LEARNING FARM ANIMALS FOR KINDERGARTEN USING AUGMENTED REALITY

SITI RAHMAH BINTI NAWARI

UNIVERSITI TEKNIKAL MALAYSIA MELAKA (UTeM)

BORANG PENGESAHAN STATUS TESIS

JUDUL: LEARNING ANIMALS FARM FOR KINDERGARTEN USING AUGMENTED REALITY

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26900 Bandar Tun
Razak, Pahang

Tarikh:_____

(TANDATANGAN PENYELIA)

DR HAMZAH ASYRANI BIN
SULAIMAN

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LEARNING FARM ANIMALS FOR KINDERGARTEN USING AUGMENTED REALITY

SITI RAHMAH BINTI NAWARI

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

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA (UTeM)

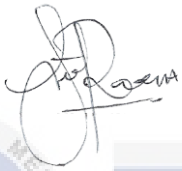
2017

DECLARATION

I hereby declare that this project report entitled

LEARNING FARM ANIMALS APPLICATION FOR KINDERGATEN USING AUGMENTED REALITY

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



STUDENT : _____ Date: 28th August 2017

(SITI RAHMAH BINTI NAWARI)

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.

SUPERVISOR: _____ Date: 28th August 2017

(DR HAMZAH ASYRANI BIN SULAIMAN)

DEDICATION

To my beloved parents and family, thank you for your unconditional support with my studies. I am honored to have you as my parents and family. Thank you for giving me a chance to prove and improved myself through all my walks of life.

To my supervisor, Dr. Hamzah Asyrani bin Sulaiman, thank you for guidance and encouragement during project implementation.

To my evaluator Dr Ibrahim bin Ahmad, thank you for providing advice during presentation and evaluating my Final Year Project.

To my friends who always give me support and together we can pursue a broad knowledge.

ACKNOWLEDGEMENTS

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

First and foremost, I would like to express my deepest gratitude to my supervisor, Dr. Hamzah Asyrani bin Sulaiman, who has supported and guidance me throughout the progress of Final Year Project with her patient and knowledge. Without her, this report and product would not have been completed on time.

Next, I would like to thank my parents who have always supported and encouraged me when I encountered bottleneck during the progress of Final Year Project. Without their support, I would not have the motivation to continue it.

Last but not least, I would like to thank my friends as well. Thank you for listening, offering me advice and supporting me throughout this entire semester. Thanks again for not stingy on sharing their knowledge and lending their hands for me.

ABSTRACT

This project discusses about Learning Farm Animals with Augmented Reality Technology. The previous application also provided animals in 3D form and the sound. By developing this AnimalsAR, user will be able to learn about farm animals and its sound. For developing this project, Interactive Visual Cognitive Software Development Life Cycle had been applied. This project is one of ongoing study for developing new learning application through augmented reality technology.

ABSTRAK

Projek ini membincangkan berkenaan Mengenal Haiwan di Ladang dengan Teknologi reality diperkukuhkan. Aplikasi yang telah sedia ada juga memaparkan haiwan dalam bentuk 3D beserta bunyi. Dengan membangunkan aplikasi AnimalsAR ini, pengguna akan dapat belajar mengenai haiwan di lading dan bunyinya. Untuk membangunkan projek ini, Interactive Visual Cognitive Software Development Life Cycle telah digunakan. Projek ini merupakan salah satu kajian yang sedang dijalankan untuk membangunkan aplikasi pembelajaran baru yang menggunakan teknologi reality diperkukuhkan.

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CHAPTER I

INTRODUCTION

1.1. Introduction

With the latest development of technology, learning farm animals have gone beyond augmented reality technology. It can be played by using smartphone or tablet. Throughout this augmented reality that has been applied in learning animals for early childhood, it can provide real-time environment and attractive way to learning. This will be an advantageous way for education purposed.

AR technology has been found in. AR itself can be defined as a combination of real and virtual environment with provided interaction and comes with 3D object as the output [1]. Back to where augmented reality was first found. Before that, people are using book and video approach in education.

1.2. Problem Statement

Nowadays, flashcard and book about learning animals farm for early child as education medium is the only source that available. But the problem is, the content is not attractive enough to attract them to learn in a fun way. It is because it only consists static image, text and sound. There is no two ways interaction in learning.

These problems will distract children passion in learning animals in the farm.

i. The book consist only static image.
ii. There is no media approach. Children only learn by looking at the static image.

1.3. Objectives

This project gets on the following objectives:

i. To study and investigate a new Augmented reality about learning animals farm.
ii. To develop an application using an Augmented Reality as new learning method.
iii. To evaluate either the developing of the Augmented reality is successful to solve the problems of kindergarten education.

1.4. Project Scopes

1.4.1. Users

This project is designed focuses on kindergarten student as the main target of users.

1.4.2. Devices

The project is only focuses on mobile devices with Android platform. The Android platform should be in Android 2.3.1 which is „Gingerbread" and higher. The mobile devices should have its own camera which allow it to view the object. Since augmented reality features is applied in this project, the identification marker type is chosen and implemented in a printed flashcard with A6 (105mm X 148mm) size.

1.5. Project Significant

This project is carried out to improve the understanding about the animals that live in the farm. Student does not need to learn about animals in a boring and old way.

Using this technology, both student and parents can learn about animals from augmented reality view that include 3d animals and colourful flashcard.

1.6. Conclusion

From this application, learning about animals with applied augmented reality technology will make the student more interested to learn. This application will have about 6 animals that come with 3d pop up animals. The application will show the 3d animals that will pop up while the 2d flash card is in scan. This application is developed using some of multimedia elements. The purpose of developing this application is to introduce another way to learn about animals.

The next chapter will explain about the literature review and the project methodology to show the specific requirement, the fact and finding related with this project. Milestone of this project development is included.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1. Introduction

For this mobile application development, there are two subs topics which are literature review and project methodology. The literature review will show the research that related to this topic.

The research found is focused about the learning process, because people still using the old version learning style which include the book reading. By applying augmented reality technology, this may attract targeted user to learn about animals in another way.

The methodology shows the technique used in developing this application. Modified waterfall model is applied as a method in the development process. This model is one of the guider when developing the application. In waterfall model, there are 4 phases which are gathering the requirement of the project and analyse, the design phase, implementation phase and testing.

A comparison between existing applications also provided. The comparison of the existing application is made by the technology applied, ar sdk, platform used to develop, the price, content, tracking method and also the pro and cons.

2.2. Domain

This application is for educational use which focuses on learning farm animals. Roughly, this application is an education method which is learning animals by augmented reality method. This will help children to learn more about animals and its sound. There are a lot of interactive element that have been applied in this application.

Furthermore, the usage of smartphone technology has been spread. This application will help to attract children to learn in more interactive way. Children also may learn about the sound of the animals itself.

2.3. Existing System

2.3.1. Comparison of Existing System

Table 2.1: The comparison between existing system

	 AR-Animals Book	 VR Forest Animals Adventure
Technology applied	Using Augmented Reality Technology	Using Virtual Reality Approach
AR sdk	Vuforia	Vuforia
Tracking	Book and printed A4 as	Using Smartphones and

method	marker.	the VR glasses.
Price	Free	Free download
Platform	Android 2.3 and above	Android 2.3 and above
Content	Games and 3D object	Games and 3D object with real look environment.
Additional feature	Colourful environment and allow user to rotate and scale the animals. Also contain the animals sound.	Colourful environment and real look animals.
Pro and cons	Pro • Free download for application and the marker. Cons	Pro • Free download application. Cons • User need to provide their own vr glasses.

2.4. Project Methodology

Before developing this project, project methodology need to be defined. This method is a guideline during developing the application, waterfall method is used. This prototype was designed to develop the concept of creating virtual model in real environment that appears to co-exist with the environment. The application allows user to experience the real-time and virtual models simultaneously. Thus, the modified waterfall model was implemented for the application prototype. This can be observed in Figure 2.1.

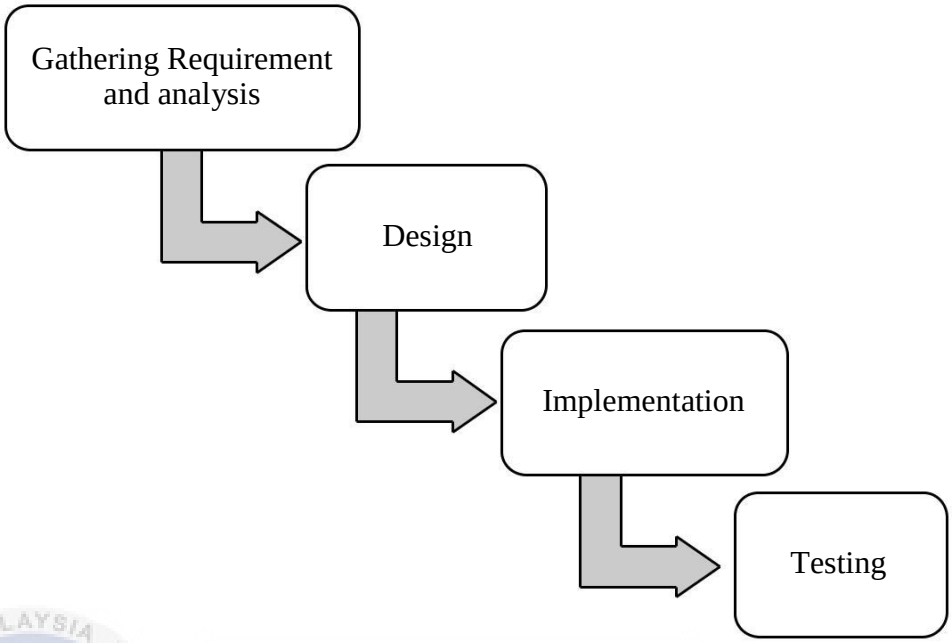


Figure 2.1: Waterfall Model

2.5. Project Requirement

There are several software and hardware that are used in this project development. Both software and hardware requirement are explained as following below.

2.5.1. Software Requirement

The software that had been use for developing this project are:

i. Adobe Illustrator CS5
ii. Adobe Photoshop CS5
iii. Autodesk Maya 2010
iv. Unity
v. Microsoft Word 2016
vi. Vuforia (Online Server)

2.5.2. Hardware Requirement

The hardware used or developing this project are:

i. Personal Laptop.
   - Asus A43S
   - Intel core i5
   - NVIDIA GeForce 520M with 1GB VRAM
   - Windows 7 32bit

ii. Smartphone.
   - Lenovo TAB 2 A7-30HC
   - Android 5.0.1 „lollipop"
   - CPU: 4 Core 1.3GHZ

iii. Printer.
   - HP Deskjet 1510 All-in-One multifunction printer.

2.6. Conclusion

This chapter explains about the literature review and the comparison between existing systems. Besides that, the methodology used to develop this project has been explained. This chapter also explain the software and hardware requirement that has been used during the development of this project.

