

**ANDROID MOBILE APPLICATION  
FOR SLOW LEARNER CHILDREN WITH  
TACTILE LEARNING STYLE**

by

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15001

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**CERTIFICATION OF APPROVAL**

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Approved by,

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TRONOH, PERAK

May 2014

## **CERTIFICATION OF ORIGINALITY**

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

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**AMIRAH NAJWA BT AMIN NORASHID**

## **ABSTRACT**

This paper is on **android mobile application for slow learner children with tactile learning style**. The purpose of this report is to record all the data gathered throughout author's study and research for this project. This project is a mobile application based project and the targeted users are slow learners in Year 2 that uses the official Malaysian Ministry of Education mathematics syllabus. The objective of this mobile application are to study how android mobile application can be used to enhance slow learner children with tactile learning style learning process and to implement and develop android mobile application that can be used by slow learner children with tactile learning style.

Slow learners cannot focus for a long time and process information slower than average kids. Based on research and observation, each slow learner children have different learning style and knowing the correct children learning style can help them to excel better and absorb knowledge faster. Hence, this project will help children's learning process for difficult subject to be easier, more effective and enjoyable.

The scope of this study is to focus on the content of syllabus to mathematics syllabus for slow learners in Year 2. Students can use this application to know numbers and learn mathematical addition and subtraction operation and at the same time fulfil the needs of tactile learners by providing few methods in order to make it comprehensive for them to process information better.

Project will be developed based on System Development Life Cycle (SDLC) of Rapid Application Development model. Each phases will be perform concurrently and on each cycle resulting in a system prototype that will be reviewed by the students and teachers of SK Seri Tronoh in order to measure the effectiveness of the prototype model.

The experimental result of the android application is takes as the reference summaries of the evaluation. The evaluation of experimental results shows satisfactory result where out of 6 children tested, 5 children shown a good respond to the mobile application.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 PROJECT BACKGROUND**

Android mobile application for slow learner children with tactile learning style is one example of an adaptive technology. Adaptive technology is any object, technology or items that is specifically designed to enhance and maintain the capabilities of people with disability and are seldom use by non-disabled person. Adaptive technology device is one of the items used that helps bypass and compensate children's specific learning deficits to improve the learning process for slow learner children. Adaptive technology helps to enhance children's independence by helping slow learner children to perform tasks that they were formerly unable or hard to accomplish by providing enhancement and practice needed to accomplish such tasks. Greater success can be achieved by slow learner children when they are allowed to use their abilities or strength to work around their disabilities.

Slow learner children are children that are below average intelligence and the development of the thinking skills are significantly slower as compared to average children at the same age. These children will portray characteristics of having immature language patterns or speech problems, poor judgement, immature social behaviour, poor memory, difficulties in understanding several steps in a task and problems in transferring information learned in one situation to other situations.

According to an article written by Red River College website on <http://www.rrc.ca/index.php?pid=7666> , slow learners learn better by applying tactile learning style in their learning process. Students with tactile learning style learn best by doing activities through the sense of touch where they love to learn new information by using their hands. This is why it is important to use a device preferably a tablet when completing math problems to ensure their hands are engaged while answering the questions. Students who are tactile learners may become easily distracted or frustrated with material presented in visual or audible lessons only.

They are much more interested in learning with the use of technology. Technology evolves and there are many general technology tools that are used to meet the needs of students with disabilities. One of the most common adaptive technology used today is android technology. According to research written in The Sun Newspaper on September 2013 done by Ericsson ConsumerLab in Southeast Asia and Oceania, Malaysia's penetration number of smartphones used today rises in statistics by 16% to percentage point of 63% in 2013 from 47% in 2012. Tablet penetration increased three times higher to 39% compared to only 14% on the previous year. With forecast of having 3.3 billion people will be using smartphones and tablets by 2018, it is a good indicator that shows android technology will be later used for education purpose in the future especially with a remarkable growth of application available to help children with disabilities in today's application store. These applications have begun to take place of some of the specialized tools that been purchased and used in the past for children with disabilities.

## **1.2 PROBLEM STATEMENT**

Slow learner children experienced many learning difficulties. Slow learners cannot focus for a long time and process information slower than average kids. Hence, it gives great challenge for both teachers and student at the same time. Each slow learner children aged between 7 – 14 years old have different learning style such as visual, auditory, kinaesthetic and tactile learning style. Knowing the correct children learning style can help them to excel better and

absorb knowledge faster especially for slow learners. Furthermore, it will help learning process for difficult subject be easier and help children to enjoy learning process better. Base on UNESCO statistics (2005) it clearly shows that 78.4% of Malaysian children experience preschool education, however 664916 children under the age of 6 years in Malaysia do have problem on intellectual, language, social and emotional development. In addition, UNICEF Malaysia stated that children with disability often left out from the society. Hence, it creates a social barrier and limits their abilities to play, learn, work and thrive in the society. Hence, a good education is important for slow learners to benefit their future.

Slow learners are less motivated and less persistent because these children find it difficult to learn by using conventional method (Dunn, 1979). Traditional method are said to be dull and not interactive enough to hold students focus for a long period of time.

Slow learner will need extra care and practice when it comes to learning new things as compare to their peers. Audio-visual aids, graphics, displays, reference books, online material and worksheets must be used to help children to stay focus and process information faster but it is not interactive enough for children today. In today's world, children are more interested to play with mobile application where there will be pictures and sounds involved at the same time. However, teaching aid that focuses on slow learners with tactile learning style is lack in market. By having a mobile application that can complement this problem, the application can be used in class by teachers and parents at home to help children and measure their progress in academic. It needs to help slow learners to learn better and respond well in receiving and learning new knowledge.

This project will focus on managing and enhancing slow learner's learning experience by using android mobile application by focusing on one learning style for those children with tactile learning style. Android technology will be used as the operating system of this project.

### 1.3 OBJECTIVE

The objectives of the project are as follows:

**1. To study how android mobile application can be used to enhance slow learner children with tactile learning style learning process.**

A study need to be done to understand and differentiate different style of learning and understand which learning style is suitable to enhance learning process for slow learner children. This project is done to study the preference human interaction interface by slow learner children with tactile learning style. It is important to understand how slow learner learn in class and understand how tactile learning style's effect on children.

It is belief that student and learning methods are changing and effect their learning preference (Furió, González-Gancedo , Juan , Seguí, & Rando, 2012). A study need to be done in finding the impact of technology to slow learner's development in education.

**2. To implement and develop android mobile application that can be used by slow learner children with tactile learning style.**

Implementation on findings on enhancing learning process for slow learner children will be done. Result will be measured for improvement and future reference. Mobile application will be made based on research data found in the early stage of the project. Mobile application will be made by following the needs of tactile learner.

### 1.4 SCOPE OF STUDY

The scope of this study:

- i. To focus on mathematics syllabus for slow learners in Year 2 as attached in the Appendix 1.
- ii. Students can use this application to learn about numbers between 1-20 and learn basic mathematical addition and subtraction operation on numbers between 1-20.

- iii. To produce a mobile application that fulfils the needs of tactile learners to make it effective for them to learn.

## 1.5 RELEVANCY OF PROJECT

The project is related to the current lack of mobile application that acts as teaching aids in the market that uses Bahasa Malaysia as the language medium. Most of the applications are in English or Bahasa Indonesia. This mobile application is targeted for a niche market which is for slow learners children aged between 7 to 14 years old that focuses on those who had been identified as slow learners with tactile learning style . The current techniques of learning in class are by using flash cards and by using traditional teaching aids such as coloured papers and boards. These methods is said to be hard for slow learner children and not interactive enough for them to keep their focus on class for a long time.

