will be determined.

6.2.1 Test Organization

Test organization is to determine who are involved in the testing phase of the Frog Life Cycle via Augmented Reality using Mobile Application. Other than that, the person commonly involved are the developer, project supervisor, evaluator and student. The table below show the responsibility of the person during testing phase.

Table 6.1 : The details of the test organization

Criteria	Alpha Version	Beta Version
Profession	BITM third year students and the school teacher.	Primary school students
Responsibility	Testing was done after the final version of alpha version by the developer of this mobile application was completed. Respondents will the tests functionality of mobile application which is the navigation, interactivity, interface design, content and functionality of AR.	Responsible for testing the mobile application according to the questionnaire prepared by developer.
Age (years old)	20 and above	8 years old
Gender	Male – 2 persons Female – 3 persons	Male – 12 persons Female – 20 persons
Ethnic	Malay – 5 persons	Malay – 32 persons
Total of respondents	5	32

6.2.2 Test Environment

Test environment is about the configuration of setup and the location that the testing will be test. The location must be suitable place so the testing can be conducted smoothly and completely.

Beside that, the tools that need to run the product and the minimum requirement the product are specified. Several smartphones with android operating system are needed to carried out the testing. Table 6.2 demonstrated the test environment for the testing phase.

Table 6.2 : Test environment

Testing	Alpha Version	Beta Version
Profession	BITM third year students	Primary students
Location	UTeM, Melaka	Sekolah Kebangsaan Parit Melana, Durian Tunggal, Melaka.
Environment	A room with sufficient light.	A sufficient lighting and quite computer laboratory is prepared for this testing due to insufficient of lighting will influence the testing of augmented reality mobile application.

Hardware	• Three smartphones with Android platform
	  ○ Version 2.3 (Gingerbread) or higher
	  ○ With a phone camera
	• A DSLR camera which used for record testing activities.
	• Personal compter to display the storybooks to the projector.
	• Projector to display the storybooks in softcopy.	

Others	• Storybooks in softcopy and hardcopy form.	

The testing phase is recorded using DSLR camera to record the respond of students when they using this application. The personal computer used to display the storybook to the projector. While the projector used to display the storybook to the student that all the student can read the story simultaneously. The figure below display the layout of computer laboratory when conducting the testing.

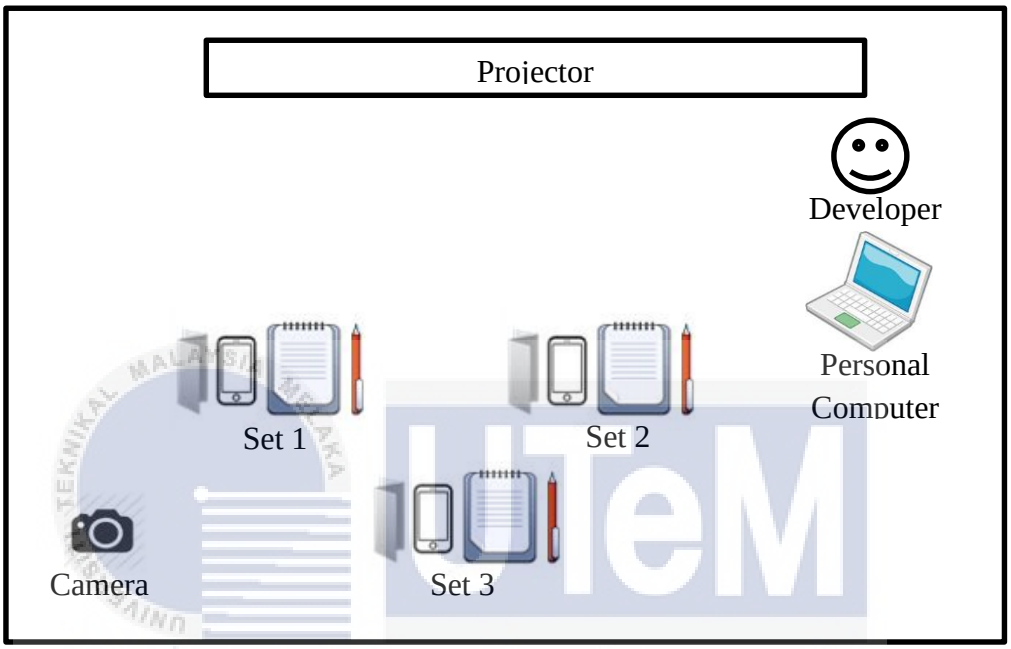


Figure 6.1: Layout of computer laboratory when conducting the testing

6.2.3 Test Schedule

The schedule prepared through the duration and timeline to be conducted which as shown in Table 6.3.

Table 6.3 : Test schedule

Testing	Alpha Version	Beta Version
Profession	Multimedia developer And School Teacher	Primary students
Total of participants	5	20
Date	28 July 2016	4 August 2016
Duration per session (minutes)	15	20
Number of participants per session	1	3 (8-10 students per section)
Total time spent (minutes)	15 minutes	60 minutes

6.3 Test Strategy

Test strategy is about the guideline to the testing plan where the method that selected for the testing. Many test strategies that can use in testing phase such as Black-Box Testing and White-Box Testing and so on. This application use Black- Box Testing as a strategies in testing phase.

Black box testing is test the functional or non-functional, without reference to the internal structure of the component or system. This method is include to find the error such as incorrect or missing feature, interface errors, behaviour or performance error and the termination errors. Other than that, it will be carried out by following the the testing form which is prepared to test specific functions of this mobile application. There are two types of black box testing which is the functional testing and integration testing will be choose for this project.

For beta version, this project choose the User Acceptance Testing(UAT) to carried out the collected data. A set of questionnaire will prepared for the testing. The question will be divide to four part which are Part A, Part B, Part C and Part D. In the Part D consist the Pre-Test and Post-Test to test the

effectiveness of the application. Tester need to answer the questions in the testing form by giving the rating as shown in the table below.

Table 6.4: Test rate indicate and description

Description	Rate of Score
Strongly disagree	1
Disagree	2
Somewhat agree	3
Agree	4
Strongly agree	5

i. Alpha Version

Functionality testing is a testing process used within mobile application in which software is tested to ensure that it conforms to all requirements. Functional testing is a way of checking software to ensure that it has all the required functionality that's specified within its functional requirements. While for Integration Testing, it is testing the combination of Frog Life Cycle mobile application and storybook to determine whether can function together correctly and smoothly.

ii. Beta Version

UAT consists of a process of verifying that a solution works for the target user. It is not a system testing, but rather is there to ensure that the solution will work for the target user. This testing is carried out to test whether the target user will accepts the solution that provided.

UAT is carried out based on the test script and a set of UAT questionnaire is to allow them to use the Frog Life Cycle mobile application and answer the questions that prepared. The questions are designed based on four principals which are visual clarity, navigation and interactivity, functionality of AR and content as well as effectiveness. For the part effectiveness, there have five multiple choice questions are prepared for

students to answer without referring to brochure or any resources. They have to scan the markers prepared and answer the questions. Refer to the questionnaire of UAT in Appendix

6.4 Test Design

Test design is about the test description and the test data for the testing phase. In this part also, test description and test data will focused on black-box testing and the User Acceptance Testing that mentioned in test strategy.

6.4.1 Test Description

The description is a section in which case the status of the alpha version of measured and expected results for the beta. The script of testing will be at Appendix E.

i. Alpha Version

Table 6.5 and Table 6.6 shows the module are tested to the Alpha Version for the functional testing and integration testing. For the complete questionnaire refer to Appendix F.

Table 6.5 : List of questions for functional testing.

No.	Aspect / Module
PART A: VISUAL CLARITY	
1.	Well organized of the layout.
2.	Text legibility on the screen.
3.	Neutral choice of colors.
4.	Screen color schemes did not interfere with readability.
5.	Button labels are clear and understandable.
PART B: NAVIGATION AND INTERACTIVITY	

1.	Navigation is clear and concise.
2.	Menu is easy to control.
3.	Button return anticipated response.
4.	Response time with the buttons is fast and smooth.
5.	Able to exit anytime.
PART C: CONTENT	
1.	The frog life cycle in accordance with the syllabus
2.	The storyline that provide are made understandable
3.	Texture of 3D object is clearly and precisely.
PART D: AR	
1.	Use of AR attracts the attention to focus on the every stage of frog life cycle.
2.	AR applied to impressive the stage of frog life cycle.
3.	Content presented through AR is clearly.
4.	Screen color schemes did not interfere the interface of AR.

Table 6.6 : List of questions for integration testing.

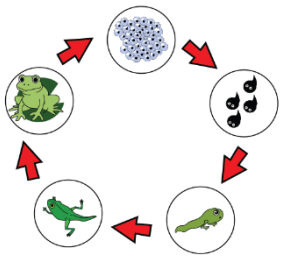
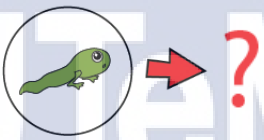
No.	Aspect / Module
1.	Every ID marker returns anticipated response after scanned.
2.	Response time of the detection of marker is fast.
3.	Interaction with 3D object is entertaining.
4.	Virtual buttons response consistently.
5.	No confusion between content with the real environment.

ii. Beta Version

Table 6.7 shows the module or question that used in UAT testing for Beta Version. For more detail of the complete questionnaire of UAT, please refer to Appendix G.

Table 6.7: List of questions for UAT

No.	Aspect / Module
PART A: VISUAL CLARITY	
1.	Layout is clear and neat as well as more exciting than the textbook.
2.	The type of font and size is easy to understand.
3.	The colors used are suitable for storybooks and mobile applications.
4.	The appearance of the 3D model can be viewed accurately than in a textbook.
PART B: NAVIGATION AND INTERACTIVITY	
1.	The response time to interact with all the buttons is fast and smooth.
2.	The menu in the mobile application is easy to control.
3.	Navigation on this application is easy to use.
4.	Button return anticipated response.
5.	Interactively with 3D models makes it more attractive than the textbook.
6.	Teaching through this mobile application is continuously with the interactive that given compared to the textbook.
PART C: FUNCTIONALITY AND CONTENT	
1.	There are this application and the storybooks that given follow the syllabus of school textbook.
2.	The storyline is given in the storybook are effective in helping you to understand than in school textbooks.
3.	Does the application provide a consistent lesson than textbooks.
4.	Information that is more accurate with the textbook.
PART D: EFFECTIVENESS	
Pre-Test and Post-Test	

1.	 Refer to the figure how many stage in frog life cycle? A. *3* B. *5* C. *6*
2.	How many days that will take from eggs to be tadpole? A. 3 days to 3 weeks B. 2 days to 2 weeks C. 4 days to 4 weeks
3.	 In week 5 the tadpole will be? A. *Tadpole* B. *Froglet* C. *Tadpole legs* D. *Frog*
4.	What happen with tadpole legs when will be froglet? A. Have 4 legs and the tails will be short B. The tails will short only C. Have 4 legs only
5.	How many weeks will be take from froglet to frog? A. 10 weeks B. 11 weeks C. 12 weeks 9 weeks

6.4.2 Test Data

Test data is the collected results from the all testing. The result of black box testing and UAT that collected are attached in Appendix respectively. Please refer to the appendix for more information.