CHAPTER III

ANALYSIS

3.1. Current Scenario Analysis

The problem that has been faced during developing this project are the requirement should be suitable as the user of this application are children from 3 to 8 years old. The content must be appropriate with their age.

3.2. Requirement Analysis

3.2.1. Project Requirement

All the software and hardware needed for this project will be identified in this part. This will be the platform used to complete this project.

3.2.2. Software Requirement

Table 3.1: List of software requirement.

Software	Purpose
Adobe Illustrator CS5	To design the graphic.
Adobe Photoshop CS5	To do graphic editing.
Autodesk Maya 2010	To design 3d object.
Unity	To develop content.
Vuforia (Online Server)	To create database for image target.

3.2.3. Hardware Requirement

Table 3.2: List of hardware requirement.

Hardware	Purpose
Personal Laptop	To develop content.
Printer	To print the card.
Smartphone	To test the application.

3.3. Project Schedule and Milestones

This project consists of two phases. Phase 1 is focusing on the development process. While phase two is a test phase where the product will be evaluated to see whether the project meet it objective or not. The project schedule will be show in table 3.3. While the project milestone in table 3.4.

Table 3.3: Project schedule or gantt chart

ACTIVITY	WEEKS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Brainstorming idea with SV														
Research on the scope topic														
Designing the content and interface														
Flash menu integration														
Motion graphics, animation and effect integration														
Insert all the content specified														
Insert audio and video														
Check for errors and problems														
Play testing														

Table 3.4: Project milestone

Week	Activity	Note / Action
1 13-17 Feb **Meeting 1**	Proposal PSM: Discussion	Deliverable – **Proposal** Action – Student
	Proposal assessment & verification	Action – Supervisor, Evaluator
2 20-24 Feb	Proposal Correction/Improvement	Action – Student
	List of supervisor/title	Action – PSM/PD Committee
3 27 Feb - 3 Mac **Meeting 2**	Proposal Presentation & Submission via PSM Online System Chapter 1 (System Development Begins)	Deliverable – **Proposal Presentation (PP)** Action – Student
4 6-10 Mac	Chapter 1 Chapter 2	Deliverable – **Chapter 1** Action – Student, Supervisor
5 13-17 Mac	Chapter 2	Action – Student
6 20-24 Mac **Meeting 3**	Chapter 2 Chapter 3	Deliverable – **Chapter 2** **Progress Presentation 1 / Pembentangan Kemajuan 1 (PK 1)** Action – Student, Supervisor
	Student Status	Warning Letter 1 Action – Supervisor, PSM/PD Committee
7 27-31 Mac	Chapter 3 Chapter 4	Action – Student
8 3-7 Apr	**MID SEMESTER BREAK**	
9 10-14 Apr	Chapter 4 Project Demo	Deliverable: **Chapter 3** Action – Student, Supervisor
10 17-21 Apr **Meeting 4**	Chapter 4 Project Demo	Deliverable – **Progress Presentation 2 / Pembentangan Kemajuan 2 (PK 2)** Action – Student, Supervisor
	Student Status	Warning Letter 2 Action – Supervisor, PSM/PD Committee
11 24-28 Apr **Demonstration**	Project Demo	Action – Student
	Determination of student status (Continue/Withdraw)	Submit student status to Committee Action – Supervisor, PSM/PD Committee
12 1-5 May	Project Demo PSM1 Report	Action – Student, Supervisor
13 8-12 May **Meeting 5**	Project Demo PSM1 Report PSM 1 Showcase Poster Submission	Action – Student, Supervisor
14 15-19 May	Project Demo Submission of the PSM1 Report onto the PSM e-Repository online system	Deliverable – **Complete PSM1 Draft Report** Action – Student, Supervisor
15 22-26 May **PSM 1 Showcase**	**PSM 1 SHOWCASE** **Wed, 24 May 2017; 8:00am - 5:00pm**	Action – Student, Supervisor, Evaluator, PSM/PD Committee
16 29 May - 2 Jun	**REVISION WEEK** Correction on the draft report based on the comments by the Supervisor and Evaluator during the final presentation session Submit PSM1 Logbooks to PSM Online System	Deliverable – **Complete PSM1 Logbooks** Action – Student, Supervisor
	Submission of overall marks to PSM/PD committee	Deliverable: **Overall PSM1 score sheet** Action – Supervisor, Evaluator, PSM/PD Committee
17 & 18 5-18 Jun	**FINAL EXAMINATION WEEKS**	

3.4. Conclusion

As conclusion, all requirement specification including product and process requirement are identified. This chapter also identify about the accurate hardware and software requirements used to develop this project. Finally, the purpose of table, milestone and Gantt chart in this chapter is to ensure this project finish in time.

CHAPTER IV

DESIGN

4.1. Introduction

This chapter will explain about design phase. All flow to design this application will described briefly in design phase. In the I-VC SDLC methodology model, design phase and can be defined as the systematic development of the learning process.

This chapter will focus on several main aspects which are system architecture, preliminary design and user interface design. System architecture is the conceptual model that conceptual model that defines the structure, behaviour and views of an overall system.

4.2. System Architecture

System architecture is the conceptual design that defines the structure of the mobile application. In this project, the main thing about this AR mobile application is marker-based application. Hence, without the flashcard, students are not able to use the mobile application because the markers are printed and put in the card. Hence, they have to get the marker card by download from the websites after the card is published. Figure 4.1 shows the system architecture of AnimalsAR mobile application.

4.3. Preliminary Design

4.3.1. Storyboard Design

4.4. User Interface Design

4.4.1. Navigation Design

Navigation design provides in this application are exit button, play button and home button. When user click on play button, 3D animals will be display and its sound will be appeared to get their attentions to use this application.

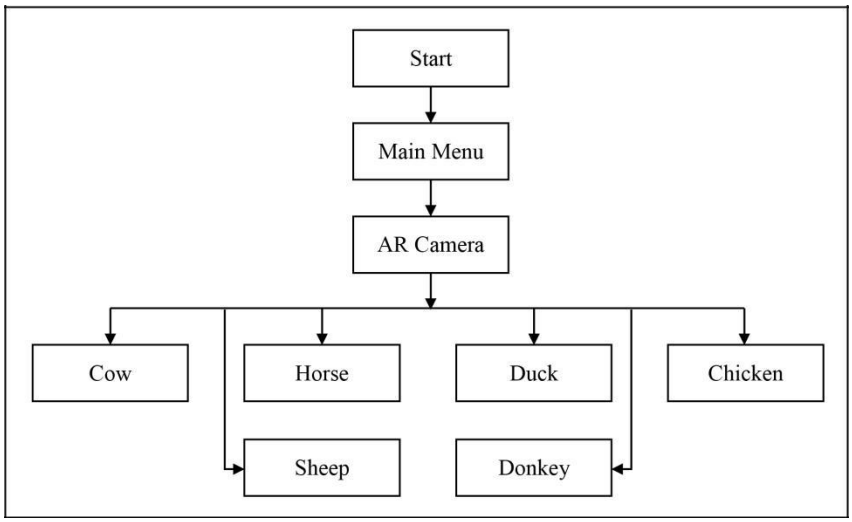


Figure 4.1: Show the navigation design

4.4.2. Input and Output Design

In this application, no input design provided for user. Only output design will appear that will allow user to view the animals in 3d form and hear its sound.

Figure 4.2: The output of the object

4.4.3. Flashcard Design

Flashcard is design using Adobe Illustrator CS5 in A6 size (148mm x 105mm). This flashcard is used as a medium to attract user to use this application. It only consists the animals, the name of the animals and the ID marker that allow user to view the pop up object using smartphone camera. Without this

card, the application will display nothing unless the main menu.

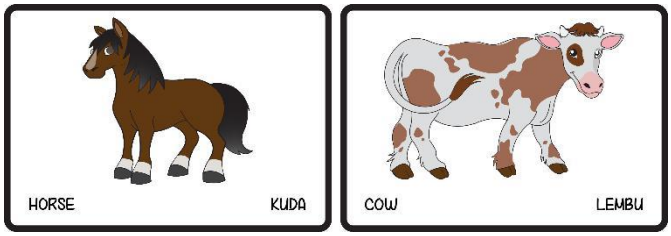


Figure 4.3: Flashcard design

4.4.4. Icon Design

The application need to be install in the smartphone with camera. The icon is design using Adobe Illustrator CS5. This icon will be present AnimalsAR.

Figure 4.4: Application icon design

4.5. Conclusion

The design phase is important to make sure the effectiveness of this system. This chapter explain about the application prototype such as the flow and interface that consists of navigation, media creation, input and output design, metaphors, template design, media creation and integration and upload files.

CHAPTER V

IMPLEMENTATION

5.1. Introduction

In this implementation chapter, it will discuss all entire process that involved in this phase. This chapter will explain the production anf implementation process which include the media creation and integration phases. In the media creation phase it contain the text, graphic, studio and animation production. All mentioned above is the production process that will include into the prototype to end product. Media integration is the process of integrating the created multimedia elements.

All of this activity must be referring the time management to keep the project development on time. By implementing all the design such as storyboard, interface design and the navigation flow, this application will be a good product referring all the case studies. On the other hand, all the activity that already discuss from the previous chapter will help to convert all the information to an application.

Next, configuration environment setup and version control procedure will be explained in the product configuration management. In this section, design and setup the configuration management in developing the prototype and all versions that has been developed before will be described until the latest developing. The implementation will be based on what have been planned in the previous chapter. At the end of this implementation phase, the system is expected to be run perfectly and achieve the objective and goal of project.

5.2. Media Creation

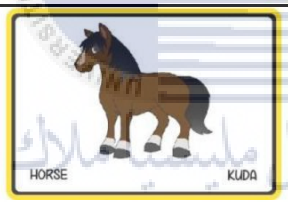
In this process, it will explain in details about the production of texts, production of graphics, production of audio and production of animation for the prototype.

5.2.1. Production of Texts

Text is important for given description and detail. Production of text is important to make a better experience and understanding for user or player of this application. The production of text for prototype must be easily readable and simple in order to fulfil the user needs. If the user cannot read all the instruction in the game, user cannot play it well because lack of understanding for the game instructions.

Choosing the appropriate font style is important to illustrate what the type of animation is produced. A suitable text is also taking considerable of the target user or player. Table 5.1 shows the type of texts, fonts handling and texts formats.

Table 5.1: Text Production

Interface	Font	Size (pt)	Style
	**Bubble & Soap**	**60**	**Regular**
	**Balloony Personal Use**	**50**	**Regular**
	**Agent Orange**	**36**	**Regular**
	**Agent Red**	**26**	**Regular**
	**Strawberry muffin demo**	**21**	**Regular**

Since the prototype is for kids aged 4-6 years old, it is better to use the font that can attract their interest and it also must be readable. The type of fonts that is use in this prototype is Arial. The fonts are mostly in black and white because the colour will be contract to the graphics behind them. These types of fonts are simple, attractive and clear.