Conventional method of teaching through visual and auditory is not always the most effective method to teach students with special needs. Technology is needed to provide a tools and skills for teachers to address multiple modalities to create an interactive classroom with fun learning process. Technology assists the classroom teacher by offering students with many ways of learning new information, expressing ideas and demonstrates understanding in a highly interactive learning environment. Interactive technology can play a positive role in helping children with managing everyday challenges, enhance good communication skills, improve school performance , and experience the world better (Alper, Hourcade & Gilutz, 2012) Today, people with disability rely heavily on technology to grow and be independence in learning new information. Technology is important intervention and tools that can be used to overcome a functional deficit. Tablet and smartphones are available, more readily available to assist people with disability and gives tremendous positive impact on people with disabilities (Cooper, 2009).

Based on an article written on The Guardian, *Tablets in schools: coding, creativity and the importance of teachers* (2014) stated that some schools in

United Kingdom found that it is important to boost computer literacy alongside reading, writing and math skills because it helps to make learning interesting and fun. Penttinen (2009) stated that student today are more adept in using technology in learning. According to another research done by Wettasinghe and Hasan (2007), they mentioned that classroom that is rich with technology usage can be intrinsically motivating classroom setting for slow learners.

Children with tactile learning style will learn better by touching objects and this is relevant to the project because mobile application involved learning by touching on the tablet or mobile phone screens. This will complement the problem and later act as solution to help slow learner children to learn and process knowledge better. The demand of android is big and usage of technology is very much needed in teaching children with disability in schools and to be used by parents at home. Realistically, this project is designed to tackle the android market for future states of connectivity and the population's computer literacy and forecast report of a booming mobile segment in the later future.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 CHARACTERISTICS OF A SLOW LEARNER**

Children with disabilities are a richly diverse population and different disability has different needs and a different design solution. Slow learner children are the one who learn more slowly than their peers, has a low academic achievement and doing poorly in school but do not have any disability that requiring special education (Al-Hashmi & Region). Chauhan (2011) mentioned that slow learners are unable to cope or work as normally expected of their age group. Slow learner children have an IQ that is low enough to cause difficulty in keeping up in the classroom. Average level of IQ is 100 however, slow learner children has an IQ level between 70 to 90. These IQ ratio formula calculation are attached in Appendix 2 and the distribution in showing the average IQ score can be referred in Appendix 3. Slow learners have a high intelligent score to be considered as children with mental retardation but likely be too low for average children. Slow learners do need special help in education but they are not be considered as mentally retarded (Malik, 2009).

According to a study published in the Journal of Neuroscience titled Scientists discover why some people are slow learners on February 2013, scientist found out that slow learner has a low alpha activity occurred in the somatosensory cortex that shows low readiness of the brain to exploit new information and process it. It is important to provide a need for special educational measures for slow learner to ensure they have maximum

progress and capable to read and write. They should also be capable enough to develop practical skills to lead a good personal and social life.

Slow learner children have no problem in the domain of adaptive technology behaviour in making connections, establishment and socialize. The basic problem that they have is in term of educational development. They went through a slow learning pace, their brain does not process sensory information sufficiently and gone through serious language deficits and it is difficult for slow learners to keep up with the average learners. Slow learners are lack of concentration, retention and abstract thinking. They will left behind normal development skills acquisition and the understand of basic concept of living will only be fully understood after 1 to 2 years later as compared of their peers (Malik & Hanif, 2012)

There is a few degree and difference in learning backwardness or categories of slow learners. Slow learners can be divided into those who required separation from other normal children and children who served in integrated general set-up as attached in Appendix 4. A paper written by Sangeeta Chauhan on Slow Learners: Their Psychology And Educational Programmes mentioned that children who served in integrated general set-up are the one who is going to school and are still able to learn and behave in school. They are divided into two types which are children having general backwardness and children having specific backwardness. Children having general backwardness are those who are weak in managing all school curriculum while, children having specific backwardness are those who are slow and lags in certain area or specific subject only and these children progress can be satisfied and extraordinary as compared to other slow learners.

Slow learner children have a limited cognitive capacity. Cognitive capacity is the total amount of information the brain is capable to retain in a certain point of time. The amount of cognitive capacity used in a given time is known as cognitive load. Memory is a complex process and serious cognitive processes that includes recognition, recall, knowledge, cognitive strategies and influence learning process.



According to research done slow learners have a poor memory power (Chauhan, 2011). Research done found out that attention span of the slow learners is relatively short and they are lack of concentration.

## **2.2 LEARNING STYLE**

Learning is a process of acquiring and retaining knowledge that is needed to be used later in life. Learning is not a passive process where it needs an ability to process new information, be able to recall, and apply it appropriately in the complex interaction between learner and the material being learned (Sturimski, 1997). The task of education is to get normal and disable children to achieve their potential and grow. Children must require a good oral communication to create and build confidence, however, slow learners have it difficult to find and combine words. In order to express and deliver an idea, one must have good communication skills and communicate the idea with someone. Slow learners in the other hand are poor at remembering messages and listening to instruction and as a result, slow learners are unable to express idea with clarity to other. That is why slow learners have resource on gestures or action rather than words (Chauhan, 2011). Sturimski (1997) mentioned that it is important to help children especially slow learner on how to learn efficiently and effectively with the correct learning style or strategy.

Knowing the correct learning style and strategy is important to assist learning situation and knowing how to use the techniques are powerful tools that can allow students to grow into strategic, effective, and lifelong learners. Learning strategies or style are techniques, principles or rules that are efficient, effective, and organized steps or procedures used that facilitate the acquisition, manipulation, integration, storage and retrieval of information across situations and settings. It is a tool that we can use to help ourselves understand and learn new skills and integrate new information in a way that makes sense (Sturimski, 1997).

According to a paper written by Al-Hashmi & Region, suggests that students will learn quicker if the teaching method used complement with children's preferred learning styles. They suggest that as learning improves, children confidence and self-esteem will increase and gives positive impact on their learning process. Children will be interested in learning and motivates them. Penttinen (2009) suggests that people will only learn more by using the right teaching methods and learning environment

An article written by Red River College website on <http://www.rrc.ca/index.php?pid=7666> stated that most common learning style are visual, auditory and kinesthetic learning. Visual learners learn by watching or seeing new material. Auditory learners best by listening. Kinesthetics learners learn best by doing and moving activities. Lastly, tactile learners learn best by touching object.

Dunn (1979) mentioned that, slow learners slow similar characteristics in learning style. He did his research by experimenting giving different instructional resources to investigate which resources will facilitate and prevented learning among children. According to his research, multimedia resources combined with learning packages using visual-tactual-kinesthetic materials enhance children ability in learning new skill that they had not been able to master before. Slow learners tend to be tactual and kinaesthetic rather than be able to learn by listening and reading. They require mobility and informal environment in learning. Younger children preferred tactile and kinaesthetic learning through patterns and routines as compared to auditory and (Brand, Dunn & Greb, 2002).

Correct learning style is important to

- i. Maximizing learning potential of particular student
- ii. Succeed on all educational levels
- iii. Understand the correct way of learning and enhance learning quality
- iv. Eliminating limitation on learning new information
- v. Reduces frustration and stress level.