6.4 Test Results and Analysis

This part will display the test result that collected from the testing. From the all testing result, this application has developed applications that meets the requirements of the intended user. Output results were divided into the mode and median.

6.5.1 Test Results

This part is the result that collected from the tester and calculated into the median and mode.

i. Alpha Version

The result of functional testing and integration testing from BITM third year student and the school teacher is shown in Table 6.8 and Table 6.9.

A. Result of Functional Testing

Table 6.8: Result of function testing

No.	Aspect / Module	Median	Mode
PART A: VISUAL CLARITY			
1.	Well organized of the layout.	4.5	5
2.	Text legibility on the screen.	4.5	5
3.	Neutral choice of colors.	4.5	4

4.	Screen color schemes did not interfere with readability.	4.5	4
5.	Button labels are clear and understandable.	4.5	4
PART B: NAVIGATION AND INTERACTIVITY			
1.	Navigation is clear and concise.	4.5	4
2.	Menu is easy to control.	4.5	4
3.	Button return anticipated response.	4.5	4
4.	Response time with the buttons is fast and smooth.	4.5	4
5.	Able to exit anytime.	4.5	5
PART C: CONTENT			
1.	The frog life cycle in accordance with the syllabus	4.5	5
2.	The storyline that provide are made understandable	4.5	5
3.	Texture of 3D object is clearly and precisely.	4.5	5
PART D: AR			
1.	Use of AR attracts the attention to focus on the every stage of frog life cycle.	4.5	5
2.	AR applied to impressive the stage of frog life cycle.	4.5	5
3.	Content presented through AR is clearly.	4.5	4
4.	Screen color schemes did not interfere the interface of AR.	4.5	4

B. Result of Integration Testing

Table 6.9: Result of integration testing

No.	Aspect / Module	Median	Mode
1.	Every ID marker returns anticipated response after scanned.	4.5	4

2.	Response time of the detection of marker is fast.	4.5	4
3.	Interaction with 3D object is entertaining.	4.5	4
4.	Virtual buttons response consistently.	4.5	4
5.	No confusion between content with the real environment.	4.5	5

ii. Beta Version

The table bellows are the result of UAT from the beta testing.

Table 6.10: User acceptance test result

No.	Aspect / Module	Median	Mode
PART A: VISUAL CLARITY			
1.	Layout is clear and neat as well as more exciting than the textbook.	4	5
2.	The type of font and size is easy to understand.	4.5	4
3.	The colors used are suitable for storybooks and mobile applications.	4.5	5
4.	The appearance of the 3D model can be viewed accurately than in a textbook.	4.5	5
PART B: NAVIGATION AND INTERACTIVITY			
1.	The response time to interact with all the buttons is fast and smooth.	3	4
2.	The menu in the mobile application is easy to control.	4.5	5
3.	Navigation on this application is easy to use.	4.5	5
4.	Button return anticipated response.	4.5	4
5.	Interactively with 3D models makes it more attractive than the textbook.	4.5	5

6.	Teaching through this mobile application is continuously with the interactive that given compared to the textbook.	4.5	4
PART C: FUNCTIONALITY AND CONTENT			
1.	There are this application and the storybooks that given follow the syllabus of school textbook.	4.5	4
2.	The storyline is given in the storybook are effective in helping you to understand than in school textbooks.	4.5	5
3.	Does the application provide a consistent lesson than textbooks.	4.5	4
4.	Information that is more accurate with the textbook.	4.5	3
5.	There are this application and the storybooks that given follow the syllabus of school textbook.	4.5	4
6.	The storyline is given in the storybook are effective in helping you to understand than in school textbooks.	4.5	5
PART D: EFFECTIVENESS			
Pre-Test and Post-Test			
Pre-Test			
No.	**Question**	**Answer correctly**	**Answer wrong**
1.	Refer to the figure how many stage in frog life cycle?	17	15
2.	How many days that will take from eggs to be tadpole?	10	22
3.	In week 5 the tadpole will be?	13	19
4.	What happen with tadpole legs when will be froglet?	16	16

5.	How many weeks will be take from froglet to frog?	15	17
Post-Test			
1.	Refer to the figure how many stage in frog life cycle?	30	2
2.	How many days that will take from eggs to be tadpole?	29	3
3.	In week 5 the tadpole will be?	23	9
4.	What happen with tadpole legs when will be froglet?	31	1
5.	How many weeks will be take from froglet to frog?	26	6

6.5.2 Analysis Results

This part is to analyse the results that collected and summarized in the testing. The data will be charted into the bar chart form and evaluated according to the result.

i. Results for Alpha Version.

In the Alpha Version have two part of testing which are analyse in alpha version and analyse the result collected. Analyse in alpha version is for test the functional testing and integration testing to demonstrate the data collected from the tester. While, in analyse the result collected is summary of testing result for alpha version is concluded.

A. Results of Functional Testing

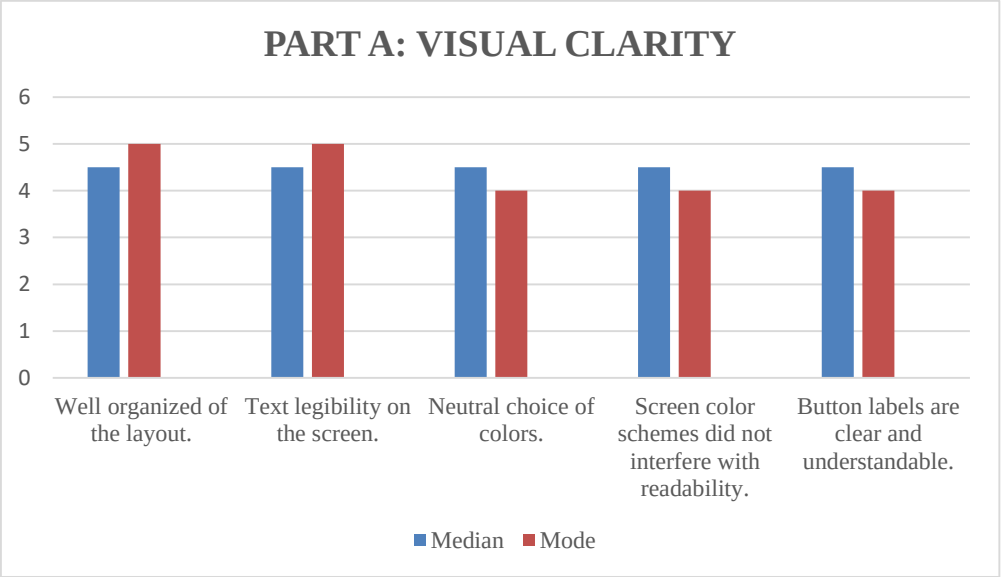


Figure 6.2: Statistic of visual clarity for functional testing

Figure 6.2 show the criteria that related to the visual clarity of Frog Life Cycle mobile application which contain to the layout, text and color used. From the bar chart above, the level of the rate for all criteria is 4 and above which is the testers are agreed that the visual clarity is suitable for the children.

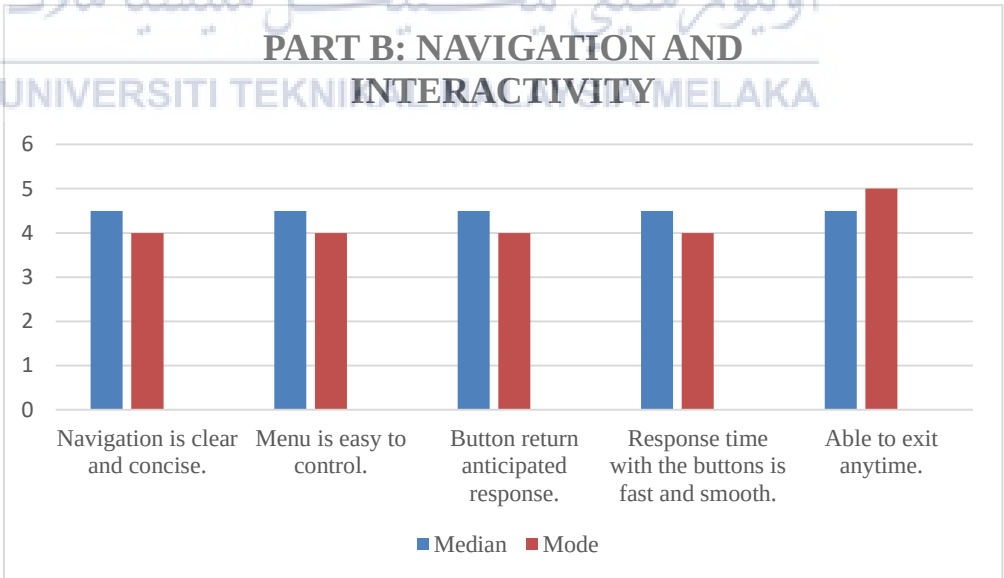


Figure 6.3: Statistic of navigation and interactivity for functional testing

Figure 6.3 is about the question of the navigation and interactivity of the mobile application. This is related to the respond time when navigating or controlling the menu. From the bar chart, its clearly that the level for all of the categories highest is 5 which is majority of the tester are agreed.

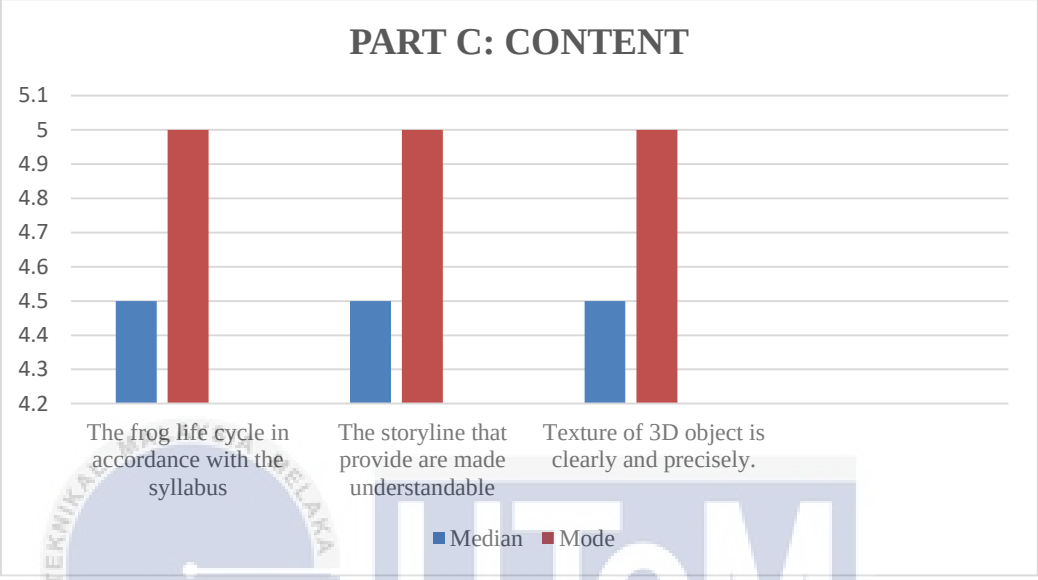


Figure 6.4: Statistic of content of Frog Life Cycle for functional testing

Figure 6.4 is related to the content of the Frog Life Cycle mobile application which consist the process of frog life cycle, the content of the storybook and the 3D object. Almost of the categories achieved 5. And this result define that the information provided in the mobile application and brochure is adequate and useful for user.