Figure 5.1: Example of Text Used in the Prototype

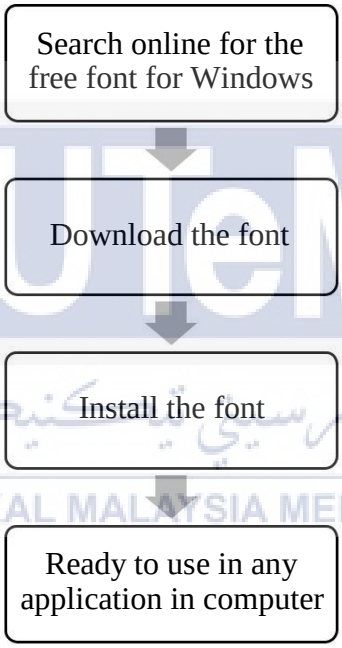


Figure 5.2: Text Integration Flow

5.2.2. Production of Graphics

Production of graphic is where the design and editing for the prototype whereas the backgrounds, characters and buttons are developed. Some of the images are draw by author and some are

taken from online resources. Images were traced using Adobe Illustrator CS5 from internet by using the line and pen tools provided.

Table 5.2: Graphic Format and Description

Format	Description
PNG	• Minimum compression loss • The quality of images is not changed by any compression ratio • Easy to upload to the mobile application • Used for animation and video
AI	• .ai (Illustrator Document) is format store drawing program which is vector based. • Makes the vector graphic scalable to any proportion. • Use for painting and drawing and also gives control over typography and its manipulation. • For tracing object from image that downloaded in internet.

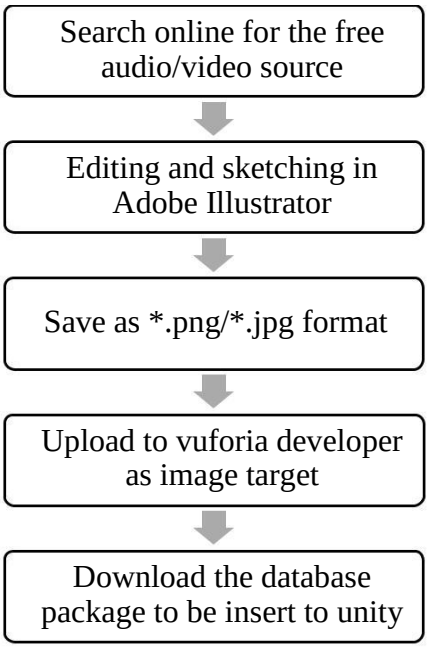


Figure 5.3: Graphics Process

5.2.3. Production of Audio

The voice over audio is used in this prototype to guide the learner throughout the learning process. The voice over used in the whole application was downloaded from internet and converted to mp3 format. The animal"s sound is also downloaded from online source and converted to mp3 format. Table 5.4 shows the audio that applied in the prototype.

Table 5.3: Audio Format and description

Format	Description
MP3	• MP3 format is can play on variety of platform player. • Small file size for each audio. • This audio is used for in animation

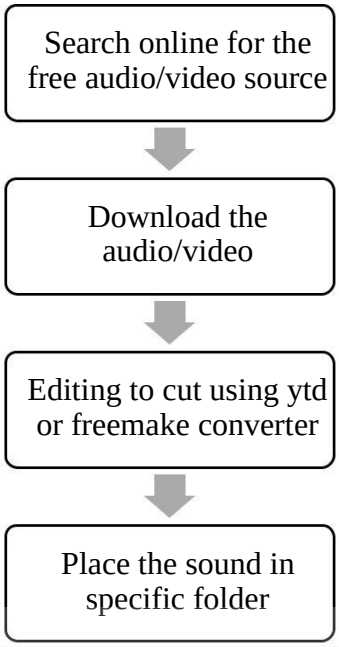


Figure 5.4: Voiceover Process

Table 5.4: Audio Production

Type of Audio	Description
Background music	.mp3
Chicken sound	chickenSound.mp3
Cow sound	cowSound.mp3
Horse sound	horseSound.mp3
Sheep sound	sheepSound.mp3
Duck sound	duckSound.mp3

5.2.4. Production of Animation

Animation is the rapid display of a sequence of images of 2D or 3D artwork or model position in order to create an illusion of movement. It is an optical illusion of motion due phenomenon of persistence of vision,

and can be created and demonstrated in a number of ways. The most common method of presenting animation is as a motion picture or video program, although several other forms of presenting animation also exist.

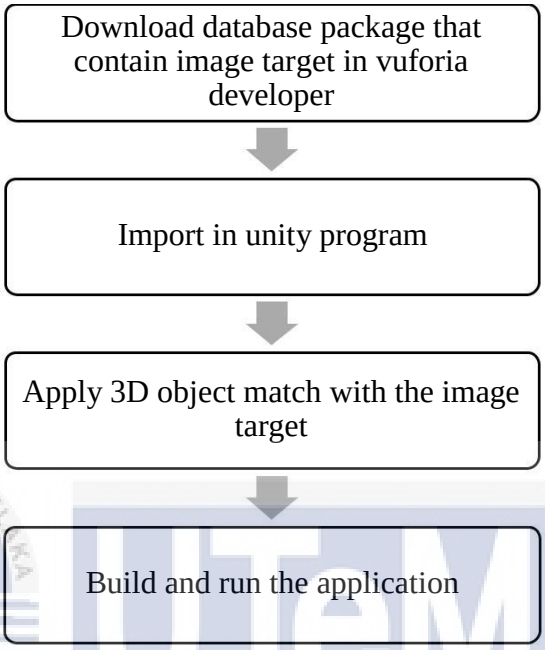


Figure 5.5: Animation Process

5.3. Media Integration

Media Integration is the process of integrating the created multimedia components used in developing the prototype. Every project must be delivered in certain format for the final product. Media integration is whole material will need a few list of software that can arrange and integrate the entire element that was used before to produce a final product. In this project, Adobe Illustrator CS5 and Unity used and will be integrated in apk format.

All the graphics and animation were done using the tools available in Adobe Illustrator CS5. The audio were converted in .mp3 format and imported to unity then the apk is build and install in device.

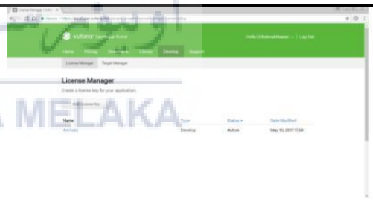
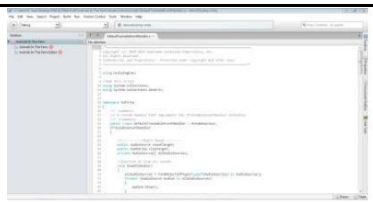
5.4. Product Configuration Management

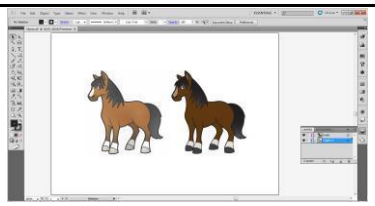
Product configuration management is includes explanation of configuration environment setup and version control procedure.

5.4.1. Configuration Environment Setup

In developing the project, developer was using Adobe Illustrator CS5 as a platform to develop project and make an editing process. Several software configurations need to be done before any task can start. This setup is important in order to make sure the end product work properly. Table 5.3 shows the configuration setup of the prototype.

Table 5.5: Configuration Environment Setup

Software	Function	Interface
Vuforia	• To create the database for the image target	
Unity 2017.1.0f3	• Version 2017 • Arrange coding and function of AR using Unity.	
MonoDeveloper	• For C# file	

Adobe Illustrator	• Version 5 • Create 2D graphic and texts.	

5.5. Implementation Status

Implementation status is the progress of the prototype development status for each module based on Gantt. Table shows the implementation status of this project.

Table 5.6: Implementation Status

Description	Duration to complete	Percentage	Status
Storyboard Design	1 week	100%	Completed (On Time)
Template Design	1 week	100%	Completed (On Time)
3D Object Design	1 week	100%	Completed (On Time)
Test Question	3 day	100%	Completed (On Time)

5.6. Conclusion

This chapter has been covered about each element that is present in prototype and activities in which it has been developed and integrated. It explain the production and implementation in details, which describe the production of text, production of graphic, production of audio, production of animation, integration and configuration management such as software

tools used to support configuration control and version control procedure in managing module version. Implementation status described the status of the development progress for each component or module that requires data insertion. With the completion of this chapter, the project is finally can be visualized and ready to be tested.

CHAPTER VI

TESTING

6.1. Introduction

In this chapter, there will be discussion about testing and evaluating the product of this project after completes the process of game development. The all functionalities of this augmented reality application must be test before it publishes out. The output of this project is come out with a 3D object while scanning on 2D flashcard. Hence the functionalities of the game in this project are important. Every single

button such as navigation key and character movement keys need to be test.

This chapter will also cover on test plan which are comprised of test user, test environment, test schedule and test strategy. The real life data are selected and the results are analysed in this chapter. The results shown are the reflection of the product developed. That will show either the product development are succeeded or failed to meet the required objectives. There were two testing will be used for testing phase such as alpha and beta testing. It was important to test the product via users because user requirement is important.

6.2. Test Plan

6.2.1. Test User

This section describes the target user which is the number of personnel involved to be tested. For this application, the testing phase involved two different target groups such as children and teacher.

i. **Children aged between 4 to 6 years old**

The test will be performed by children aged 4 to 6 years old. This group of children were tested on their understanding and the acceptance of the application. The developer has to observe their attitude while carrying the test.

ii. **Teacher**

There were tested on the usability of the reading application either it helps in learning animals in the farm for their student. They also were asked on their opinion about the design whether it appropriate with the target user or need support of technical person to use this application wisely.

6.2.2. Test Environment

This section describes the location or environment of testing to be carried out. The testing phase for this prototype is conducted using a smartphone with high performance to support multimedia. This testing was performed on a kindergarten and primary school.

Table 6.1: Location of Testing

Phase	Address
Kindergarten	Tabika Kemas Keratong 3, 26900 Bandar Tun Razak, Pahang
Primary school	Sekolah Kebangsaan Tun Syed Ahmad Syahbuddin, Melaka.

i. Hardware Requirement

Table 6.2: Hardware Requirement for Testing

Hardware	Description
Tablet	Platform:Android5.0.1 (lollipop) Resolution: 600x1024 pixels
Flashcard	Marker AR Size: A5

ii. Software Requirement

Table 6.3: Software Requirement for Testing

Software	Description
AnimalsAR	This is the application that allow a 3d animals to pop up while the flashcard in scan.