## **2.3 TACTILE LEARNING STYLE**

As mentioned in Kinesthetic Learning Strategies website, tactile learning style is frequently joined with kinesthetic learning style. Kinesthetic learning style involved whole bodily movement however, tactile learning style is more moderate and involved more hands-on activity than larger body movements. Tactile learners best learn through the sense of touch where they use their hands to learn new information. They learn better through experience and do hands on activities, for example taking notes, highlight notes by using bright colours to attract and engage their attention in learning new information.

Cowley college's website stated that tactile learners have active hands where they enjoy manipulatives and use different media such as finger paints, drawing, blocks and hands-on science experiments. Learningabledkids's website supported that tactile based learners find that project-oriented method of teaching will probably appeal to fulfil their needs to have active hands when learning new things.

Technological devices such as tablet or phone are good when completing math problems to keep tactile learners interested in answering the problem and help them to learn in the ways most conducive to them. They enjoy and learn well with math manipulatives, learning stations, art projects and experiential tools. Engaging students' attention is even more crucial in dealing with slow learners because they cannot sustain their attention and concentrate in class for a long time.

## **2.4 TECHNOLOGY USAGE IN EDUCATION FOR THE SLOW LEARNER**

The world is going mobile today with phones, computers and media devices that can fit in pockets, portable and it connects people with variety of information sources an relevant to learning (Naismith, Lonsdale, Vavoula &

Sharples, 2004). Chauhan (2011) suggested that media application in instructional process should be done to sustain slow learners attention for a longer period of time and promote concentration. Usage of media will overcome distractibility and promote attentiveness among children, multimedia instructional strategy should be used in teaching slow learner. Activities that promotes creativity and practicality promotes development of good attention and work habit and at the same time suited slow learner's capacity and make children interested in learning.

Usage of technology is beneficial for slow learners based on research done by (Furió, González-Gancedo , Juan , Seguí, & Rando, 2012) stated that 96% of the children would love to play educational game on iPhone again and 90% of the children connected with the experience better than using the conventional method of learning. This shows that mobile application on android can be used as one of educational tools today. Game-based learning or adaptive technology is believed to be an effective tool for learning and can help in enhancing learning experience and improve student's learning experience

Computer assisted instruction and mobile application can be used in slow learner's leaning experience because it gives instant knowledge and result will provide slow learners with instant knowledge of result and feedback which is essential for slow learners to improve their learning process. Slow learners can learn at their own rate and gives slow learner an motivation to learn and do their best and enjoy learning. 30% of slow learners took less time to learn the same information with the help of technology. Technology helps in enhance learning, increase productivity and promote creativity. Correct design of interactive technology also gives a better understanding of requirement, build realistic expectations for target group and lastly, empower a particular target group ( Frauenberger, Good & Alcorn, 2012).

Burd & Buchanan (2004) state that tactile learners need to do it themselves and perform in an active learning environment and be involved in the learning process. Bonk & Zhang (2006) further state trying-out, experiencing, imitation, and practice concepts and ideas are important in order for slow

learners to learn better. It is important to get the right balance of theory and fulfilling the needs to design a right application for slow learners. Interactive technology such as drag and drop technology, interactive flash animations, simulations with 3D graphics, or virtual reality environments are likely to appeal to tactile learners because they loves to click and touch the screen of the tablet or phones. Flash technology with drag and drop functions will work great for slow learners with tactile learning style. These children are generally interested in practical application than theory.

## 2.5 COMPARATIVE TECHNOLOGY FOR THE SLOW LEARNER

There are a lot of existing android technology in the online market store in the PlayStore and AppStore. However, there is only 5 mobile applications that can facilitate learning in Bahasa Malaysia. There is lack of mobile application in Bahasa Malaysia in the PlayStore and there is no application that can help to enhance slow learner with tactile learners in Bahasa Malaysia for free. The other mobile application are focuses on learning to spell and identify numbers without focuses on kinaesthetic learner needs.

PROJECT PROTOTYPE	OTHER PRODUCTS IN THE MARKET
The interactive technique used offers flexibility for parents and teachers to monitor children's progress	Linear-technique is been used and it does not offer flexibility to parents and teacher. For example flash cards is the common method used in schools.
It is an android mobile software. It is portable and made according to the needs of slow learners in Year 2	There is lack of android mobile application that is designed specifically for slow learners that followed the syllabus by the Ministry of Education.
It is a focus research product for slow learners with tactile learning	There is no mobile application that uses Bahasa Malaysia as a medium so

style	enhance slow learners learning process that teachers Mathematics.
-------	----------------------------------------------------------------------

TABLE 1: Comparative Study With The Existing Technology

## **CHAPTER 3**

### **METHODOLOGY**

Methodology is a systematic guideline and theoretical analysis of the methods applied to the fields of study or in specific components such as phases, tasks, methods, techniques, and tools. It acts as the analysis of the principles of methods, rules, and postulates employed by the discipline. This kind of methodology requires techniques to be used to conduct research prior to the development of the system or application.

#### **3.1 PROJECT ACTIVITY**

In this research Rapid Application Development (RAD) methodology was used to make the mobile application because it avoids long planning phase and allows prototype to be rebuild and redefined repeatedly to identify the most significant and useful features for implementation to deliver good result and output. The prototype development stage will iterate where new and different features will be added and lastly be tested to ensure that all application output is well suited to users' requirements and functions.

This methodology helps to support the making of this application and at the same time helps to ensure the high level of quality in the product. Lastly, this methodology also helps in allowing the prototype to be built quickly and concurrently in the build phase.

Figure 1 below shows the important phase for the project. Project will be developed based on of Rapid Application Development (RAD) methodology where project will be divided into few different phases which consist of phases such as Planning Phase, Analysis Phase, Design Phase, Implementation Phase, System Prototype, Testing Phase, Implementation Phase, and Maintenance Phase. Each of the Analysis,

Design, and Implementation phases will be performed concurrently and on each cycle resulting in a system prototype that will be reviewed by the students and teachers of SK Seri Tronoh in order to measure the effectiveness of the prototype model.

Based on the diagram below, FYP I will consist of Planning phase until Designing phase. While the other Implementation Phase until Maintenance Phase was done in FYP II

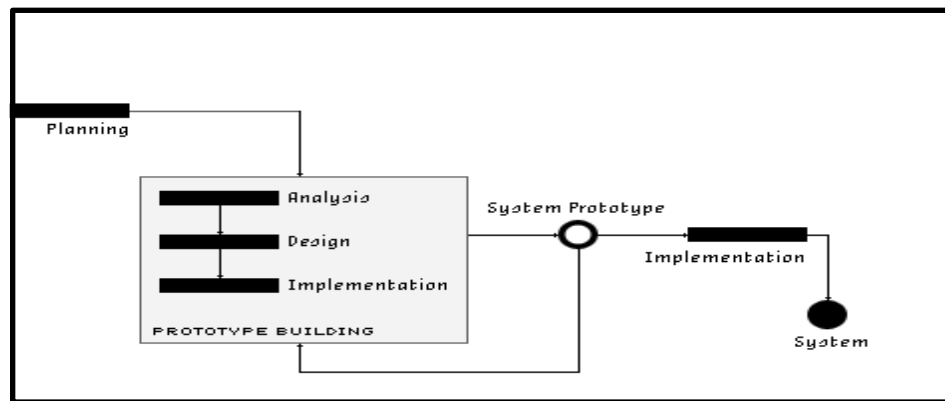


Figure 1 : Rapid Application Development (RAD) methodology

### 3.2 PLANNING PHASE

Initial research is conducted which consist of background study and literature review related to the needs of learning for slow learner with tactile learning style and find the differentiation between existing application and this project. The objectives, scope of study and significant of study are identified to create the boundary of this project. Literature review is conducted to further identify the relationship on how to create a suitable mobile application to enhance students' academic performance. In addition, the author needs to have an adequate skills and knowledge to use AppInventor as application platform that acts as the main tool to complete this project.