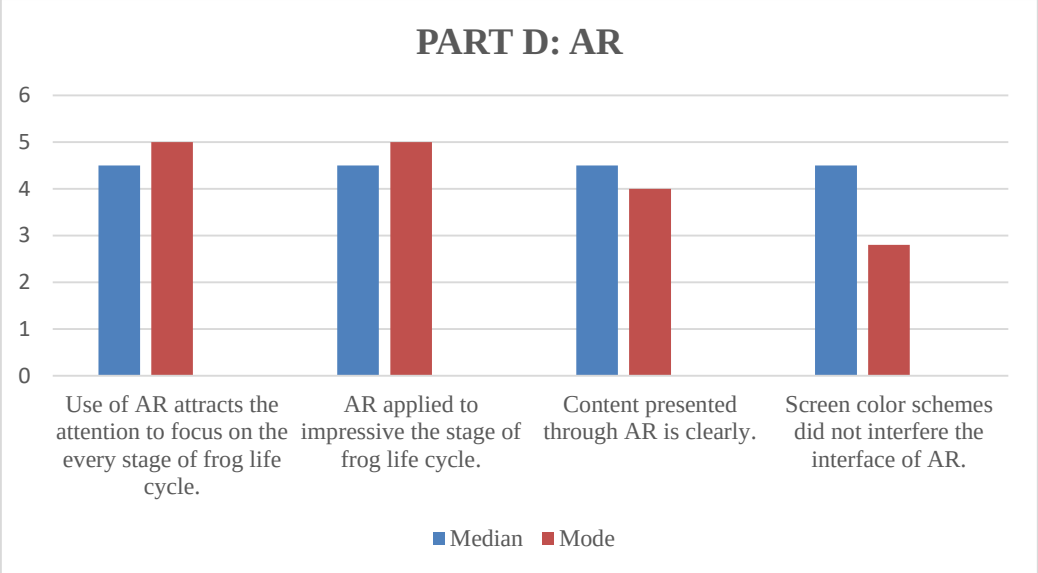


Figure 6.5: Statistic of use of AR for functional testing

Functionality of the AR is also tested in functional testing. Figure 6.5 showed the criteria to be evaluated by multimedia developer. The level of rate for all criteria is depicted 4 and above. Its comes to the statement that BITM third year student and the school teacher agree that using of AR is effective and able to attract the attention of user to focus on the content. Besides that, use of AR is able to act as a medium to deliver the knowledge for individual.

B. Results of Integration Testing

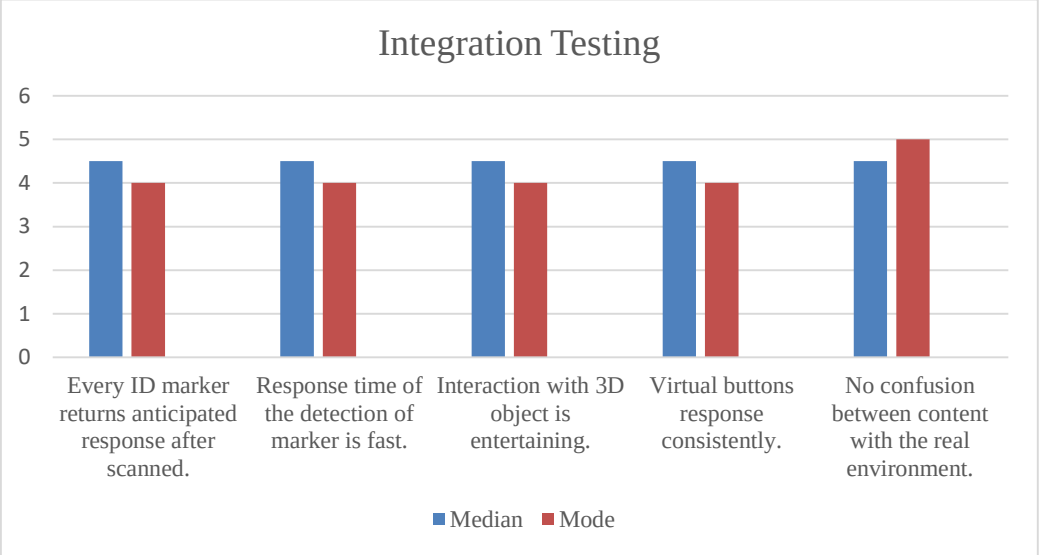


Figure 6.6: Statistic of integration testing

Figure 6.6 is the criteria about the integration between Frog Life Cycle mobile application and the storybook. The level of the rate for all criteria is high and achieves 4 and above which obviously explains that the Frog Life Cycle mobile application is work correctly and functionally.

C. Summary of Testing Result for Alpha Version

From the result above of the testing, functional testing and integration testing, a summary is made. Four of the principals: visual clarity, navigation and interactivity, functionality of AR and content as well as use of AR are achieved 4 and above which are the BITM third year students and the school teacher are agreed with tha all function of the Frog Life Cycle mobile application. This also the application able to work well with the storybook.

ii. Results of Beta Version.

User Acceptance Testing is he only testing for beta version. The bar chart is chosen to demonstrate the data collected from the testers. After analyse the result collected, a summary of testing result for beta version is detailed.

A. Results of UAT Testing

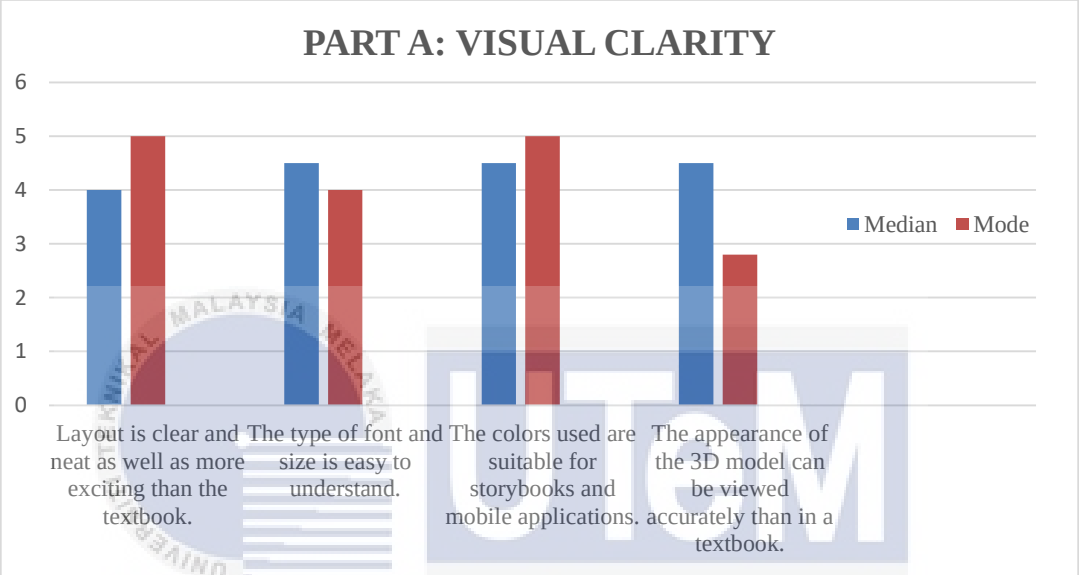


Figure 6.7: Statistic of visual clarity for UAT

Figure 6.7 shows the question that related to the virtual clarity of Frog Life Cycle mobile application. From the bar chart above, it is clearly shows that almost all of the students are agreed with all the aspect of the visual clarity of this mobile application. Almost all achieved 5 because the testers accept the way this application work by through the colors and layout.

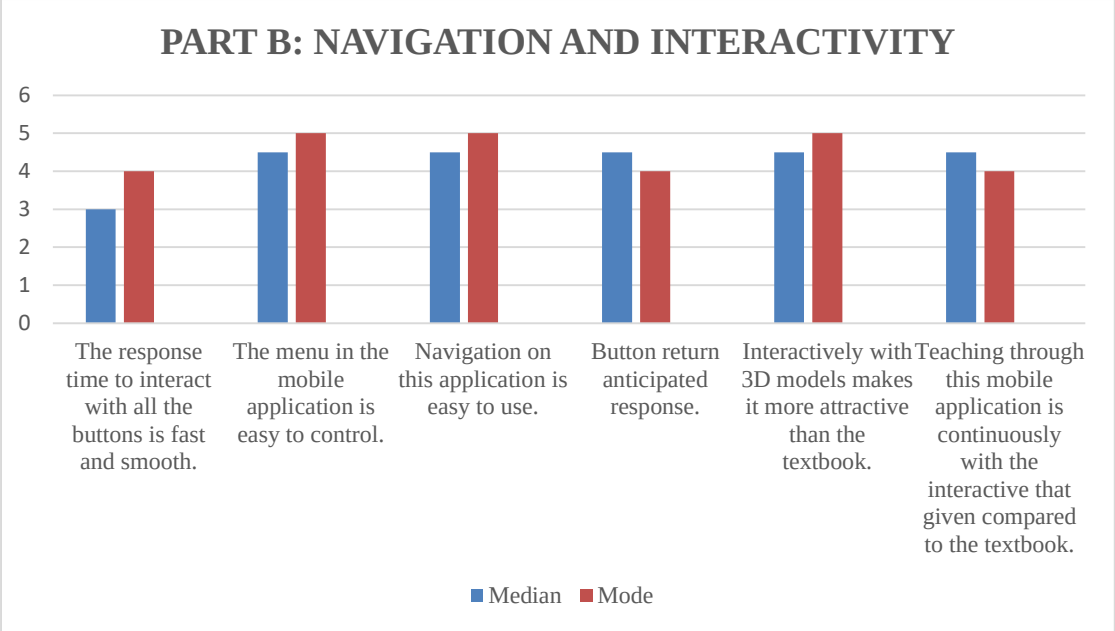


Figure 6.8: Statistic of navigation and interactivity for UAT

Figure 6.8 explained the questions related to the navigation and interactivity of the mobile application. For this aspect, it is testing the respond time when interact with buttons, ease of use the Frog Life Cycle and interaction between 3D model. Almost all of students are agreed with the part navigation and interactivity of the mobile application. Its also can prove this application is user friendly.