6.2.3. Test Schedule

The test schedule is used for managing the time and duration for developer to complete test the application. All of the tester will be divided into each category. Overall, the testing was done three times which is cycle 1 and cycle 2

Table 6.4: Testing Schedule

Type of Testing	Tester	Number of Tester	Date
Functionality	Multimedia Expert		
Usability	Teacher	1	14/08/2017
User Acceptance	Children	16	11/8/2017 12/8/2017 14/8/2017

6.3. Test Strategy

Usability testing was involved by a teacher. They need to ensure that the application prototype is suitable with the standard for the target user. Tester marked the form with scale of 1 to 5.

The user acceptance tester is done at the different time. The main target users which are children in kindergarten were representing the real users.

Observations and interviews are done to get the user level of understanding.

6.4. Test Implementation

In this section, the tests implementation will be described in details. Test implementation describes on how testing will be implemented to specific target users. This part encloses test description and test data is done based on the test strategy that has been done. The testing of the product is divided into few aspects which will discuss in the description in the next section.

Each test case has different purposes and expected results. This section will follow by test description, test data, test result and analysis and finally analysis testing.

6.4.1. Test Description

6.4.2. Test Data

User needs to fill the form based on functionality of the project and their level of satisfaction when using this application. Table below shows about forms for functionality testing.

Table 6.5: Functionality Testing

Module	Function	Expected Output	Output Success/Failed
Main Page	Start Button	Main page loaded on the screen (full screen, landscape mode)	Success

		Background music will be played.	Success
AR page	Image	3D object will appear while 2D flashcard was scanned.	Success

User acceptance testing is also done in beta testing for this application especially for target users. They are representing the users which are children aged 7 to 10 years old, teachers and parents. Meanwhile, for the real target user who aged 4 to 6 years old or known as kindergarten, only observation session are performed. The purpose to do the kind of testing is to test their understanding. The developer has to evaluate their performance while using this application based on questions in the user acceptance testing.

Table 6.6: Form of Analysing

1	Very Disagree
2	Disagree
3	Normal/Neutral
4	Agree
5	Very Agree

No.	Question
Session A: Content	
1	The information provided is valid and correct..
2	The information provided is enough for public knowledge.
3	The explanation about the animals is clear and easy to understand.
Session B: User Interface	
4	The interface of “Farm Animals AR” is pleasant.

5	The size and type of font used in “Farm Animals AR” is suitable.
6	Graphics and images used help you to understand better.
7	The flow of the “Farm Animals AR” is simple.
8	The flow of the “Farm Animals AR” is easy to follow.
9	The flow of the “Farm Animals AR” is understandable.
Session C: Usability	
10	The content is clear and simple.
11	The way of the presentation is attractive.
Session D: Overall	
12	The combination of learning animals in the farm and mobile applications bring advantage in my learning..
13	“Farm Animals AR” application is helpful.
14	The combination of 3D models in “Farm Animals AR” and 2D marker flashcard is interesting.
15	“Farm Animals AR” assisted more realistic than static image.
16	I would use the “Farm Animals AR” application in my learning/teaching.

Conclusions that can be concluded from the result are shown as table below.

Table 6.7: Summary Result

Test	Function	Description
Main Page	Button	All buttons are functioning properly
	Background sound	Sound are functioning properly
AR Camera	Camera	Cameraused are functioning properly
	Button	All buttons are functioning properly

	Animal sound	Animal sound are functioning properly
	3D object	3D object are functioning properly

6.5. Test Result and Analysis

The purpose of the testing is mainly to test the weaknesses of the project to find the better solution for them. The results are gathered and analyse by the developer and can be referred in the table below. As a result, developer can verify whether the project is success and acceptable by the target user.

Table 6.8: Result of Usability Testing

Question	Mean of Level of Evaluation
The information provided is valid and correct.	3.94
The information provided is enough for public knowledge.	3.53
The explanation about the animals is clear and easy to understand.	3.71
The interface of "Farm Animals AR" is pleasant.	3.73
The size and type of font used in "Farm Animals AR" is suitable.	3.65
Graphics and images used help you to understand better.	3.69
The flow of the "Farm Animals AR" is simple.	3.69
The flow of the "Farm Animals AR" is easy to follow.	3.68
The flow of the "Farm Animals AR" is understandable.	3.69
The interface of "Farm Animals AR" is pleasant.	3.69
The size and type of font used in "Farm Animals AR" is suitable.	3.69
Graphics and images used help you to understand better.	3.68

The content is clear and simple.	3.69
The way of the presentation is attractive.	3.68
The combination of learning animals in the farm and mobile applications bring advantage in my learning.	3.69

6.6. Analysis Testing

The analysis is analysed to make sure it meets the objectives. Method used in the testing is testing form and observations. The results then are analysed based on the functionality, usability and user acceptance.