The project is feasible to the time frame allocated for Final Year Project (FYP) which is 8 months. This project requires designing an android system mobile application that can be used for education purposes. Proper planning will be done in



order to ensure the success of mobile application. Key milestone and Gantt chart will be use and act as a benchmark to ensure the completeness of every task on particular time frame during the project. Most of the time will be spent in designing the application and understanding the needs of the students and find the correct scope of study and what kind of system can help to improve the learning disability. Thus, the project is feasible and can be completed within the given time frame.

The understanding of the requirement were been done in two different stages:

i. Primary data

Observation was the first method used for data collection. Observation method were done to understand how children learn in school, how they are taught in school and lastly, to find the method that can be most efficient to teach the children in schools.

ii. Secondary data

Interview session with both teachers and children were done to collect data. Interview was done to get a clear explanation and additional information to develop an effective mobile application to teach slow learners in school.

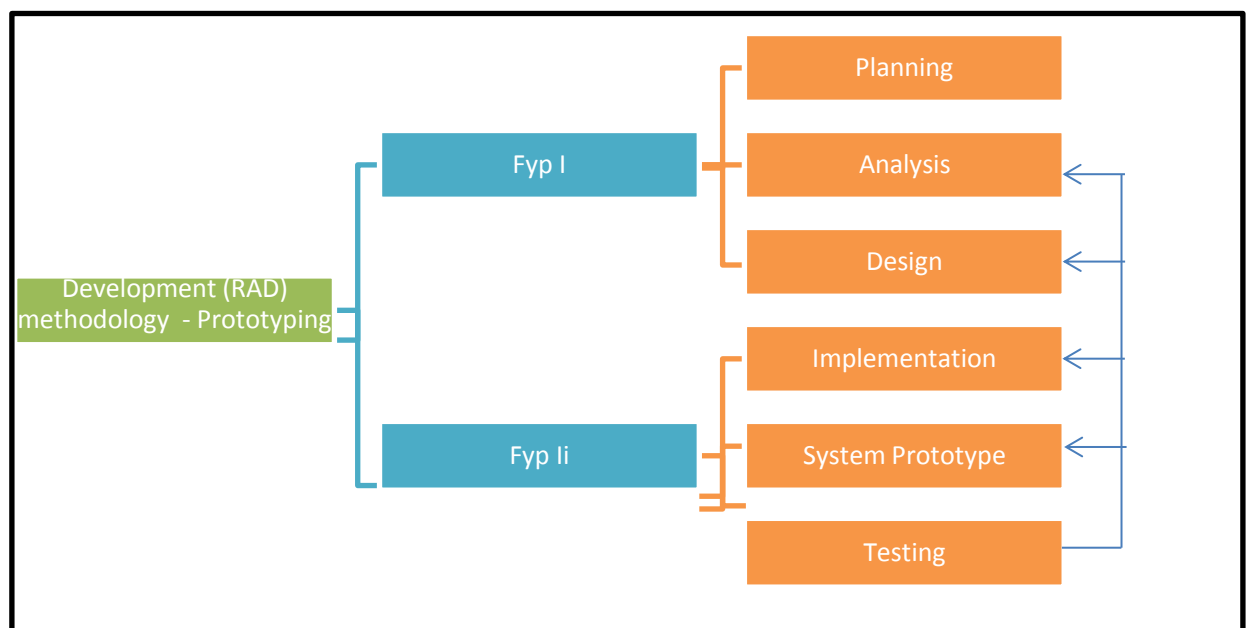


Figure 2: Implementation of SDLC in the development of mobile application.

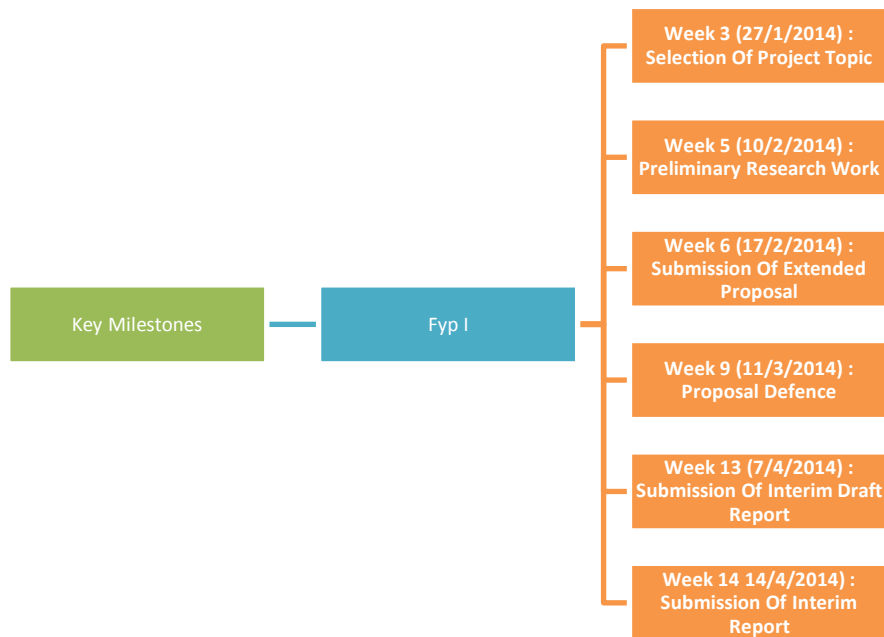


Figure 3: Key Milestones for the development in first semester (FYP I)

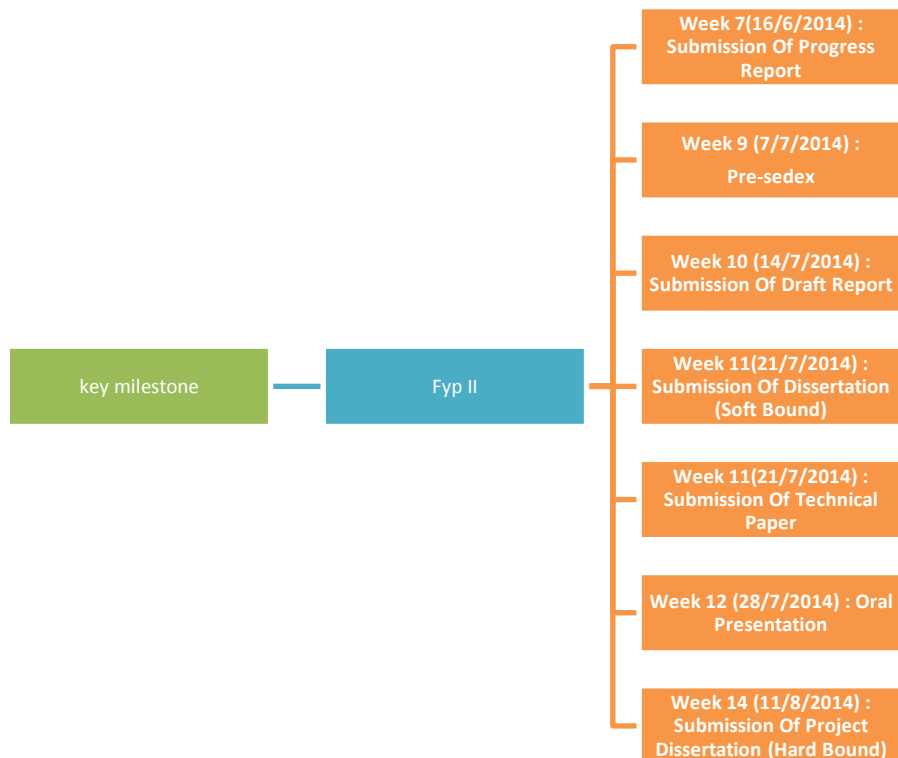


Figure 4: Key Milestones for the development in second semester (FYP I)