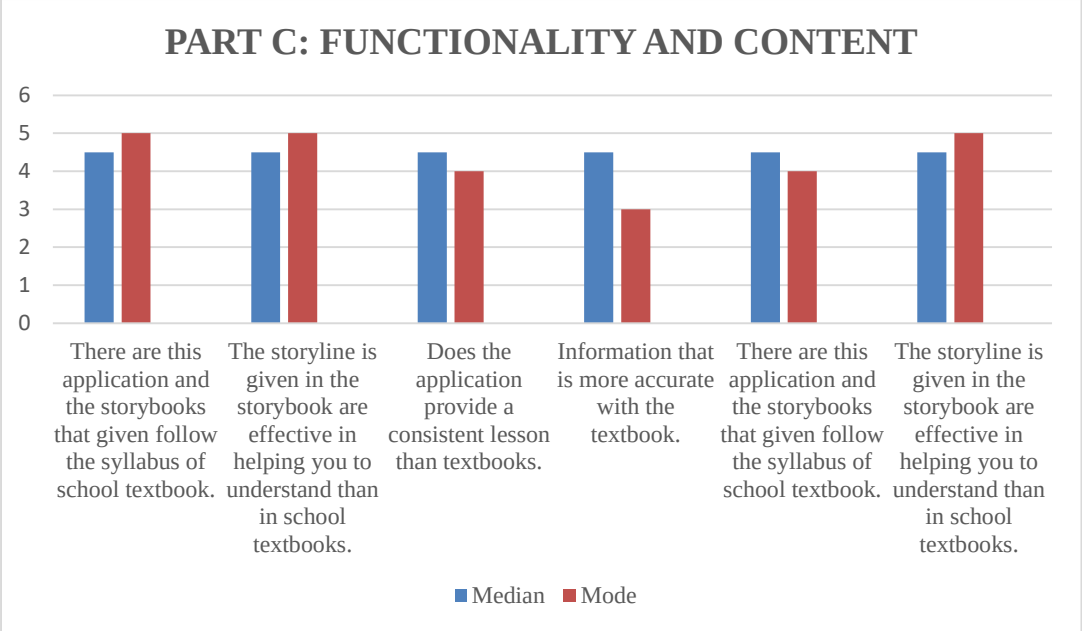


Figure 6.9: Statistic of functionality of AR and content for UAT

Figure 6.9 explained the functionality if AR and the content provide in the mobile application. From the bar chart above, student are agree the storyline that given in the storybook are effective in helping them to understand about the frog life cycle and it is achieved 5.

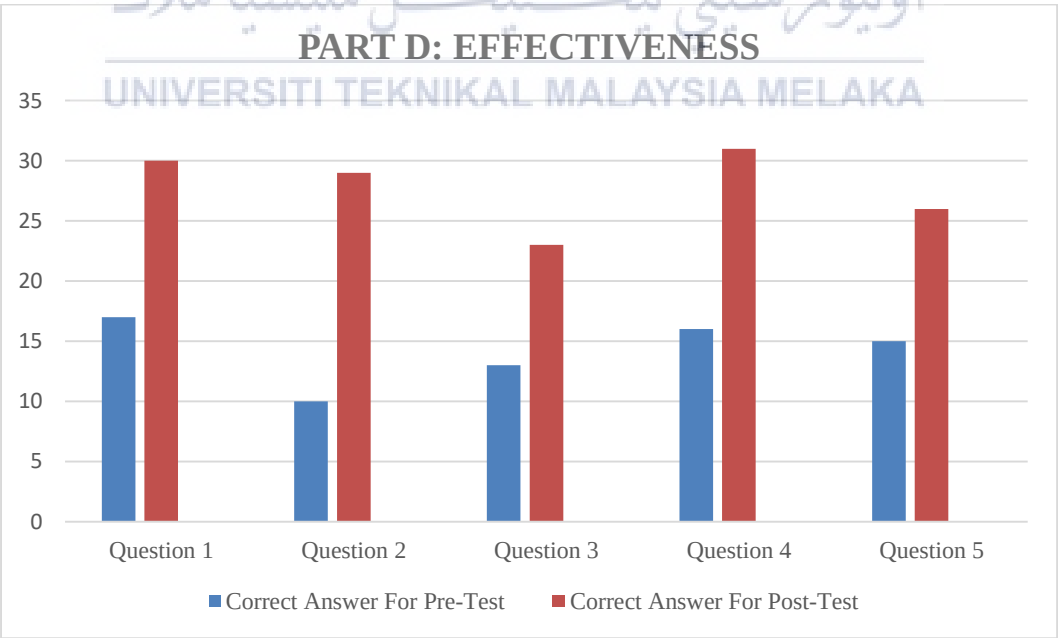


Figure 6.10 : Statistic of effectiveness using method Pre and Post-Test.

In Figure 6.10 shows about the effectiveness of using this application. Which is this method are using pre and post-test question to test the understanding of frog life cycle to the student. From the pre-test most of the student not very sure about the frog life cycle and their information. Through many of the answer are wrong and inaccurate. While after post-test most of the student are understand and can answer the question correctly. Other than that, the student also more interesting with the storybook that given during the testing run. Beside that, this application are also suitable for home learning because this application have the storybook for deliver the information. This shows the application are effective for use in learning, whether in school or at home because from this pre and post-test method the children are more interesting and more attract with this application.

B. Summary of Testing Result for Beta Version

From the four of the principals that tested which are visual clarity, navigation and interactivity, functionality of AR and content as well as the effectiveness of mobile application, it is obviously show that Frog Life Cycle mobile application is able to deliver the information and knowledge continuously. The students also, agreed and acceptable this mobile application. In conclusion, it is obviously shown that Frog Life Cycle mobile application is accepted by primary students and is achieved the third objective which mentioned in Chapter 1.

6.6 Conclusion

In the conclusion, the testing process is carried out very smoothly and successfully at Sekolah Kebangsaan Parit Melana, Durian Tunggal, Melaka. From the result that had been collected and analysed, its shown that the product is able work with AR for the target users and its able to deliver the information and the knowledge to the student.

Moreover, AR is still new and the new concept of technology in this country among the foreign country. Many children also not already know about augmented reality concept in their learning or in their life. Therefore, observation on weaknesses and strengths, prepositions for improvement and contribution of the project will be discussed in the next chapter.

CHAPTER VII

PROJECT CONCLUSION

7.1 Observation on Strengths and Weaknesses

Frog Life Cycle is an Android mobile application that developed by Vuforia SDK. Vuforia SDK is one of the software that suitable for developer to develop an interactive augmented reality application. While for this Frog Life Cycle application also, still have its own strengths and weaknesses.

7.1.1 Strengths

The strengths of this application are listed as the following:

i. Use of AR concept to attract children in learning process

AR concept are applied on Frog Life Cycle mobile application to attract the children to know the process of frog life cycle. Its is an advances concept that can use at school for science subject in chapter 2. While this application also can be used as a learning tool at home.

ii. Storybook as tool to delivering knowledge.

For this application, it provide the storybook as a main tool to deliver the information. This application need to interact with this storybook to get the output 3D object and the information of every stage of frog life cycle. This tool make mobile application becomes more interesting.

iii. Can be learn anywhere.

This application can be taken anywhere because it can be used with smart phone. In addition, they also have their own smart phone that's means they can use this application in easy way.

7.1.2 Weaknesses

There are several weaknesses in this application even this application is known to be successfully developed. This project is based on a real time system, its means this mobile application need to be run with the device and recognizes the mobile application.

i. Need sufficient of light.

This application need of sufficient of light when running. Its is because its need to detect the marker for display the 3D object. If there is not enough of light, the 3D object will not display in the stable condition.

ii. Problem of overlapping of the 3D object.

In this application, sometimes the 3D object is hard to detect and overlap because of the maker. This will make the user hard to view the 3D object quickly.

iii. The storybook must be in colour printed.

Frog Life Cycle mobile application is need the storybook in colour printed. This is because the maker that use in this application is based on the colour picture.

7.2 Proposition for Improvement

Through to the strengths and weaknesses that have been state, there have some improvement need to be done to improve this Frog Life Cycle mobile application.

Firstly, the developer can do some amination without the effected to the texture of 3D object. This is because the 3D object more to realistic with the

real movement of frog for every stage. By adding the animation of 3D object the children can know and more understand the frog life cycle clearly.

Furthermore, the developer also can create a short video such as 2D video in cycle form and add to the mobile application for explaining the process. This is can make the application more interactive and more interesting. Its also the interactive video can more attract the children to use this application.

Lastly, the developer needs to overcome the problem of the detection of AR markers. This is because some AR marker get the full star in their SDK such as Vuforia SDK but still hard to detect the 3D model. However, there is also some marker didn't get the full star but can detect the 3D model easily. In addition, this problem make the user feel boring with this application.

7.3 Conclusion

After a several months of development, Frog Life Cycle had revolution from an idea to a reality. Through the testing, almost the children attract and interesting with this application. Other than that, the information and knowledge can receive clearly. Moreover. Frog Life Cycle need to improve follow the suggestion and the feedback 4that provide by supervisor and evaluator, but its still achieved the initial objectives which has been stated in chapter one.