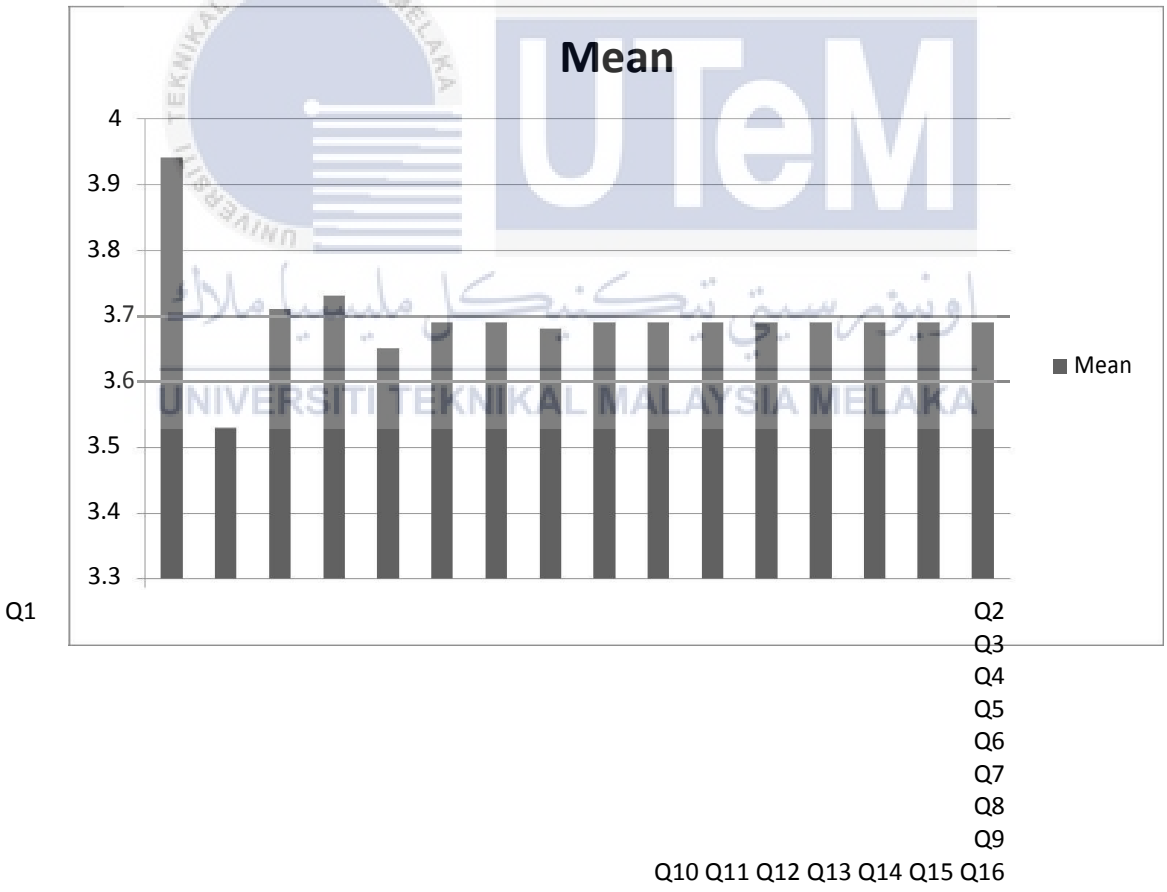


Figure 6.1: Usability testing

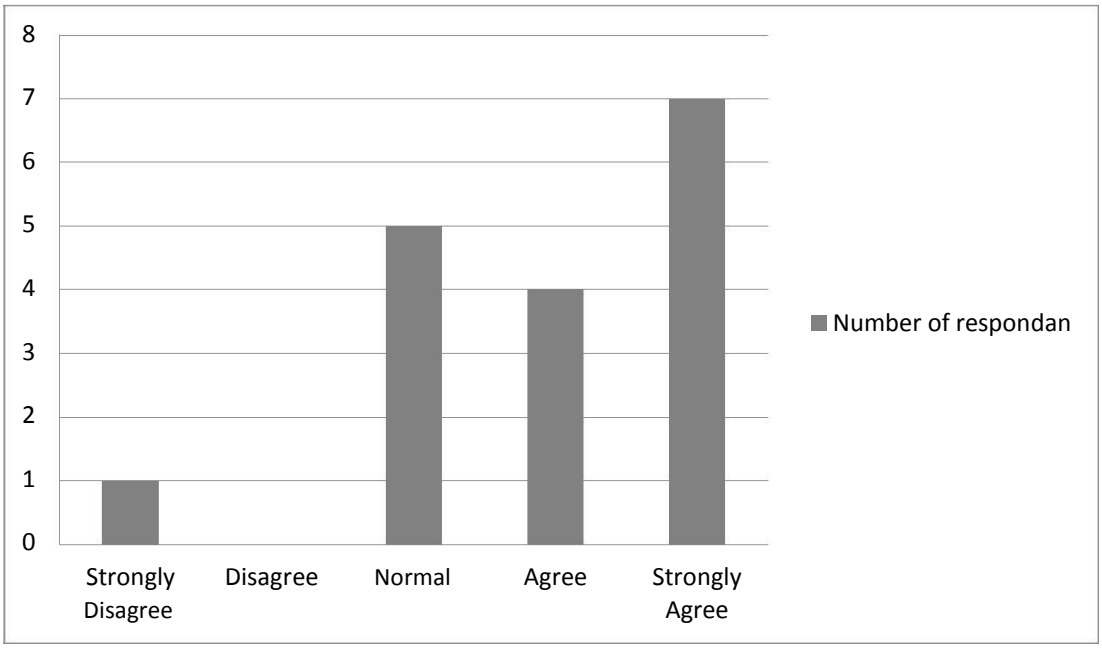


Figure 6.2: Test data for question number 1

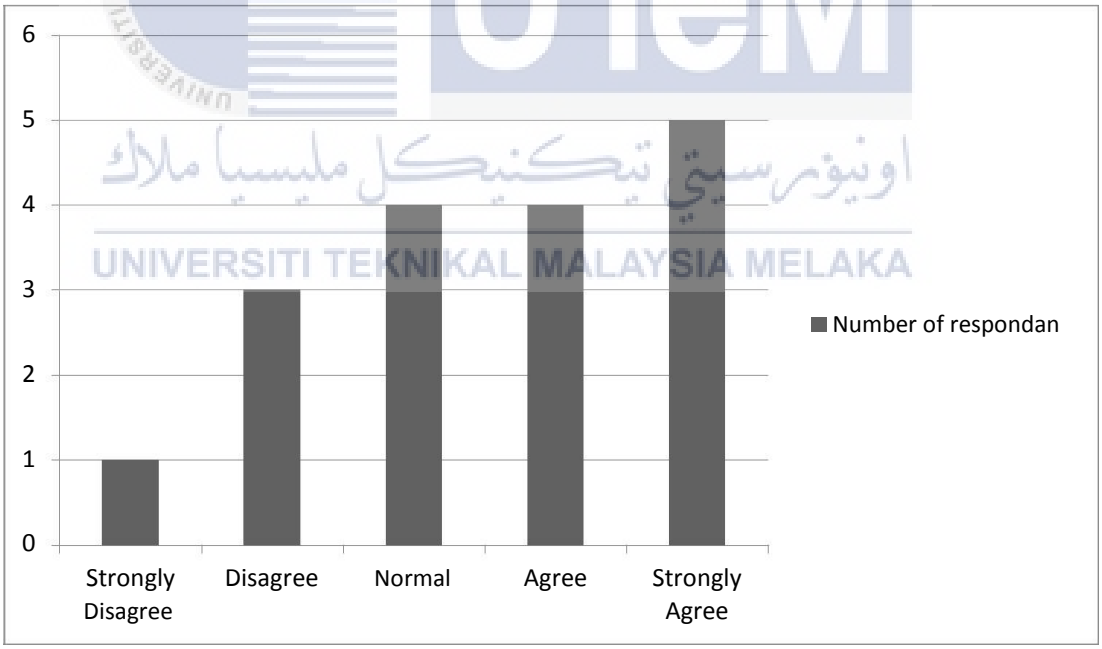


Figure 6.3: Test data for question number 2

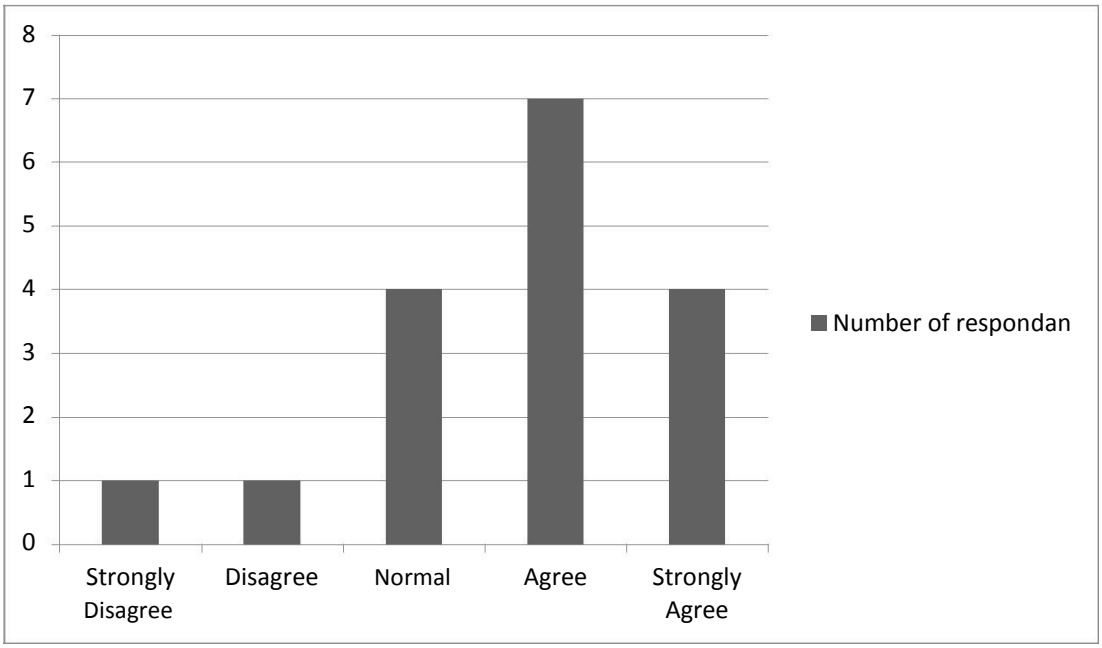


Figure 6.4: Test data for question number 3

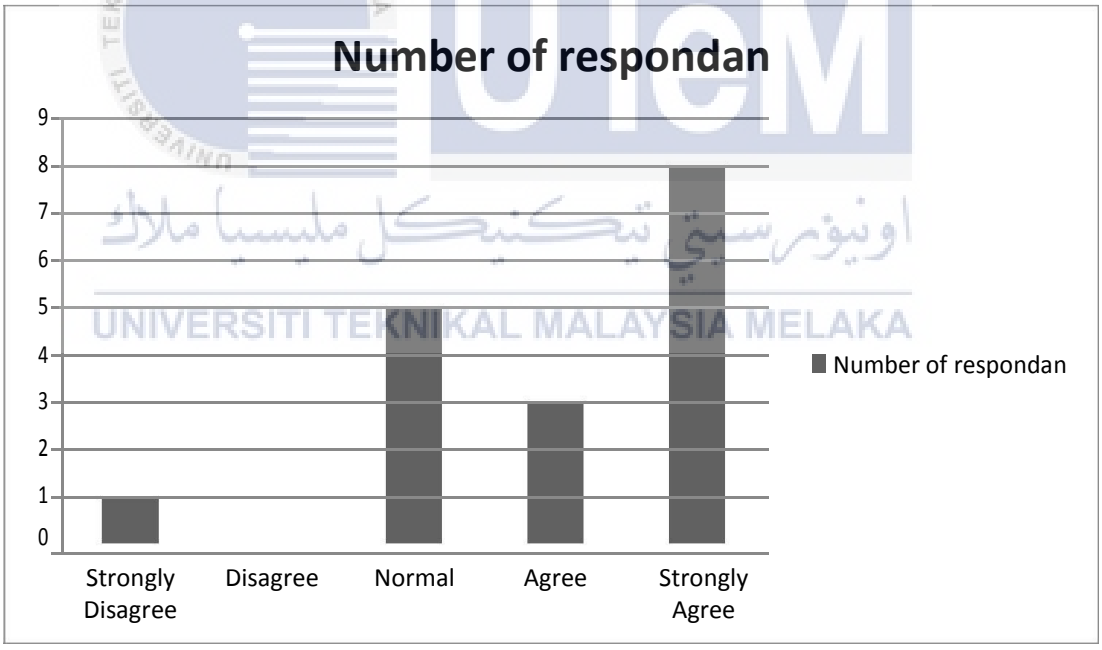


Figure 6.5: Test data for question number 4

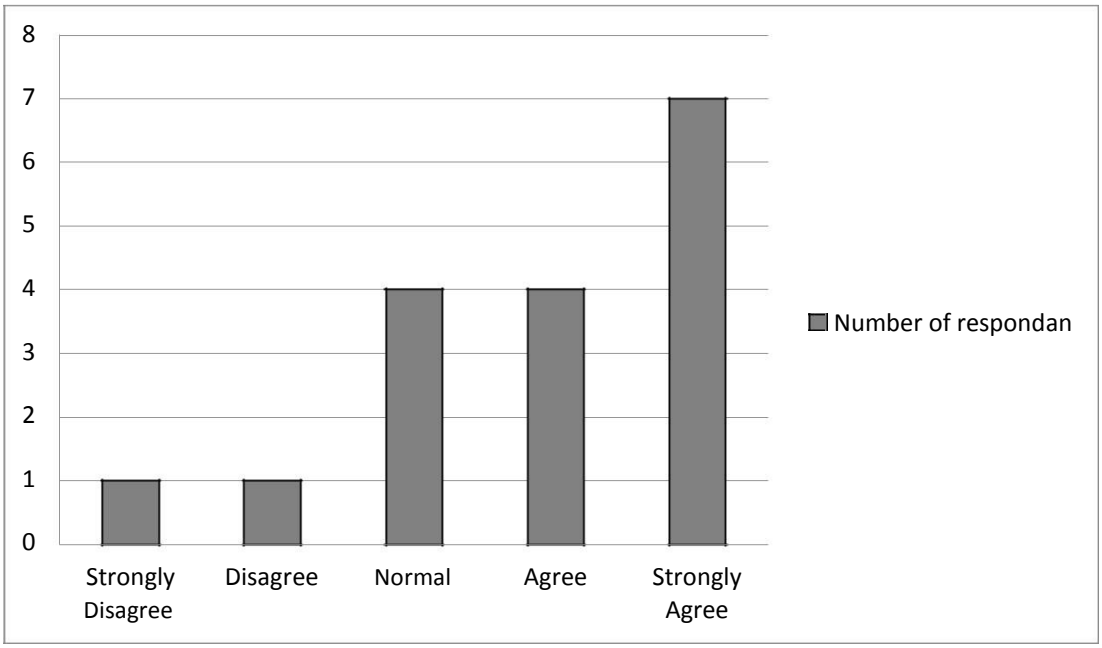


Figure 6.6: Test data for question number 5

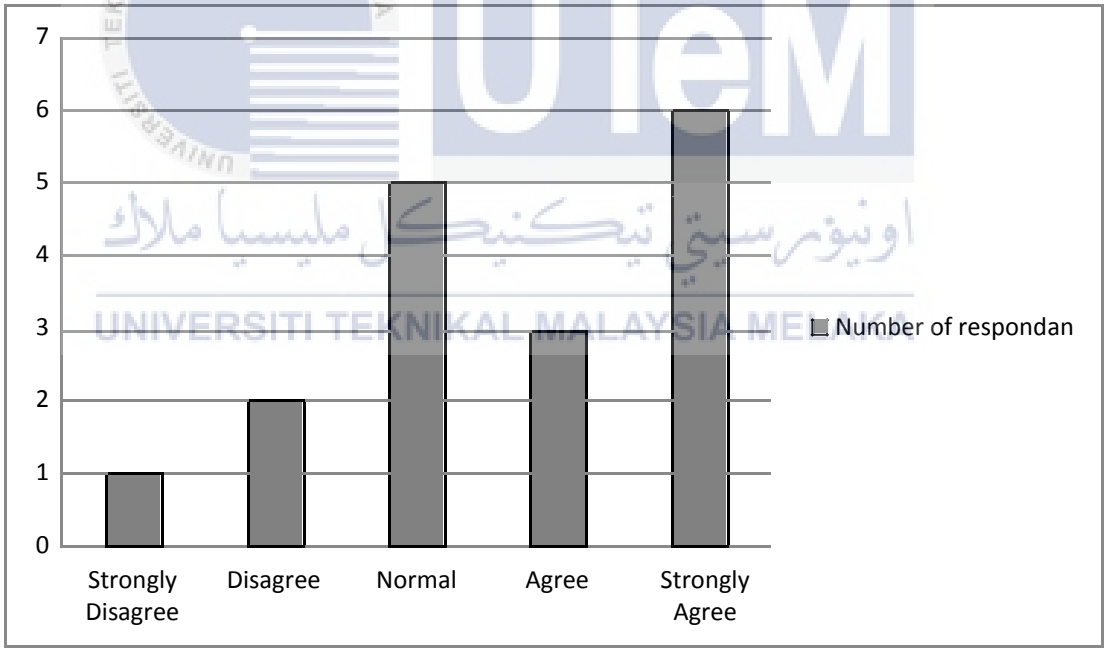


Figure 6.7: Test data for question number 6

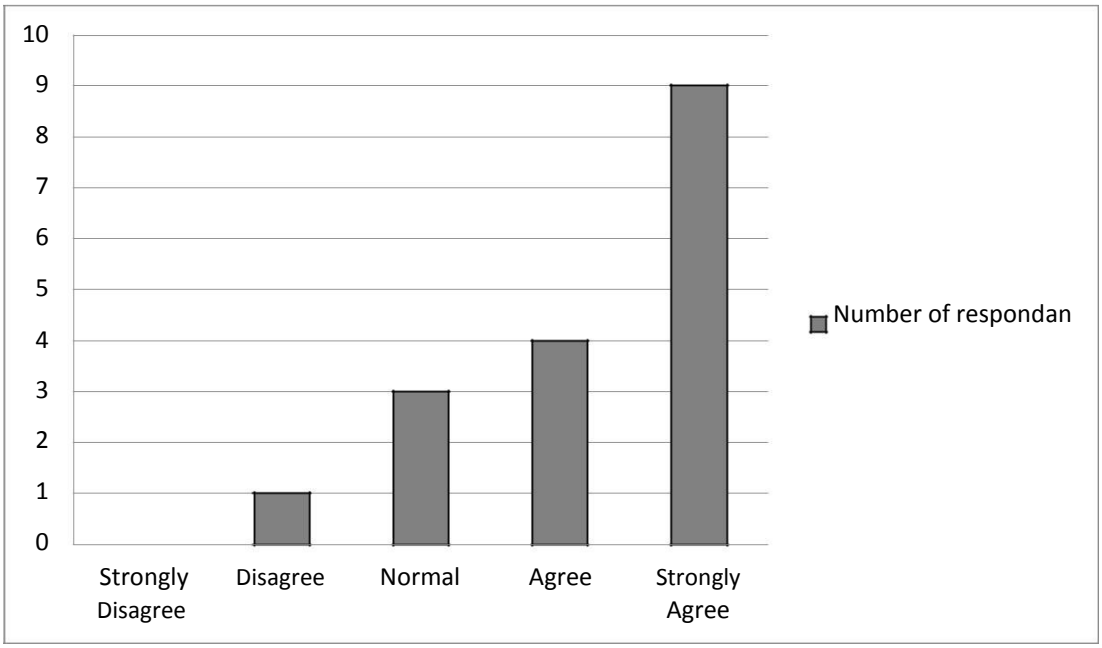


Figure 6.8: Test data for question number 7

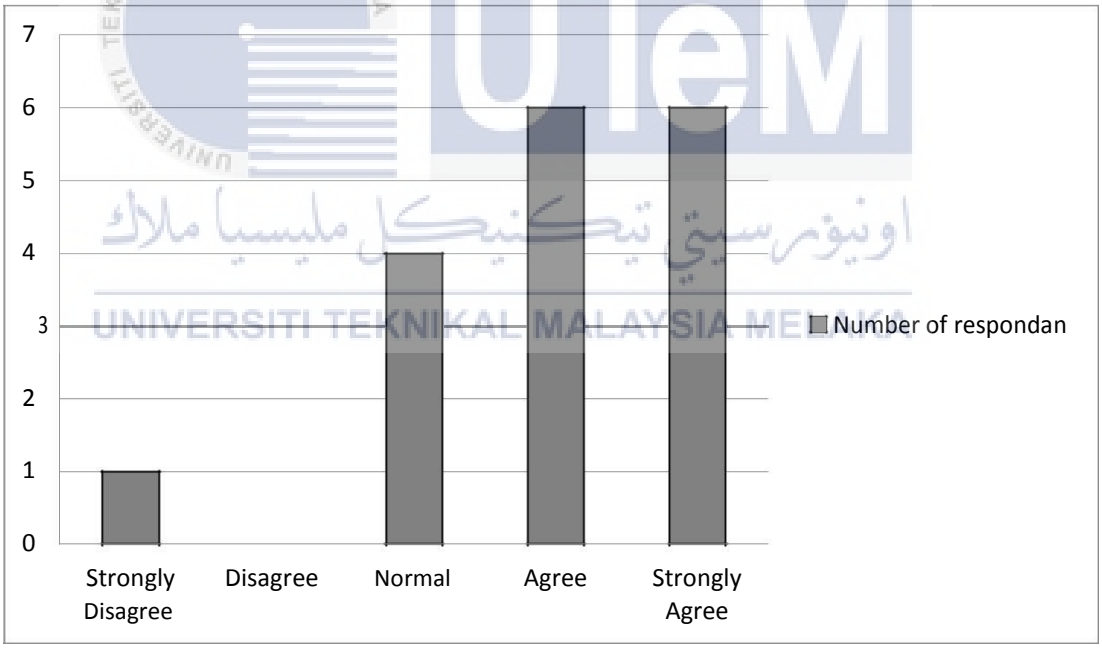


Figure 6.9: Test data for question number 8

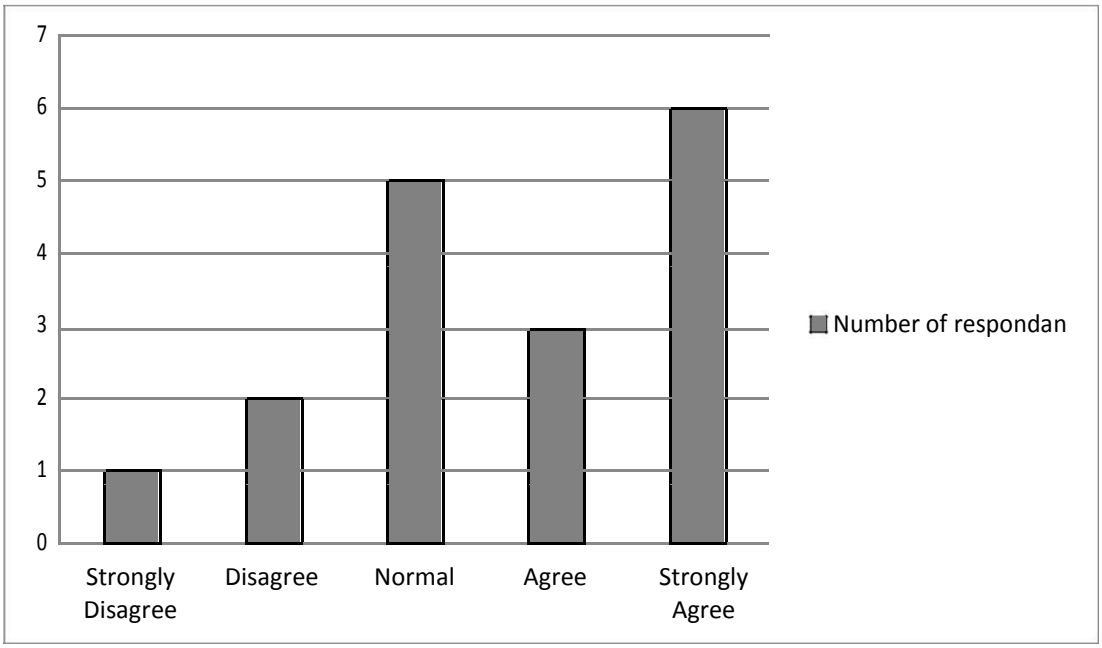


Figure 6.10: Test data for question number 9

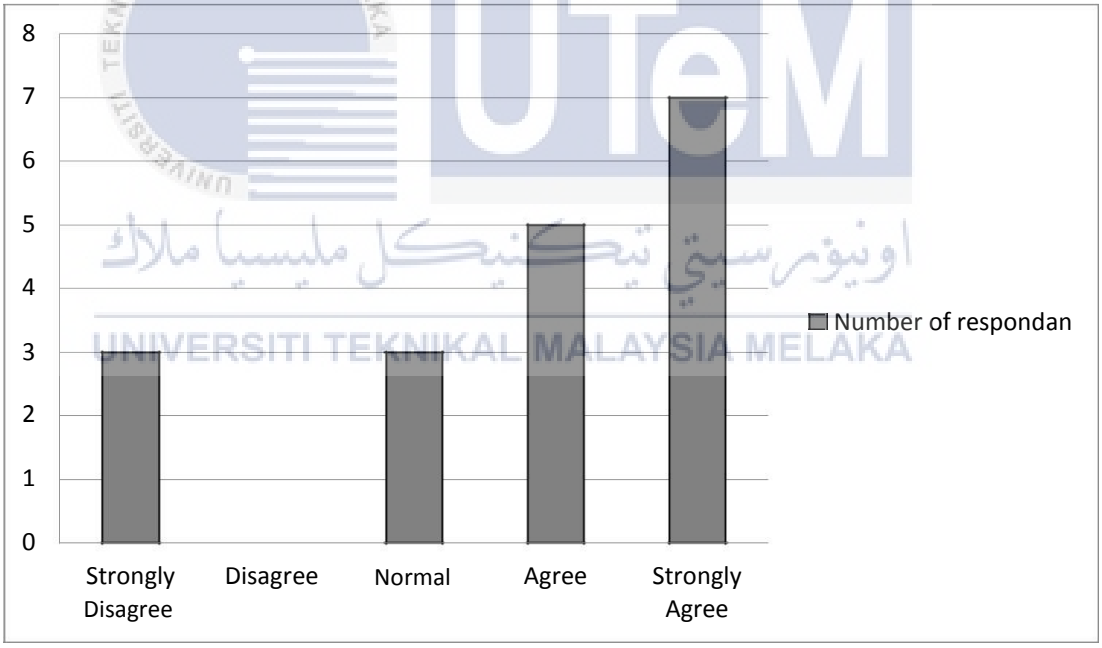


Figure 6.11: Test data for question number 10

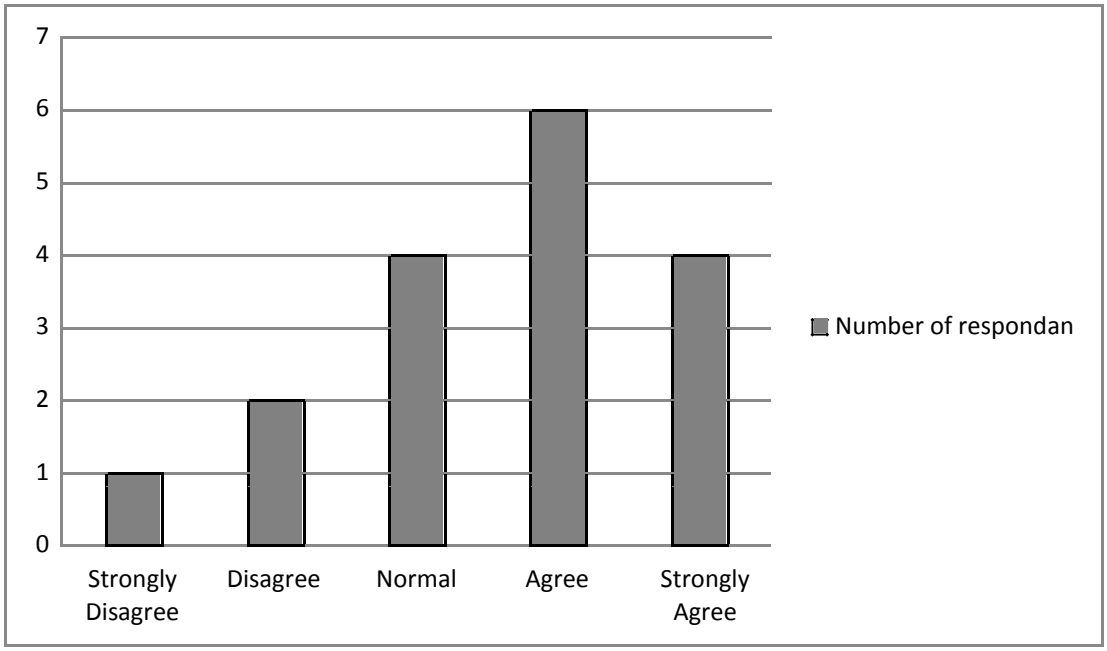


Figure 6.12: Test data for question number 11

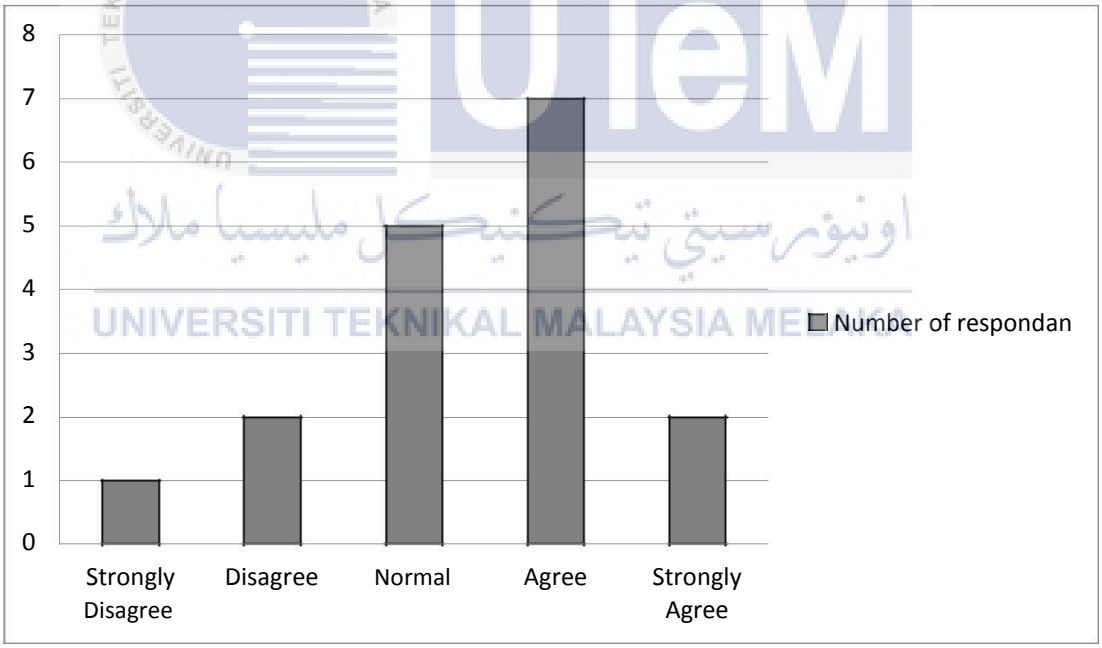


Figure 6.13: Test data for question number 12

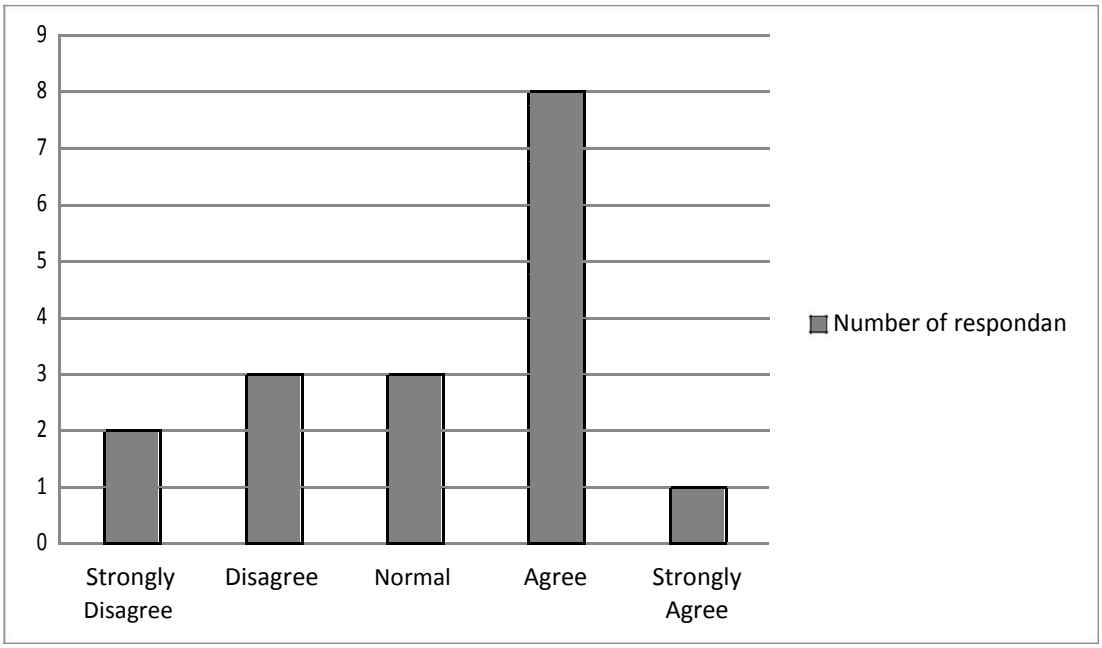


Figure 6.14: Test data for question number 13

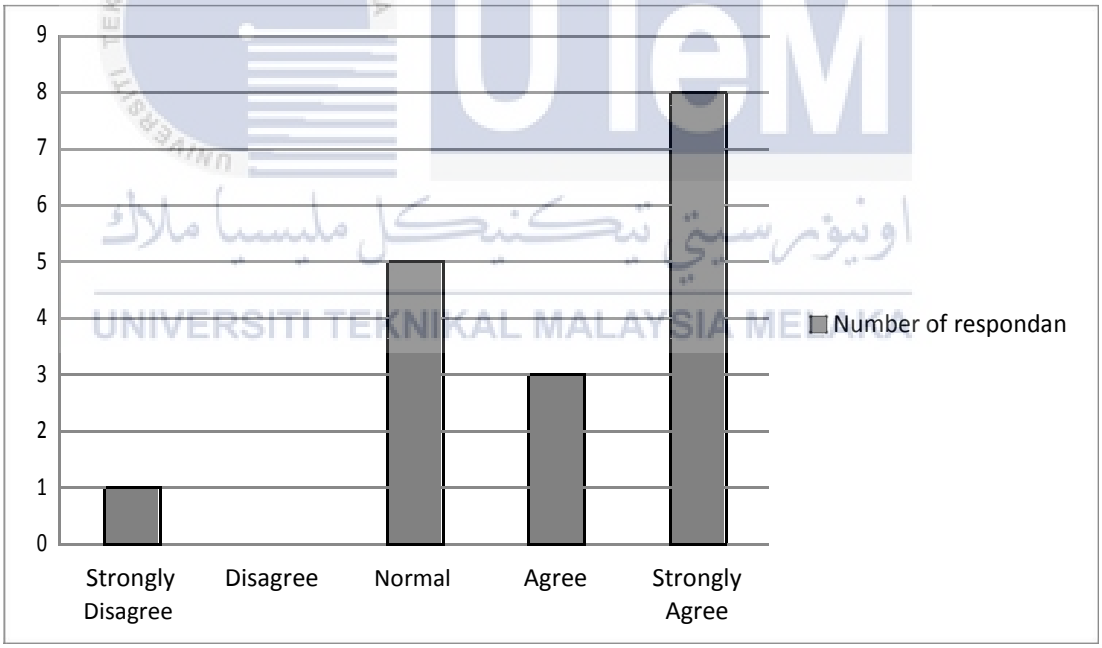


Figure 6.15: Test data for question number 14

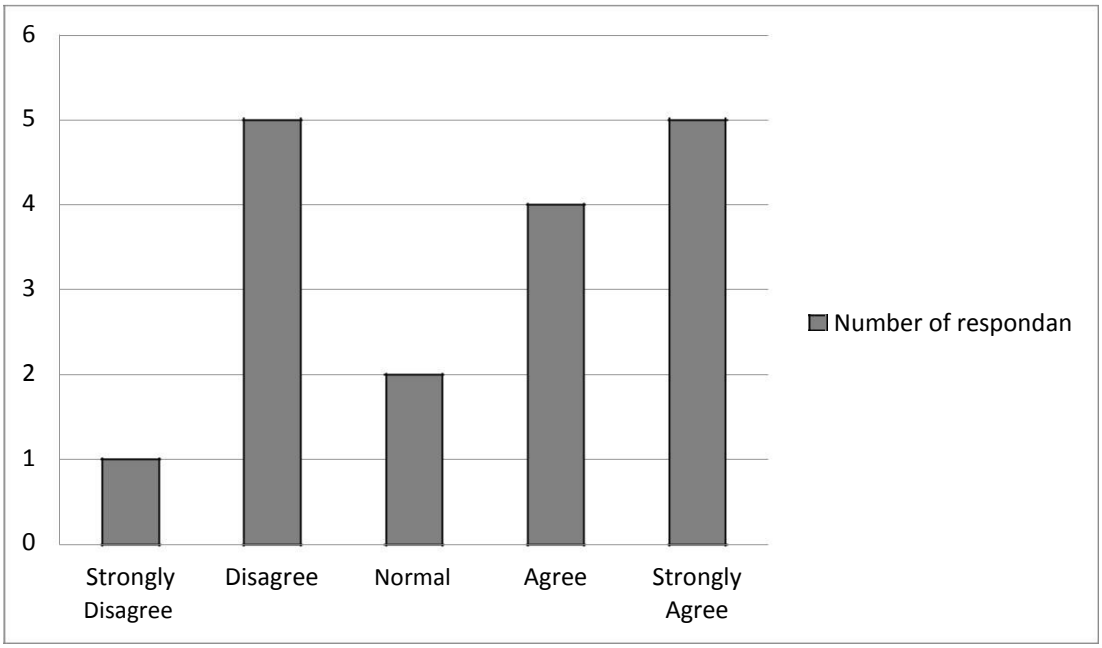


Figure 6.16: Test data for question number 15

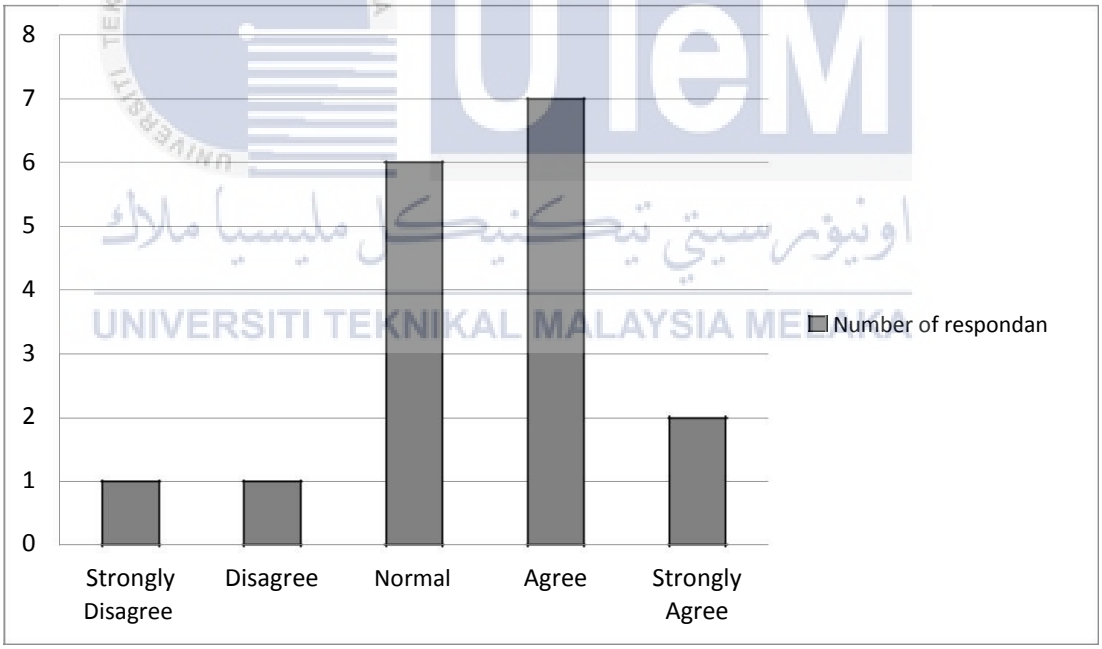


Figure 6.17: Test data for question number 16

Table 6.9: Results of Functionality Testing

Results
Need to add more 3D object/animals.
This application is good and interesting.
This application working well.

6.7. Conclusion