	FYP 1							FYP 2																				
ACTIVITIES /WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Selection Of Project Topic			●																									
Preliminary Research Work Regarding Student with Disability																												
Preliminary Research Work Regarding Slow Learner																												
School Visit																												
Literature Review					●																							
Submission Of Extended Proposal						●																						
Proposal Defense																												
Submission Of Interim Draft Report													●															
Submission Of Interim Report													●															
Submission Of Progress Report																												
Working on Real Project Design And Requirement																												
Working On Prototype Interface																												
working On Prototype Database																												
Prototype Testing And Validation																												
User Testing Report																												
Improvement Phase																												
Pre-SEDEX																												
Submission of Draft Report																												
Submission Of Dissertation																												
Submission Of Technical Paper																												
Oral Presentation																												
Submission Of Project Dissertation																												

TABLE 2 : Project Gantt Chart With Milestone



### **3.3 ANALYSIS PHASE**

Project user requirement will be identify in this phase and all research findings will be added into this project. Project requirement will be divided into two categories which are functional and non-functional requirement.

A qualitative paradigm was used in this study to collect user requirement which is through face-to-face interview with students and teachers of SK Seri Tronoh. Qualitative data is used as an exploratory study to explain how and why learning activities done is important. This type of data will help enhance the data collected and act as an in-depth look at the learning processes of the teacher and pupil at schools where research was conducted. All data are documented. This observation is important to fully understand the problem of slow learner and explored the possibilities of ways to solve and enhance children's learning process. Semi structured interview were conducted among students of SK Seri Tronoh, SK Tronoh and teachers. Survey form can be found in the Appendices section.

Another technique used is research from available resources such as books, articles, research papers, journals, and websites which are related to the background and scope of the projects.

#### **3.3.1 FACE-TO-FACE INTERVIEW RESULT**

Based on the feedbacks from 6 teachers, they agreed that there are lacks of mobile application for slow learners in the market store and it is even harder to find teaching aid that can help slow learners with tactile learning style. Teachers agreed that slow learners do not talk much and they do not want a subject to be taught with lengthy instruction. Instructions should be short and simple. Slow learners in the school still cannot spell simple words with more than two syllables.

#### **3.3.1 OBSERVATION RESULT**

It is important for children to have a game-like teaching aid as compared to non-interactive mobile application because most of methods are available in teaching slow learners were not interactive enough to attract their attention because as mentioned in the problem statement and literature review that slow learners have a

short attention span and that is why it is important to make an application that has interactive multimedia visual inside it. Slow learners with tactile prefer to have games and activities where they can move their fingers on the screen on the tablet in order to learn certain things as agreed by teachers in the school.

### 3.3.2 REQUIREMENTS DEFINITION

Below is the outline that describe the functional and non-functional requirement of the mobile application. The system flow of this application can be referred in Appendix 8.

#### 3.3.2.1 FUNCTIONAL REQUIREMENT

FUNCTION	Ability to pick syllabus wanted
AREA	Functional (For User)
DESCRIPTION	The application should be able to display a list of syllabus from the memory which allows users to browse the files to be selected for children's learning

TABLE 3 : Functional Requirement 1

FUNCTION	Ability to play the syllabus picked
AREA	Functional (For User)
DESCRIPTION	The correct syllabus must be picked according to the topic picked by the user on the earlier interface

TABLE 4 : Functional Requirement 2

#### 3.3.2.2 NON-FUNCTIONAL REQUIREMENT

FUNCTION	Ability to perform and response quickly
AREA	Non - functional
DESCRIPTION	The application should have a short response time for a simple execution of the summarization and a high throughput (rate of processing work) while maintaining the quality of the output.

TABLE 5 : Functional Requirement 3

### 3.4 DESIGN PHASE

Prototype development will be conducted according to the finding and analyse data got from teachers and students of SK Seri Tronoh and SK Tronoh. Prototype will be built by using AppInventor. AppInventor is a visual, drag-and-drop tool for building mobile apps on the Android platform where user can design their own interface by using the available web based graphical user interface (GUI) builder and insert in the function of the application in the platform. Several testing will be done in this phase to complement with the needs of slow learners children preferred human computer interaction interface.

The activity in designing the GUI of this application is faster been done by using AppInventor compared to the common Android App compilers. It allows the GUI page design to be customize into certain shape, written in any words and can also be replaced by using another picture.

TOOLS	SPECIFICATION
HARDWARE	Personal Laptop and Android Smartphone
SOFTWARE	App Inventor, Android Emulator, FluidUI

TABLE 6 : Hardware and software needed to build mobile application

#### 3.4.1 PROPOSED DESIGN MODEL



Page 1 : Welcome page

Function :

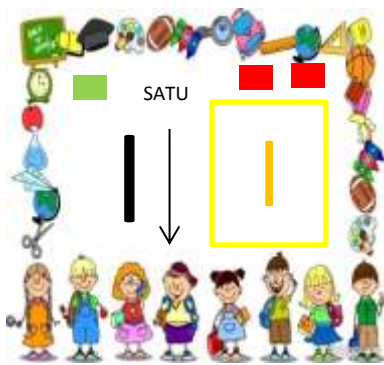
By pressing the yellow box, user will be brought to a new page



Page 2 : Syllabus selection

Function:

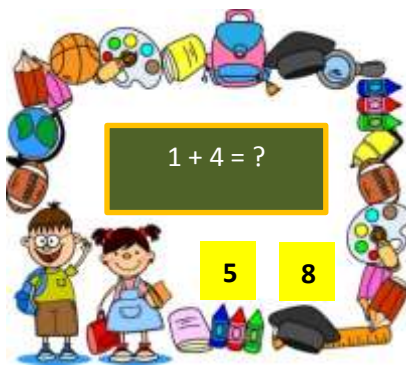
Student can pick syllabus they wanted in the list and based on selection student will be brought into a new page.