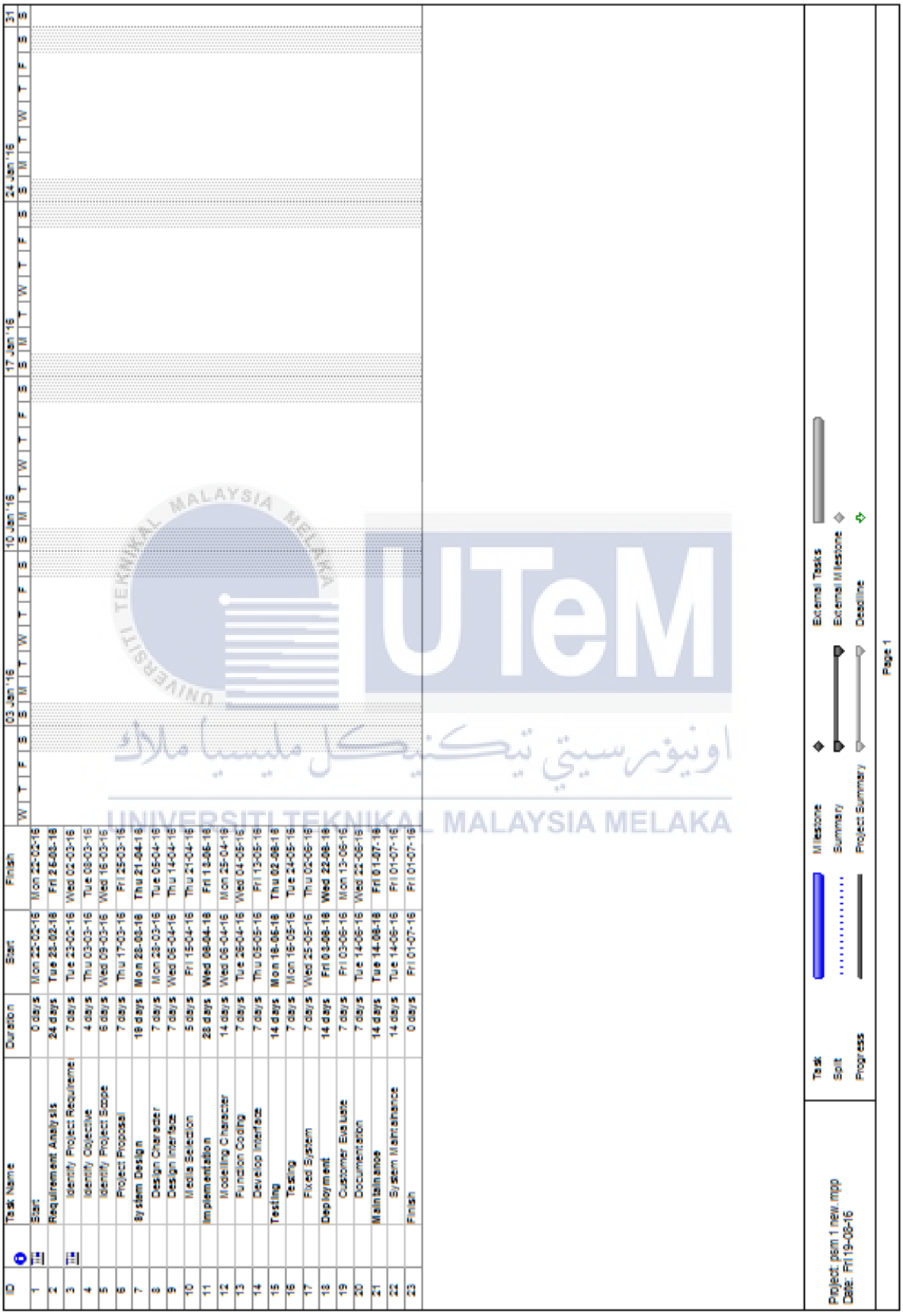
REFFERENCES

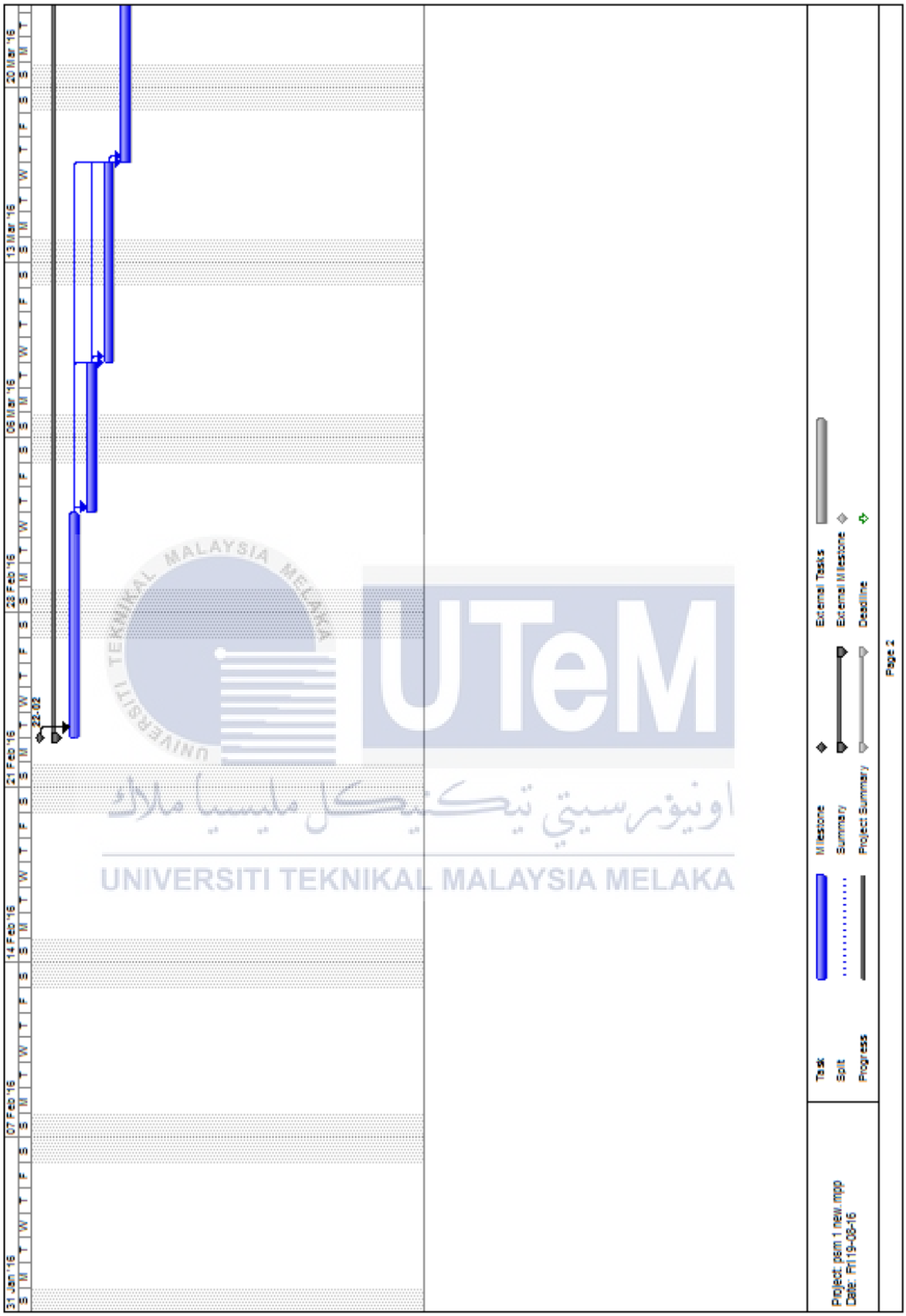
1. Bahler, J. L. (2005). What is Frog and Frog Families. In J. L. Bahler, Frog AnChorus Of Colors (pp. 15,31,47,73). 387, Park Avanue South, New York: Sterling Publishing Co,Inc.
2. C.Vogt, R. (2008). Frog Life. In R. C.Vogt, Rain Forest (p. 56). London: Weldon Owen Pty Ltd.
3. Mohd, H. R. (2015). Koleksi Cerita Haiwan Rimba. In H. R. Mohd, Koleksi Cerita Haiwan Rimba. Kuala Lumpur: Edukid Publication Sdn Bhd.
4. itsybitsyfun. (n.d.). Retrieved from Life Cycle of a Frog Worksheets: http://www.itsybitsyfun.com/life-cycle-of-a-frog-worksheet.html
5. Frog Activities. (n.d.). Retrieved from Frog Printable Worksheets and other "Off line" Activities:: http://www.kidzone.ws/lw/frogs/activities.html
6. What is a Life Cycle? (n.d.). Retrieved from Topic 4 Life Cycle: http://www.doe.virginia.gov/instruction/cross-curricular_instruction/science/animals_habitats/topic4_life_cycle.pdf
7. Buku Teks Sekolah Rendah 2015. (2014, November 7). Retrieved from KSSR Online: http://kssronline.blogspot.my/2014/11/buku-teks-sekolah-rendah-2015.html
8. Yamin, M. b. (n.d.). Unit 2 : Haiwan (Cara Haiwan Membiak). In M. b. Yamin, Buku Teks Dunia Sains dan Teknologi Tahun 2 . Dewan Bahasa Pustaka.
9. Multidots. (2015, April 6). Multidots. Retrieved from How Augmented Reality Works: http://www.multidots.com/augmented-reality/
10. Kato, H., Fac. of Inf. Sci., H. C., & Billinghurst, M. (n.d.). Marker tracking and HMD calibration for a video-based augmented reality conferencing system. Retrieved from IEEE Xplore Digital Library: http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=803809&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D803809
11. DosenBiologi.com. (2015, October 27). Retrieved from Daur Hidup Katak Lengkap dan Penjelasannya: http://dosenbiologi.com/hewan/daur-hidup-katak
12. Stefan Wiedenmaier, O. O. (2009, November 13). Augmented Reality (AR) for Assembly Processes Design and Experimental Evaluation. Retrieved from Taylor And Francis Online: http://www.tandfonline.com/doi/abs/10.1207/S15327590IJHC1603_7

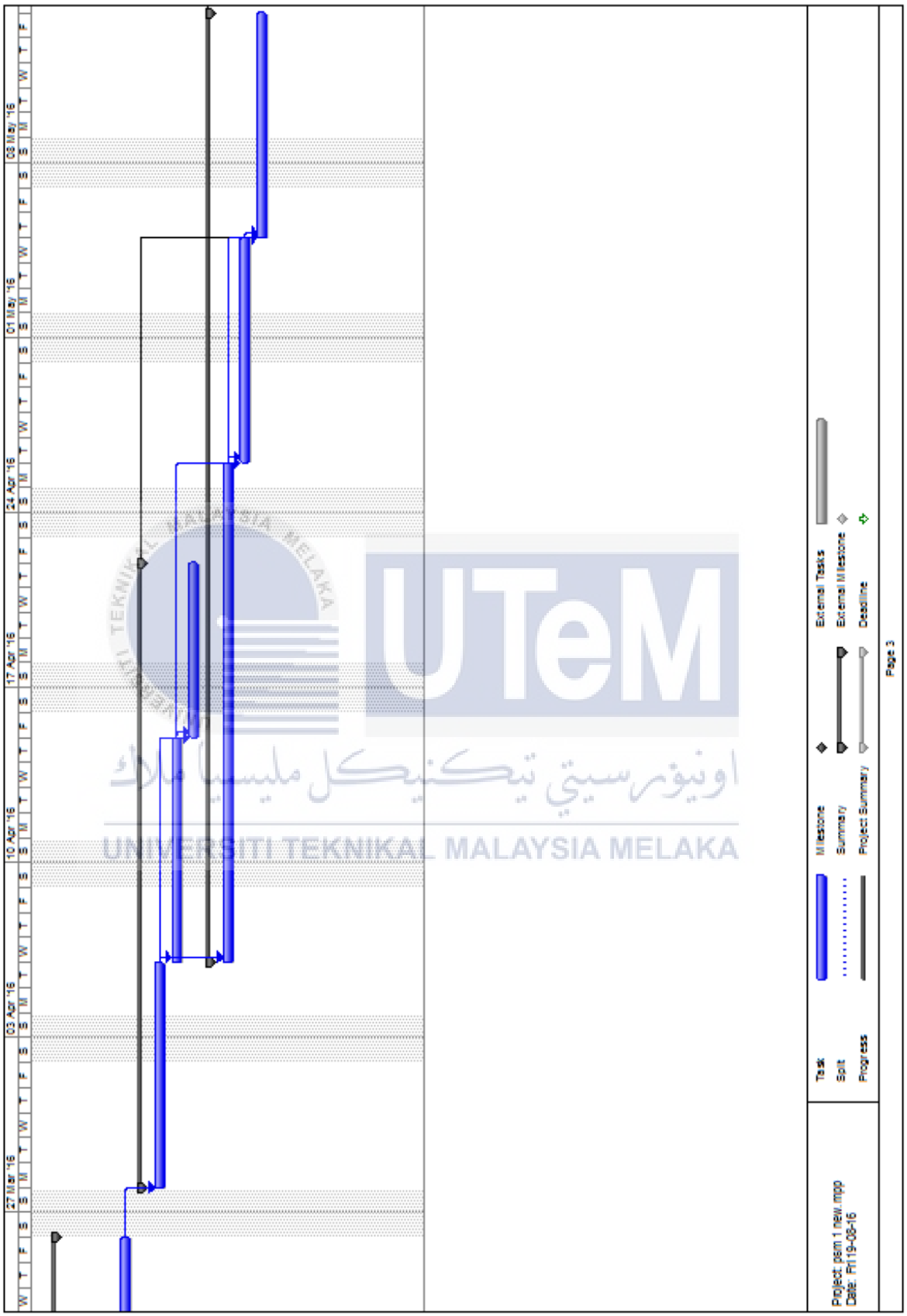
13. Augmented Reality: Marker vs Markerless AR. (2015, December 8). Retrieved from Dartmouth Home Library Home Off-Campus Access: http://researchguides.dartmouth.edu/c.php?g=59732&p=382860
14. SDLC - Waterfall Model. (n.d.). Retrieved from Tutorialspoint: http://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm

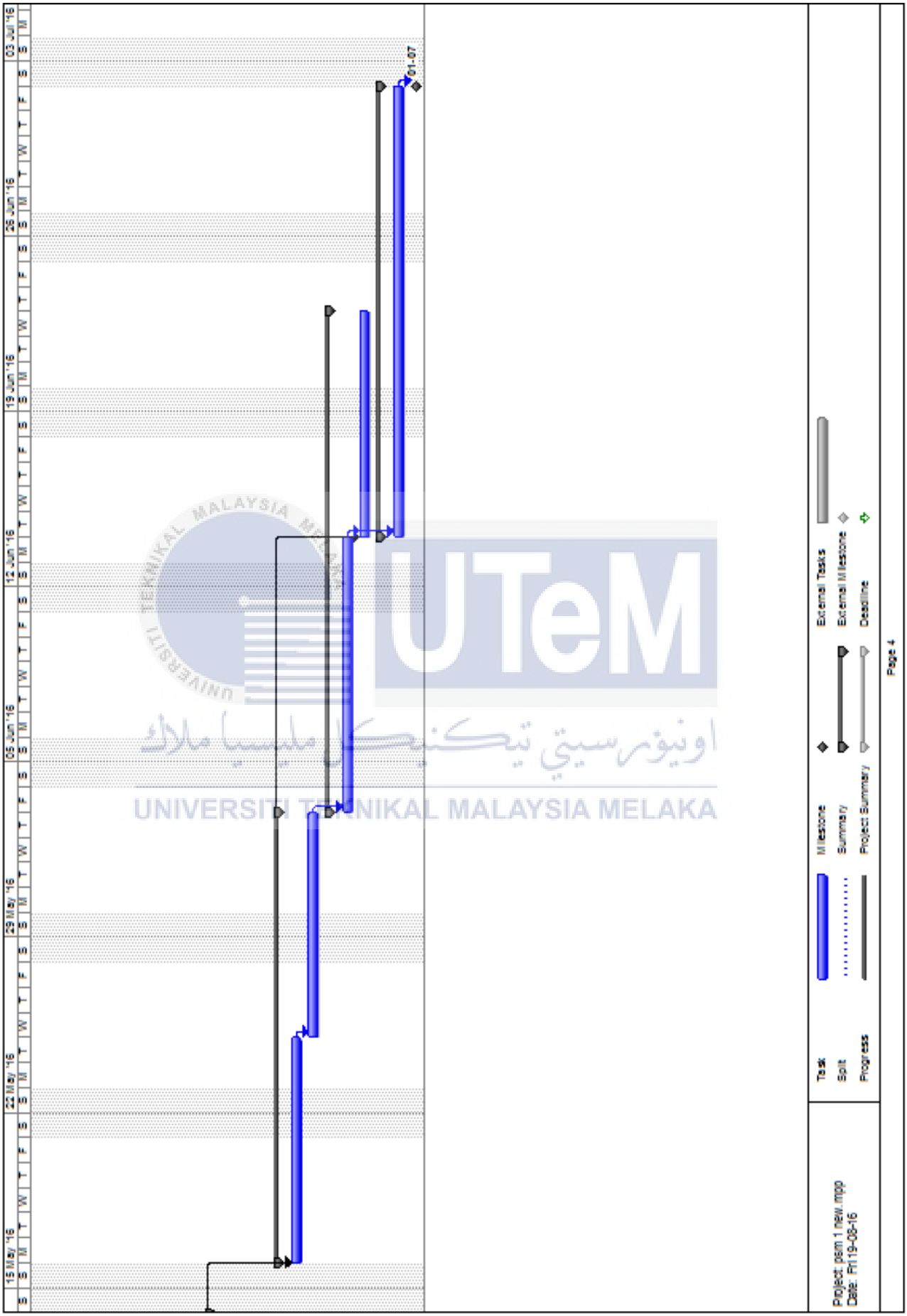
APPENDICES

APPENDIX A : GANT CHART









APPENDIX B : QUESTIONNAIRE

TITLE:

FROG LIFE CYCLE VIA AUGMENTED REALITY (AR) USING MOBILE APPLICATION FOR PRIMARY SCHOOL IN STANDARD TWO.

QUESTIONNAIRE

PART A: BACKGROUND OF PARTICIPANT

1. Gender:

   ☐ Female ☐ Male

2. Age:

   ☐ 7 – 9 Years Old ☐ 10 – 12 Years Old ☐ 13 – 15 Years Old

   ☐ 16 – 17 Years Old ☐ 18 And Above

3. Ethnic:

   ☐ Malay ☐ Chinese ☐ India ☐ Others

4. Do you possess a Smartphone?

   ☐ Yes

   ☐ No

5. How long do you spend for a mobile application that installed in your Smartphone?

   ☐ 10 – 20 minutes

   ☐ 20 – 30 minutes

   ☐ 30 – 60 minutes

   ☐ More than 1 hour

6. Which platform will you prefer to obtain the E-learning about life cycle process?

- ☐ Through Browser
- ☐ Through reference book
- ☐ Go to the Zoo or Reptile Sanctuary
- ☐ Through mobile application or game
- ☐ Others

State : _____

7. Do you think game application are suitable for E-learning??

- ☐ Yes
- ☐ No

If yes, which of game application will you for e-learning?

- ☐ Based on the storyline or maps
- ☐ Through answer some quiz
- ☐ Based on storyline than answer the some quiz
- ☐ Others

States :_____

8. Do you know what Augmented Reality (AR) is?

- ☐ Yes
- ☐ No

If yes, you use any Augmented Reality mobile application for learning before?

- ☐ Yes
- ☐ No

9. Do you think that the e-learning that you obtained through mobile application via Augmented Reality is easier than through the text book?

- ☐ Yes
- ☐ No

If no, why do you think that information is easier to obtain from text book?

- ☐ Because the details provided by mobile application via AR are not enough
- ☐ Because the details provided by mobile application via AR are not related
- ☐ Because the details provided by mobile application via AR are not very interested
- ☐ Because the details provided by mobile application via AR are wrong

PART B

1. When was your last read a storybook?
   - ☐ Within last 2 weeks
   - ☐ Within last month
   - ☐ Within last 6 months
   - ☐ Within last year and above

2. What kind of story books you prefer?
   - ☐ The Story Of Science
   - ☐ Fairy Tale
   - ☐ The Story Of The Advice
   - ☐ Others

     State : _____

3. What is your MAIN reason for reading story book?
   - ☐ More prefer to see pictures on story books only
   - ☐ To increase the Focus and Concentration
   - ☐ Training concept and to think and Analyze
   - ☐ Just fill your leisure time

4. Approximately how long have you spent to read the story book?

   ☐ 10 – 20 minutes
   ☐ 20 – 30 minutes
   ☐ 30 – 1 hours
   ☐ More than 1 hour

5. Could you undersand of the story clearly?

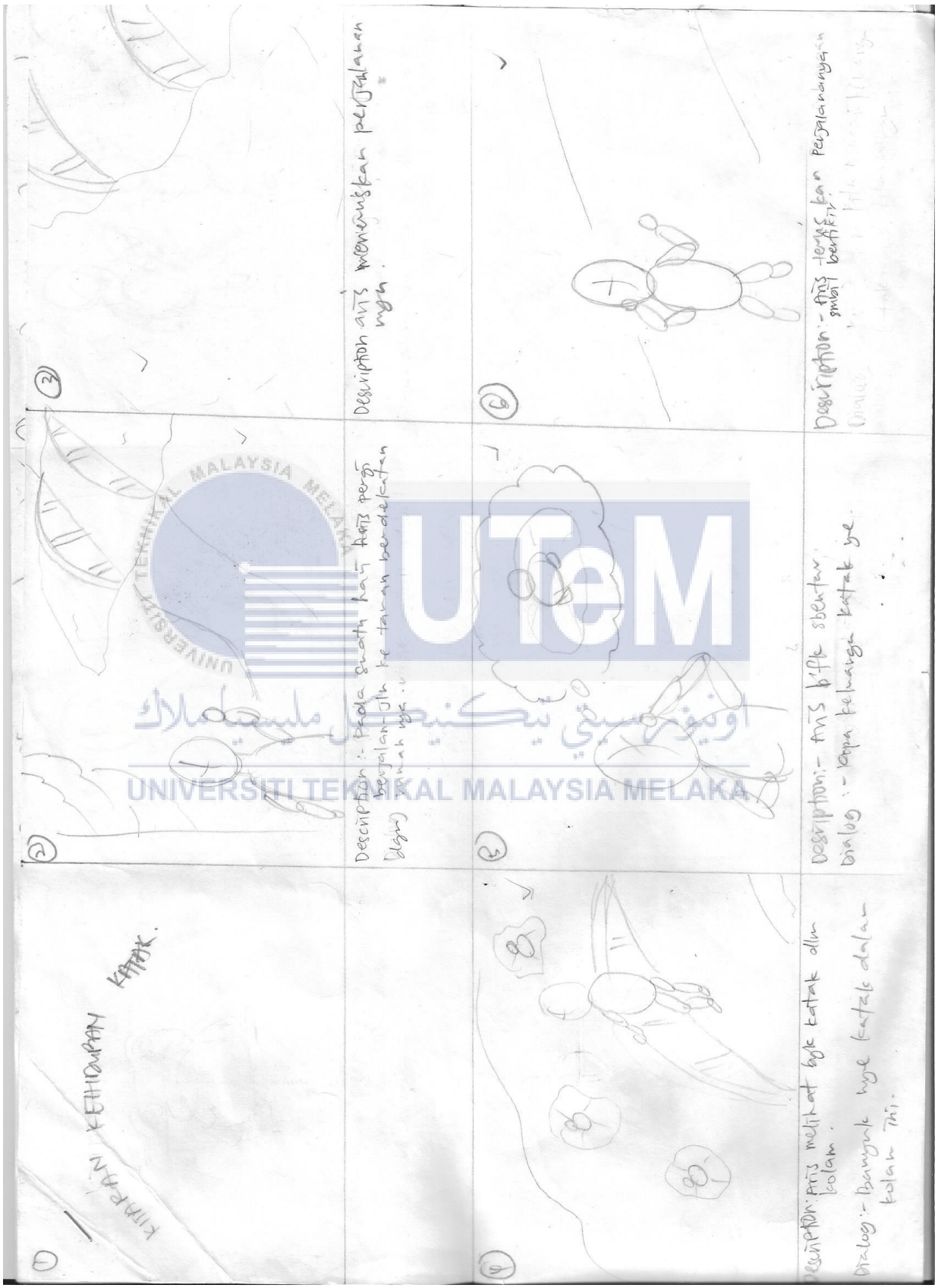
   ☐ Yes
   ☐ No

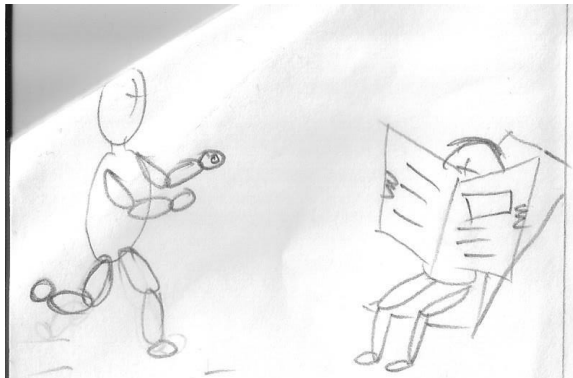
   If no, why?