At the end of testing phase, there are a lot of feedbacks either negative or positive were obtained from the respondents. These feedbacks are important as to guarantee that the project has successfully meets its target and goals. Developer is able to see the weaknesses and the limitations of the application during testing phase. Better solution can be found from testing. As a conclusion, it shows that overall application prototype can be considered as average.

CHAPTER VII

CONCLUSION

7.1. Observation on Weaknesses and Strengths

After the analyses obtain from the testing phase that has been done, it can be seen that this project has its own strength. However, there are some weaknesses found as it seems a project cannot be perfect unless some modification made. The weaknesses and strength are identified in order to ensure the successful of the project.

7.1.1. Project Weaknesses

i. Lack of animation

This application is lack of animation and sound to attract children‟s interest.

7.1.2. Project Strength

i. Simple and direct

This application is simple to be play and it can be learn by kindergarten directly.

7.2. Proposition for Improvement

Preposition for improvement are one of the matters that could overcome the difficulties and weaknesses occurred. This section presents the suggestion on how the application can be improved. There are a few ways to improve the performance.

7.3. Project Contribution

The contribution of this application is in educational fields for children learning about animals in the farm. Elements of audio, graphic and text will be applied in this prototype to make it more interesting and enjoyable. By applying more teaching and studying techniques, it can motivate children to study smart. Besides, the usages of colors and suitable fonts can attract them to learn more. Teachers and parents can use this application in helping children in their teaching and studying process.

7.4. Conclusion