Page 3 : Kenali nombor

Function : total of 5 pages for this exercise

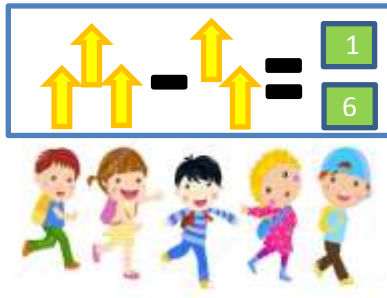
Student is required to write back the number in the box provided. Numbers provided will be random numbers between 1-20. A vibration will occur when student write the number in the box provided. This is used to enhance and strengthen their memory in memorizing numbers. A sound will also be provided with a push of a button on the screen. Students can move page easily between each page with another



Page 4 : Operasi tambah

Function : total of 5 pages for this exercise

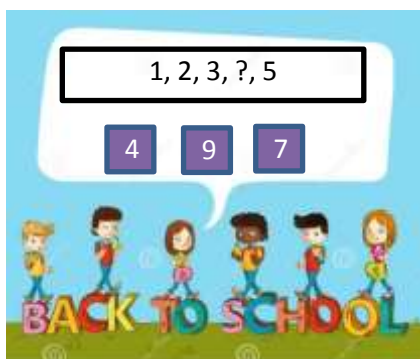
Student will follow the line of the number and a colour will come out to outline student's work. Student will need to choose the correct answer. With every correct answer, a sound saying 'betul' will come out and a vibration will occur. However, if it is a wrong answer, a sound of 'cuba lagi' and no vibration will occur. User can straight away calculate the number on the screen and at the same time it will help user to engage and enhance their learning through the sense of touch.



Page 5 : Operasi tolak

Function : total of 5 pages for this exercise

Student will make subtraction operation and figure out the answer by clicking the box. With every correct answer, a sound saying ‘ betul’ will come out and a vibration will occur. However, if it is a wrong answer, a sound of ‘ cuba lagi’ and no vibration will occur. User can straight away calculate the number on the screen and at the same time it will help user to engage and enhance their learning through the sense of touch.



Page 6 : Operasi mengenal urutan nomor

Function : total of 5 pages for this exercise

Student will need to choose a correct answer for the number sequence. With every correct answer, a sound saying ‘ betul’ will come out and a vibration will occur. However, if it is a wrong answer, a sound of ‘ cuba lagi’ and no vibration will occur.

### 3.5 BUILD PHASE

Before a system or an application is able to be built, requirements gathering as well as creation of different models and designs will have to be done in order to avoid from any conflicts and issues throughout the development later. These will eventually assist a developer by providing a clear overview about the to-be application especially in ensuring its ability to meet the targeted objectives. As the author had successfully come out with the Requirements Definitions, Functional Decomposition Diagram as attached in Appendix 5, Activity Diagram as attached in Appendix 6, and Use Case Diagram as attached in Appendix 7, prototype can now be built by using App Inventor

The activity to design of this mobile application will be made using App Inventor. App Inventor will be used in this project because it allows faster product



development compared to other common Android mobile application compiler. Moreover, App Inventor allows basic graphical user interface to be developed based on drag and drop command which produce similar result as other Visual Basic graphical user interface design software. App Inventor allows button to be customize to shapes and pictures.



Figure 5 : Drafting the application using App Inventor

The algorithm below shows the colour detection algorithm as translated based on the selected interface. These block act as a command block in the App Inventor and it is used to replace the need of using the traditional codes programming. It allows user to drag and drop the block to add functionality to the application.

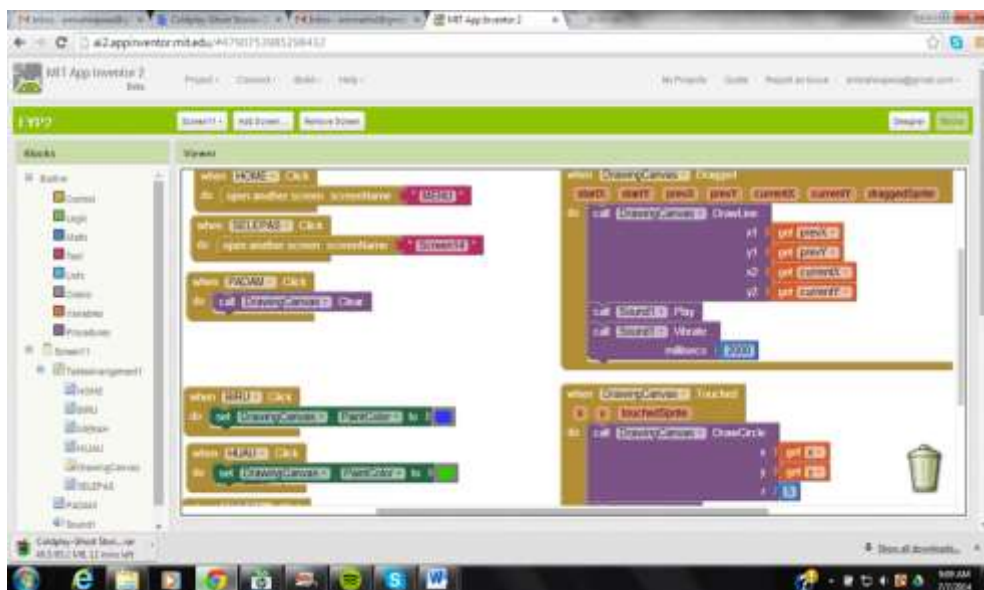


Figure 6 : Drafting the application using App Inventor

### 3.6 TESTING PHASE

The application will be tested in terms of its function and accuracy to produce a result by comparing it to the results that have already been produced. This will help validate the effectiveness of the application. The set of previous data will be obtained from the previous testing session that has been conducted. Purposive sampling was done from the school involved in the study conducted. The record of information will be used to help in exploring the data collected and find the weaknesses and improvement on product prototype will be done.

Testing phase consist of three different activities that includes application testing itself, testing on the students and testing on teachers.

The application testing will be done with the testing on the functionality for the application itself. The prototype will have continuous changes until the correct outcome is delivered and the application followed the design and functionality as planned in FYP 1. All basic functionalities were evaluated and any failed function that were failed to work will be debugged and the test cycle will resume until all functionality is working correctly and perfectly as planned.

VERSION	PURPOSES
Android Mobile Application For Slow Learners Children With Tactile Learning Style V1.0	To test whether the pixel of the application is correct and follow the layout as planned previously.
Android Mobile Application For Slow Learners Children With Tactile Learning Style V1.1	To test the navigation of the application from each page to another page
Android Mobile Application For Slow Learners Children With Tactile Learning Style V1.2	To test the ink function of the application whether it is coming out or not.
Android Mobile Application For Slow Learners Children With Tactile Learning Style V1.3	To test the application without the usage of the any internet connection. To see if the application APK installing is successful or not

#### Table 7 : Testing versions Of The Android Mobile Application For Slow Learners Children With Tactile Learning Style

Testing phase on teachers and students were done in Sekolah Seri Tronoh. This school had been picked because they have a special class for slow learners with tactile learning style based on the learning style test conducted. These testing phases are divided into two categories which are for teachers and students.

The instrument used for teachers are by using survey form. There are 5 teachers involved in this study and they are selected because these teachers are specially trained teachers to teach slow learners. All teachers tried the application and measure the effectiveness. Teachers will then be given a survey form to indicate the rate of effectiveness and survey form are attached in the Appendix 9. Interview sessions were conducted with all teachers at the end of the process.

Testing phase on student was done to measure how much this product can help student in learning mathematics at school compared to achievement got by using traditional method. There were 6 students involved and based on the earlier learning style test result all 6 students shown a result as tactile learners with a combination of other learning style as well. These students fulfilled the needs of the project because all of them are learning in Year 2 syllabus. The testing phase begin by having all students to answer the same mathematics questions for 3 times by using traditional method of using book. Later, students need to use the application and try to answer the same question for 3 times. The average correct answer were recorded and the survey form used to interviewed students can be referred in Appendix 10.