   ☐ The story to long and hard to understand
   ☐ To many image than information
   ☐ The story not very interested
   ☐ Others

   State : _____

APPENDIX C: STORYBOARD DESIGN





Description:- Aris berlari ke arah atoknya dengan membawa ank katak tsb.

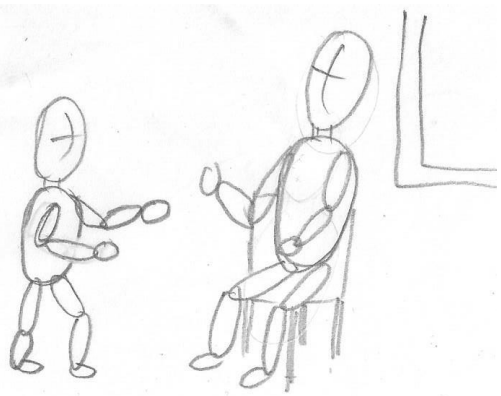
Dialog:- Atok !! cbe tgk atok ni. dah ada 4 kaki.

20

Description:- Atok mahu melihat perubahan ank katak 7tu.

Dialog:- atok:- hari ini atok tgk ank katak ini lg bebrape hari akan menjadi katak Aris!-

21

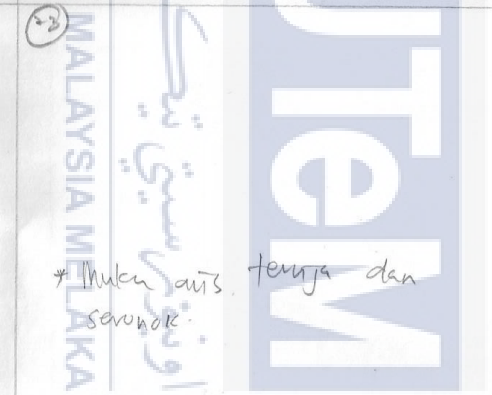


Description:- Atok menerangkan lagi — hari ank katak ini akan menjadi katak dewasa.

23

* gambar katak melompat-lompat.

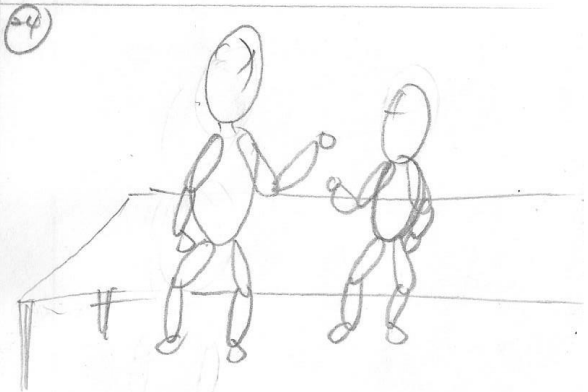
Description:- Selang beberapa hari, ank katak 7tu telah berubah menjadi seekor katak yg berwarna hijau dan melompat-lompat.



* Muka aris terkejut dan seronok.

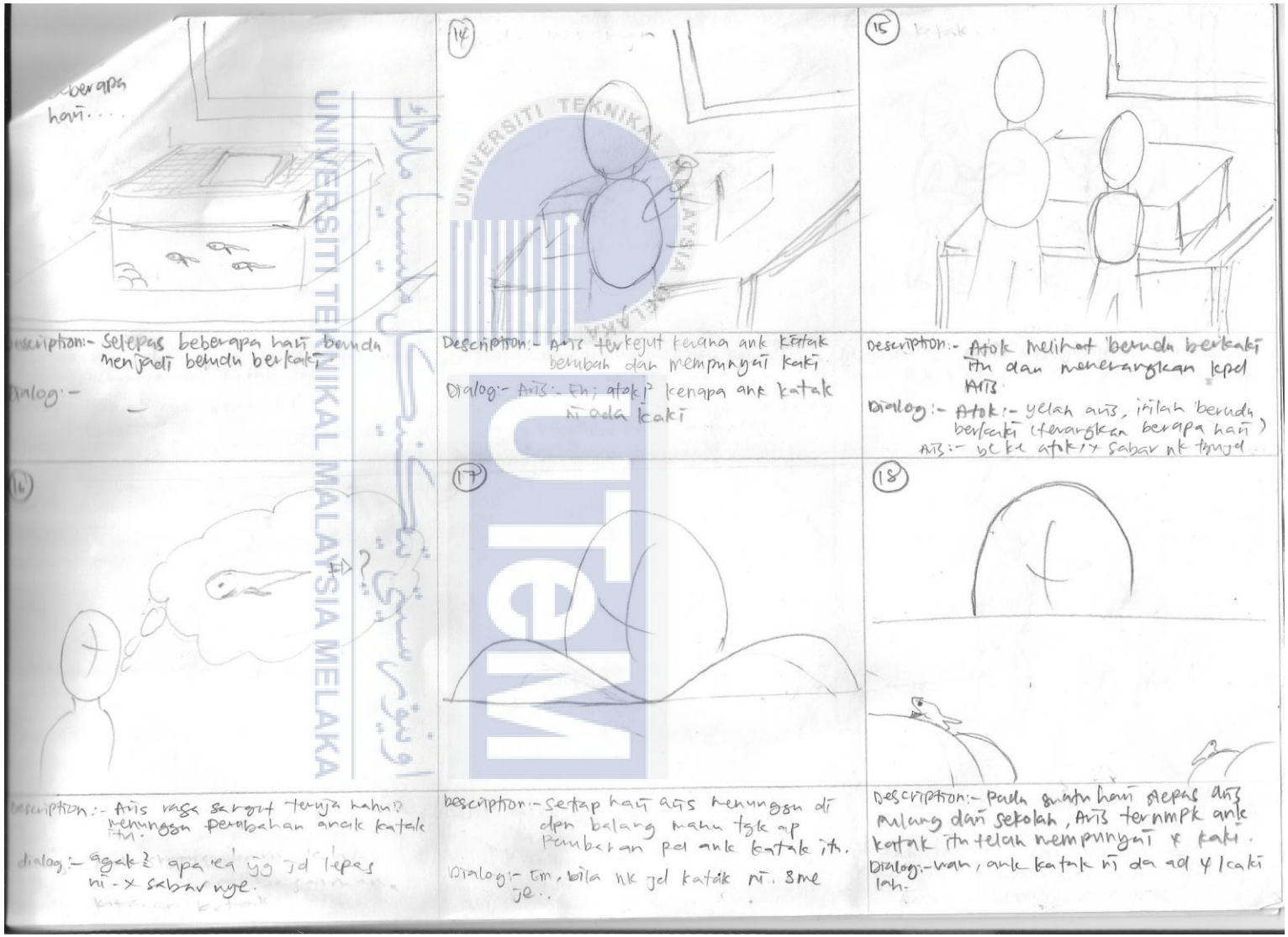
Description:- Aris sgt terkejut melihat ank katak 7tu sudah menjadi seekor katak

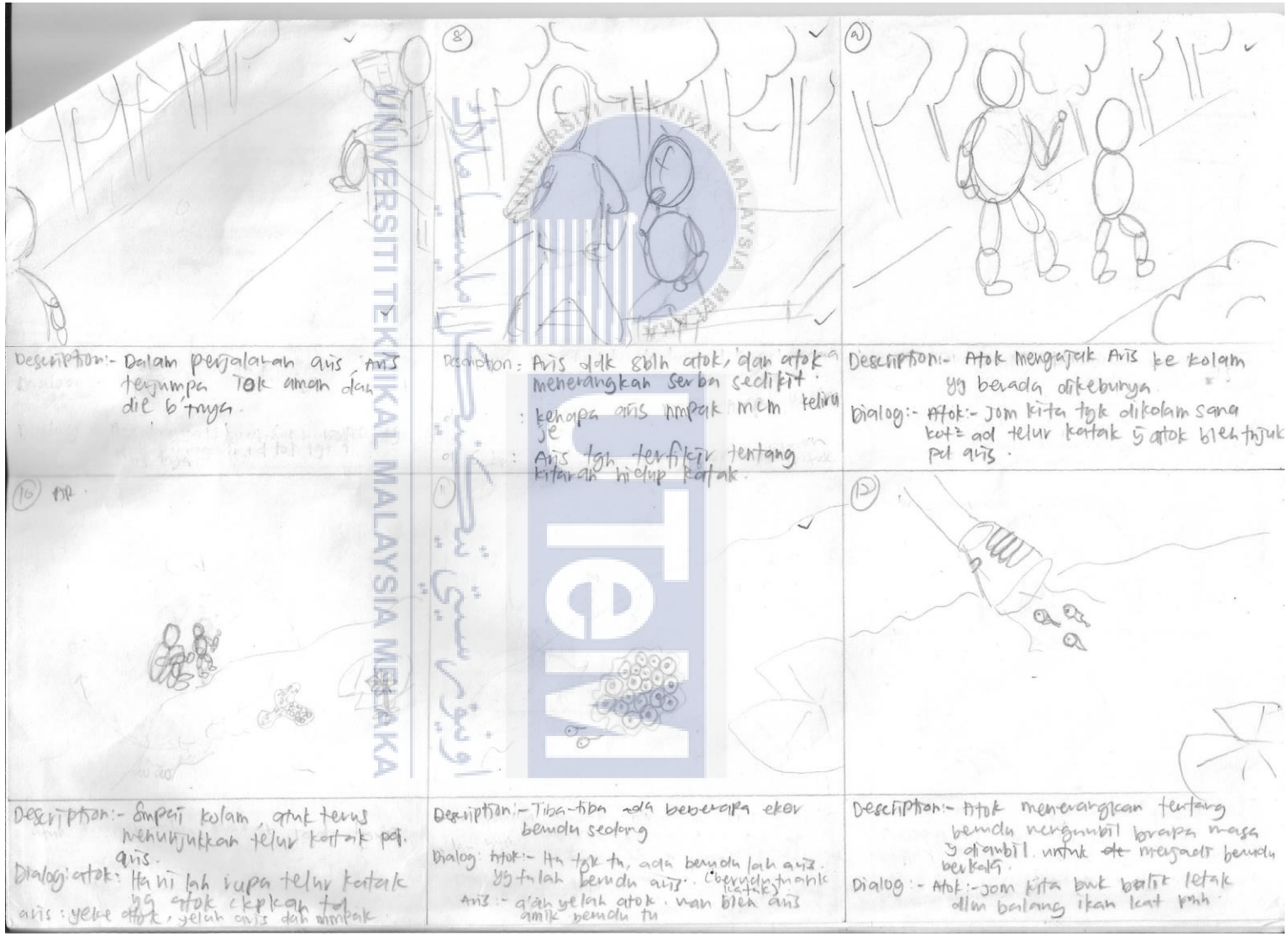
24



Description:- Setelah pemerhatian kitaran hidup katak dijalankan, sekarang aris sudah faham dr mne datgnya seekor katak