As the conclusion, the AnimalsAR application gives a variety for children in teaching and studying since the prototype meets its objectives conclusively. Children should be able to differentiate and memorize the animals that live in the farm.

APPENDIX A

Sample of question

SOALAN KAJI SELIDIK

TAJUK: ANIMALS IN THE FARM (AR)

BAHAGIAN A: Latar Belakang

Nama: _____

Umur: _____

☐ Pelajar ☐ Guru ☐ Ibu/Bapa

NO.	SOALAN	PILIHAN JAWAPAN
1	Jantina	☐ Perempuan ☐ Lelaki
2	Adakah anda mempunyai telefon pintar?	☐ Ya ☐ Tidak
3	Platform manakah yang anda lebih suka untuk mendapatkan maklumat tentang haiwan?	☐ Internet ☐ Buku
4	Adakah anda tahu apa itu “Augmented Reality” (AR)?	☐ Ya ☐ Tidak
5	Jika ya, adakah anda pernah menggunakan aplikasi mudah alih “Augmented Reality” sebelum ini?	☐ Ya ☐ Tidak
6	Adakah anda berpendapat bahawa mempelajari haiwan di ladang yang anda peroleh melalui “Augmented Reality” lebih mudah berbanding melalui Internet?	☐ Ya ☐ Tidak
7	Jika tidak, mengapa anda berpendapat bahawa maklumat itu lebih mudah diperolehi daripada Internet?	☐ Kerana butiran yang disediakan oleh aplikasi AR tidak mencukupi ☐ Kerana butiran yang disediakan oleh aplikasi AR adalah salah.

		☐ Kerana butiran yang disediakan tidak berkaitan. ☐ Kerana butiran yang disediakan tidak dikemaskini.

BAHAGIAN B:

Arahan: Untuk soalan 1-16, sila jawab setiap kenyataan berikut dengan menggunakan

skala yang disediakan dimana

1	**Sangat tidak bersetuju**
2	**Tidak bersetuju**
3	**Neutral**
4	**Bersetuju**
5	**Sangat bersetuju**

Bulatkan (●) jawapan pilihan anda.

No.	Aspek	Rate				
Seksyen A: Isi kandungan						
1.	Maklumat yang diberikan adalah sah dan betul.	**1**	**2**	**3**	**4**	**5**
2.	Maklumat yang diberikan adalah cukup untuk pengetahuan umum.	**1**	**2**	**3**	**4**	**5**
3.	Penjelasan mengenai haiwan adalah jelas dan mudah difahami.	**1**	**2**	**3**	**4**	**5**