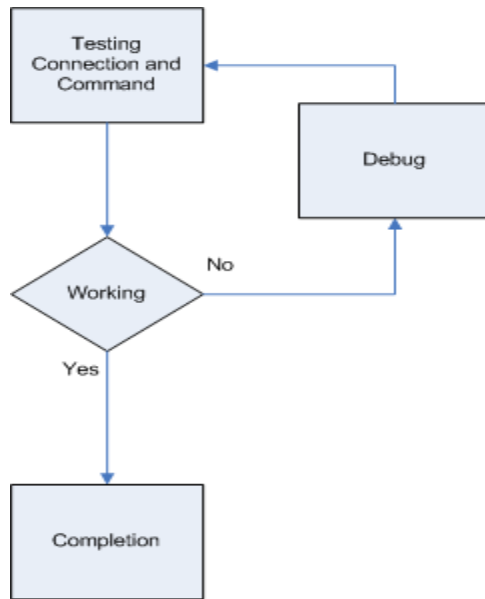


Figure 7 : Android Mobile Application For Slow Learners Children With Tactile Learning Style Model Testing.

## CHAPTER 4

### RESULT AND DISCUSSION

#### 4.1 STORY BOARD INTERFACES

##### 4.2.1 WELCOME SCREEN



Figure 8: Screenshot of welcome page

The application starts out in the welcome screen which contains the title of the application and user will click 'TEKAN SINI UNTUK MULA' to start using the application. This welcome page is important as it acts as the starting page before user starts using the application. The title is clearly shown and bright colours are used with a school theme application. The application is suitable with the topic and module to make it more interesting to attract the attention of the students in the school.

#### 4.2.2 MENU SCREE



Figure 9: Screenshot of the menu page

In the menu screen, all content of the syllabus is clearly shown where user just needs to click on the screen to go to their selected content. The content is arranged according to the syllabus provided by the Ministry Of Education to make it easier for the teacher to teach and use this application in class.

#### 4.2.3 KNOWING NUMBERS EXERCISE



Figure 10: Screenshot of the first component which is knowing numbers exercise

User can learn to write numbers on the screen by using 3 different colour of ink to improve learning experience by using the sense of touch. This will help the student to practise on writing numbers and it helps to strengthen the memory of the students to memorize the numbers better and last longer than before the usage of this application. Tactile based learners find that project-oriented method of teaching will probably appeal to fulfil their needs to have active hands when learning new things.

#### 4.2.4 ADDITIONAL OPERATION EXERCISE



Figure 11: Screenshot of the second component which is additional operation exercise. User can learn additional operation with the help on the ink. This method can help student to engage with the screen and enhance students experience by using their sense of touch to help them process all information faster and better. Student can proceed with the next exercise by clicking on the next button. Student can write down the additional operation on the screen and count back the number.

#### 4.2.5 SUBTRACTION OPERATION EXERCISE



Figure 12: Screenshot of the third component which is subtraction operation exercise. User can learn subtraction operation with the help of the ink. This method can help student to engage with the screen and enhance students experience by using their sense of touch to help them process all information faster and better. Student can proceed with the next exercise by clicking on the next button. Student can cancel off the pictures to avoid any confusing in answering the question. This will help student

to solve the question faster and reduce the chances of students in calculating a wrong answer.

#### 4.2.6 SEQUENCE OF NUMBERS EXERCISE



Figure 13: Screenshot of the fourth component which is sequence of numbers exercise

The sequence of the number will help student to memorize numbers and help student to improve their both addition and subtraction skills. User can proceed to the main menu or the next exercise by using the navigation button on top of the screen.

## 4.2 INTERVIEW RESULT

Interview session was conducted to identify and analyse all data gathered from the teachers in SK Seri Tronoh. Based on the interview result, a clear point of view about this application can be used to verify and strengthen the fact used to develop the project. The objective of conducting this interview session is to gain more knowledge and ensure the project is aligned with the objective of this project which is to enhance the learning experience of the children.

### 4.1.1 INTERVIEW WITH TEACHER MARZIAH.

This application is good and all students love it. It is a great initiative to attract students to learn a difficult subject such as mathematics in school with current learning syllabus

Figure 14: Interview with SK Seri Tronoh teacher



Based on the interview done with Teacher Marziah who is teaching mathematics in the school for 5 years, she believes the application can help her students in learning mathematics and help to give a new and a different learning experience to all students.

#### 4.1.2 INTERVIEW WITH TEACHER ASMARINA

This application is good and definitely a new way of teaching the students. However, the interactivity of the application can be improved.

Figure 15: Interview with SK Seri Tronoh teacher

Based on the interview done with Teacher Asmarina, students will now be up-to-date with the technology and the portability of the tablet will help to create a non-static class after this as students are now free to make movement in the class with the usage of the tablet.

### 4.3 OBSERVATION RESULT

#### 4.3.1 BEFORE THE USAGE OF MOBILE APPLICATION

Students were studying by using the flash card method. The method used is the same and students can only sustain their focus for a maximum of 30 minutes. Students are meant to be on their seat and no movement is allowed during the class. Students can easily get bored.

#### 4.3.2 AFTER THE USAGE OF MOBILE APPLICATION

Students enjoy learning mathematics more as compared as before. They are engaged to the subject and can sustain their interest in learning mathematics for more than an hour. The mobile application sure enhance their learning experience and encourage them to learn mathematics more.

#### 4.4 TESTING RESULT

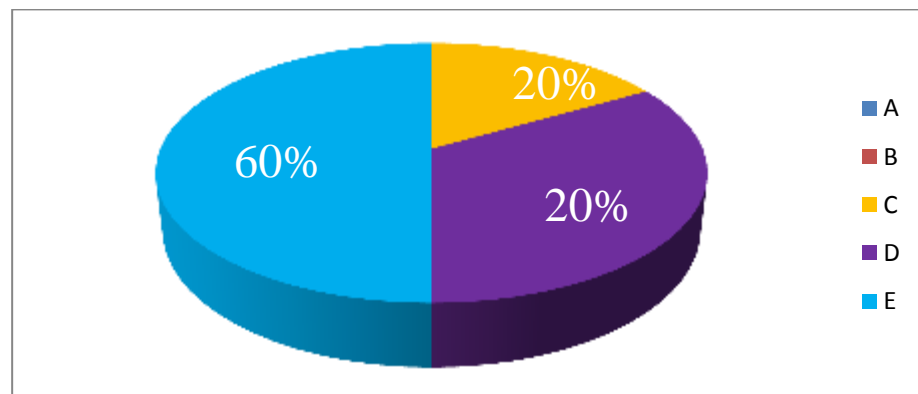
A testing phase was conducted to get feedback from both students and teachers.