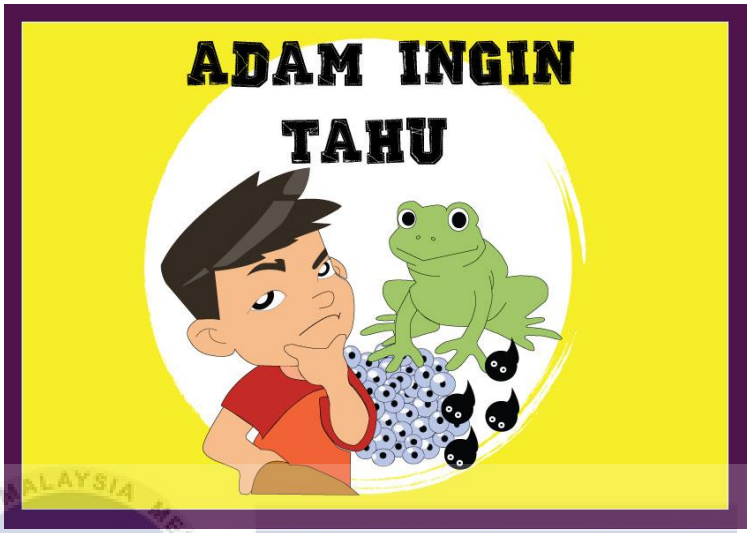
Dialog: Atok! sekarang ni baru aris faham katak tu datang dari mne.


beberapa hari....
14
15
Description:- Setelah beberapa hari berada menjadi beruda berkaki
Dialog:-
Description:- Aris terkejut kerana ank kertak berubah dan mempunyai kaki
Dialog:- Aris:- Eh; atok? kenapa ank katak ni ada kaki
Description:- Atok melihat beruda berkaki itu dan menerangkan kpd Aris
Dialog:- Atok:- yelah aris, inilah beruda berkaki (terangkan berapa hari)
Aris:- bile atok, sabar nk tunggu
16
17
18
Description:- Aris rasa sangat terjaga kahun? menunggu perubahan anak katak itu.
dialog:- agak2 apa ada yg jd lepas ni - x sabar nye.
Description:- Setiap hari aris menunggu di dpn balang mana tgk ap perubahan pd ank katak itu.
Dialog:- tm, bila nk jd katak ni. sme je.
Description:- Pada suatu hari selepas Aris pulang dari sekolah, Aris terkejut ank kertak itu telah mempunyai 4 kaki.
Dialog:- wah, ank katak ni da ada 4 kaki lah.



APPENDIX D : STORYBOOK DESIGN

PAGE 1



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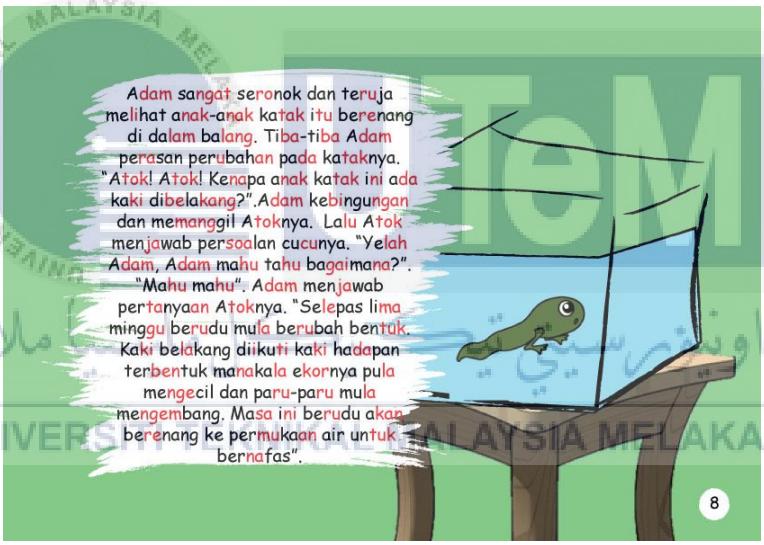

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APPENDIX E : ALPHA TESTING QUESTIONNAIRE

TITLE:

IMPLEMENTATION OF FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION

ALPHA TESTING FORM

Please circle (O) for your own choice aspects level score based on your observation for this mobile application's function.

Strongly Dissatisfied	Dissatisfied	Not Sure	Satisfied	Strongly Satisfied
1	2	3	4	5

SECTION A: FUNCTIONAL TESTING

No.	Aspect / Module	Rate				
PART A: VISUAL CLARITY						
1.	Well organized of the layout.	1	2	3	4	5
2.	Text legibility on the screen.	1	2	3	4	5
3.	Neutral choice of colors.	1	2	3	4	5
4.	Screen color schemes did not interfere with readability.	1	2	3	4	5
5.	Button labels are clear and understandable.	1	2	3	4	5
PART B: NAVIGATION AND INTERACTIVITY						
1.	Navigation is clear and concise.	1	2	3	4	5
2.	Menu is easy to control.	1	2	3	4	5
3.	Button return anticipated response.	1	2	3	4	5
4.	Response time with the buttons is fast and smooth.	1	2	3	4	5
5.	Able to exit anytime.	1	2	3	4	5

PART C: CONTENT						
1.	The frog life cycle in accordance with the syllabus	1	2	3	4	5
2.	The storyline that provide are made understandable	1	2	3	4	5
3.	Texture of 3D object is clearly and precisely.	1	2	3	4	5
PART D: AR						
1.	Use of AR attracts the attention to focus on the every stage of frog life cycle.	1	2	3	4	5
2.	AR applied to impressive the stage of frog life cycle.	1	2	3	4	5
3.	Content presented through AR is clearly.	1	2	3	4	5
4.	Screen color schemes did not interfere the interface of AR.	1	2	3	4	5

APPENDIX F : TESTING DESRIPTION

Testing Description

Details:

- 32 testers for the testing.
- 8-10 testers per section, divided into 3 group.
- Around 20 minutes per cycle.

Instructions

1. Let 8-10 students be one group.
2. Answer few questions that prepared before starting the testing
3. Let ask the student did them know what is frog life cycle and what them know.
4. Pause them for answering the question prepared
5. Continue with the testing by show the storybook.
6. Let students read through the storybook and use the mobile application by assist the storybook.
7. Pause them for answering the question prepared
8. Let students use the mobile application with the storybook by them self.
9. Pause them for answering the testing question prepared.
10. Testing is finish.

APPENDIX G: BETA TESTING QUESTIONNAIRE

TITLE:

IMPLEMENTATION OF FROG LIFE CYCLE VIA AUGMENTED REALITY USING MOBILE APPLICATION

USER ACCEPTANCE TESTING QUESTION

PART A: BACKGROUND OF PARTICIPANT

Please tick (/) for the appropriate choice.

1. Gender:

   ☐ Female ☐ Male

2. Age:

   ☐ 7 – 9 years old ☐ 10 – 12 years old 13 – ☐ 5 years old

   ☐ 16 – 17 years old ☐ 18 years old and above

3. Ethnic:

   ☐Malay ☐ Chinese ☐ India ☐ Other

4. Are You from class?

   ☐ 2 Bijak

   ☐ 2 Bestari

   ☐ Teacher

5. Do you ever use mobile applications related to learning before?

   ☐ Yes

   ☐ No

PART B: USER ACCEPTANCE TESTING

Please circle (O) for your own choice aspects level score based on your observation for this mobile application's function.

Strongly Dissatisfied	Dissatisfied	Not Sure	Satisfied	Strongly Satisfied
1	**2**	**3**	**4**	**5**

Through Text Book					Aspect / Module	Through Mobile Application and Storybook				
Rate						Rate				
PART A: VISUAL CLARITY										
1	2	3	4	5	Layout is clear and neat as well as more exciting than the textbook.	1	2	3	4	5
1	2	3	4	5	The type of font and size is easy to understand.	1	2	3	4	5
1	2	3	4	5	The colors used are suitable for storybooks and mobile applications.	1	2	3	4	5
1	2	3	4	5	The appearance of the 3D model can be viewed accurately than in a textbook.	1	2	3	4	5
PART B: NAVIGATION AND INTERACTIVITY										
1	2	3	4	5	The response time to interact with all the buttons is fast and smooth.	1	2	3	4	5
1	2	3	4	5	Menu in the mobile application is easy to control.	1	2	3	4	5
1	2	3	4	5	Navigation on this application is easy to use.	1	2	3	4	5
1	2	3	4	5	Button on the mobile applications to respond quickly.	1	2	3	4	5
1	2	3	4	5	Interactively with 3D models makes it more attractive than the textbook.	1	2	3	4	5

1	2	3	4	5	Teaching through this mobile application is continuously with the interactive that given compared to the textbook.	1	2	3	4	5
PART C: FUNCTIONALITY AND CONTENT										
1	2	3	4	5	There are this application and the storybooks that given follow the syllabus of school textbook.	1	2	3	4	5
1	2	3	4	5	The storyline is given in the storybook are effective in helping you to understand than in school textbooks.	1	2	3	4	5
1	2	3	4	5	Does the application provide a consistent lesson than textbooks.	1	2	3	4	5
1	2	3	4	5	Information that is more accurate with the textbook.	1	2	3	4	5

6. You prefer to use?

   ☐ Text Book

   ☐ This application and the storybook

   Because : _____

7. If the application requires a storybook and what changes need to be done, give your opinion.

   _____

   _____

APPENDIX H: USER MANUAL

USER MANUAL

1. Copy application package file “SDK_Example.apk” from the CD into Android Smartphone through connecting cable with computer or Bluetooth.
2. Search the apk file inside Android directory and click on it.
3. A dialog box will appear, proceed by select “Install”.
4. After the installation had completed, the application named “FLC.apk” can be seen in the application list.

Note:

1. Please ensure that your phone setting is configured to install of non-market applications.
   a. Navigate to Setting > Applications.
   b. Check the box for “Unknown sources – Allow install of non-marker applications”