Seksyen B: Antaramuka pengguna						
4.	Antaramuka “Farm Animals AR” adalah menyenangkan.	**1**	**2**	**3**	**4**	**5**
5.	Saiz dan jenis tulisan yang digunakan dalam “Farm Animals AR” adalah sesuai.	**1**	**2**	**3**	**4**	**5**
6.	Penggunaan grafik dan imej membantu anda memahami	**1**	**2**	**3**	**4**	**5**

	kandungan dengan lebih baik.					
7.	Aliran “Farm Animals AR” adalah ringkas.	**1**	**2**	**3**	**4**	**5**
8.	Aliran “Farm Animals AR” adalah mudah diikuti.	**1**	**2**	**3**	**4**	**5**
9.	Aliran “Farm Animals AR” adalah mudah difahami.	**1**	**2**	**3**	**4**	**5**
Seksyen C: Kebolehgunaan						
10.	Isi kandungan adalah jelas dan mudah.	**1**	**2**	**3**	**4**	**5**
11.	Cara persembahan adalah menarik.	**1**	**2**	**3**	**4**	**5**
Seksyen D: Keseluruhan						
12.	Gabungan antara mengenal haiwan di ladang dan aplikasi mudah alih memberi kelebihan dalam pembelajaran/pengajaran.	**1**	**2**	**3**	**4**	**5**
13.	Aplikasi “Farm Animals AR” sangat membantu.	**1**	**2**	**3**	**4**	**5**
14.	Gabungan model 3D dalam “Farm Animals AR” dan 2D flashcard bertanda adalah menarik.	**1**	**2**	**3**	**4**	**5**
15.	“Farm Animals AR” adalah lebih realistik daripada imej pegun.	**1**	**2**	**3**	**4**	**5**
16.	Saya akan menggunakan applikasi “Farm Animals AR” dalam Pembelajaran/pengajaran saya.	**1**	**2**	**3**	**4**	**5**

Arahan: Untuk soalan 17-20, sila jawab kepada setiap pernyataan dan tandakan

(✓) sama ada BERJAYA atau GAGAL.

Seksyen E: Fungsi		**Berjaya**	**Gagal**
17.	Antaramuka pengguna		
18.	Paparan grafik		
19.	Sistem navigasi		
20.	Fungsi keseluruhan sistem		

Comment/komen:

_____

_____

_____

_____

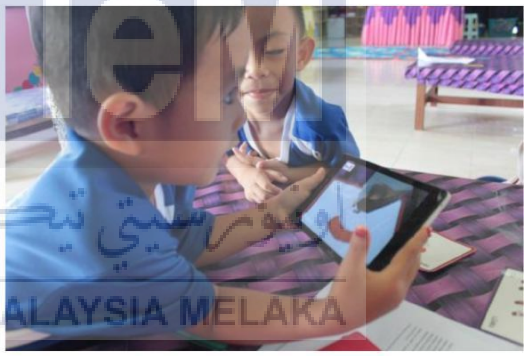
Thank You/Terima Kasih.

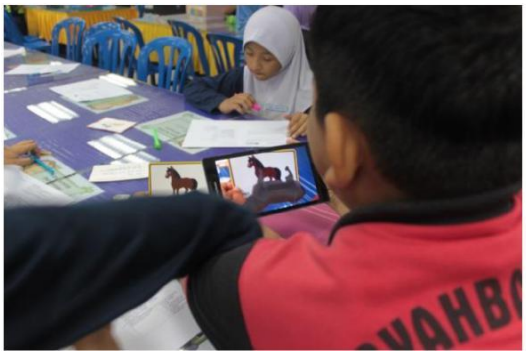
APPENDIX B

Sample of test user while testing phase







APPENDIX C

Sample of application (AnimalsAR)