##### 4.3.1 TEACHER'S FEEDBACK

Participant is required to answer a survey regarding the attractiveness, ease of navigation and effectiveness of the application to enhance the learning experience of slow learners in the school, SK Seri Tronoh. All participants are aware with the objective of the project as all teachers had already been briefed before and were involved since the very beginning of the research. Five teachers are involved in the research

The questions for the survey are as listed below :

1. How do you rate the ease of navigation of the application?
  - a. Complicated
  - b. Difficult
  - c. Moderate
  - d. Easy
  - e. Very user-friendly

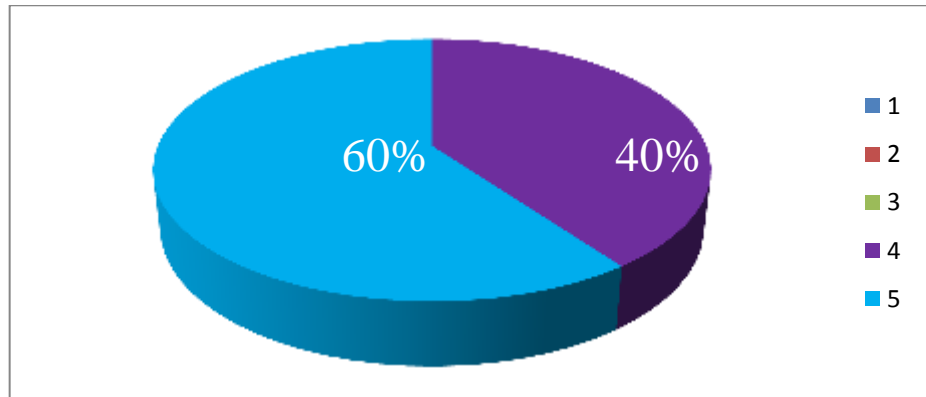


Three of the teachers in the school agreed that the navigation of the application is very user-friendly and can be easily used by the children. There is one teacher who suggested that the navigation of the application can only be categorised as easy. However, one teacher rated this application's navigation as moderate.

2. How do you think the application would help children to learn?

(with 1 being less beneficial and 5 being highly beneficial)

1      2      3      4      5

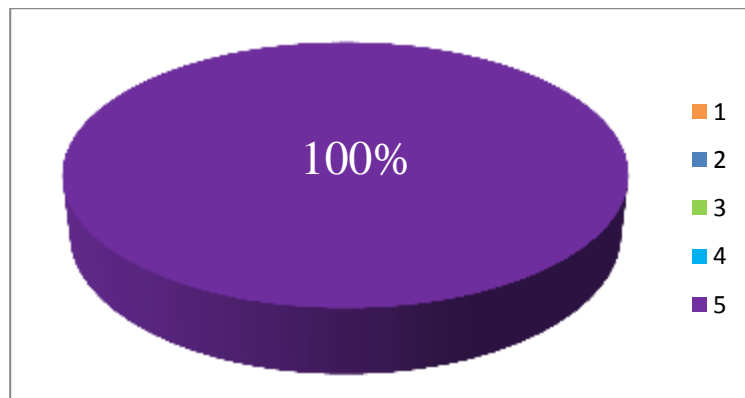


60% or 3 of the teachers agreed that this application is highly beneficial to children in learning mathematics while another 40% or two of the teachers classified this application as a beneficial application to use in class. Overall all of the teachers agreed that this application will definitely help the students in learning mathematics.

3. Do you think the application is useful to your daily work in teaching the children?

(with 1 being least useful and 5 being very useful)

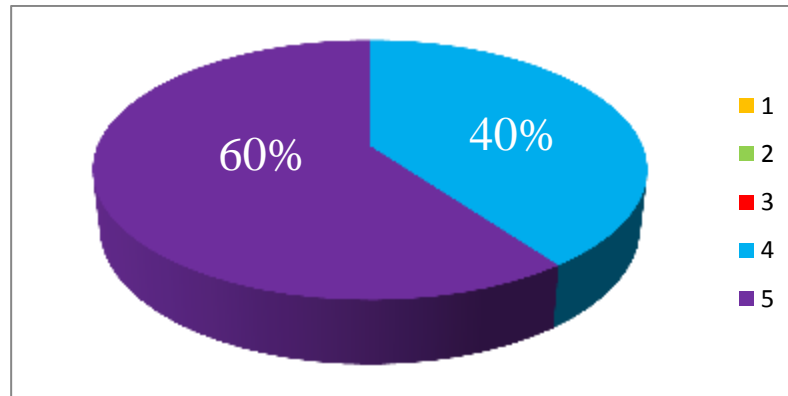
1      2      3      4      5



100% or all five teachers agreed that this mobile application is very useful in teaching children daily. This application will make it easy for teachers to teach in class and all of them agreed to use it again in the future.

4. What do you think about the GUI, is it suitable for children of Year 2?  
(with 1 being less suitable and 5 being highly suitable)

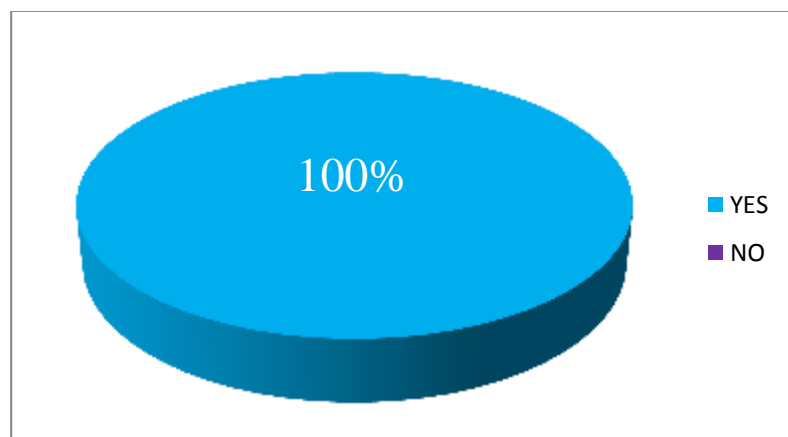
1      2      3      4      5



60% of the teachers supported the GUI of the mobile application and stated that it is highly suitable for the children. While another 40% of the teachers stated that the GUI is suitable for children’s learning. Overall, the feedback is good and appropriate for children and attractive enough to attract the attention of the children to use it.

5. Do you think the application follow the standards?

YES    NO



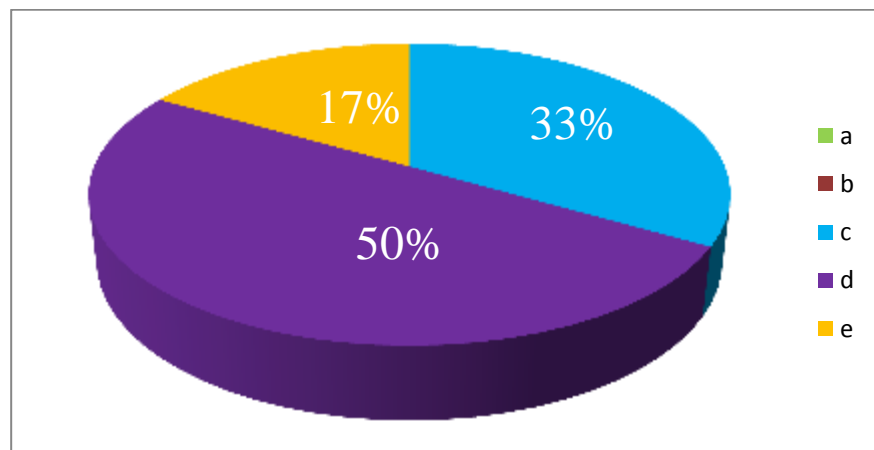
All five of the teachers involved with children with special needs agreed that this mobile application is following the syllabus as stated by the Ministry Of Education and it can be used in school to teach slow learners in Year 2.

#### 4.3.2 STUDENTS 'S FEEDBACK

Participant is required to answer a survey regarding the attractiveness, ease of navigation and effectiveness of the application to enhance the learning experience of slow learners in the school, SK Seri Tronoh. All participants are aware with the objective of the project as they had been already been briefed before involved with this research since FYP I.

1. How do you rate the ease of navigation of the application?

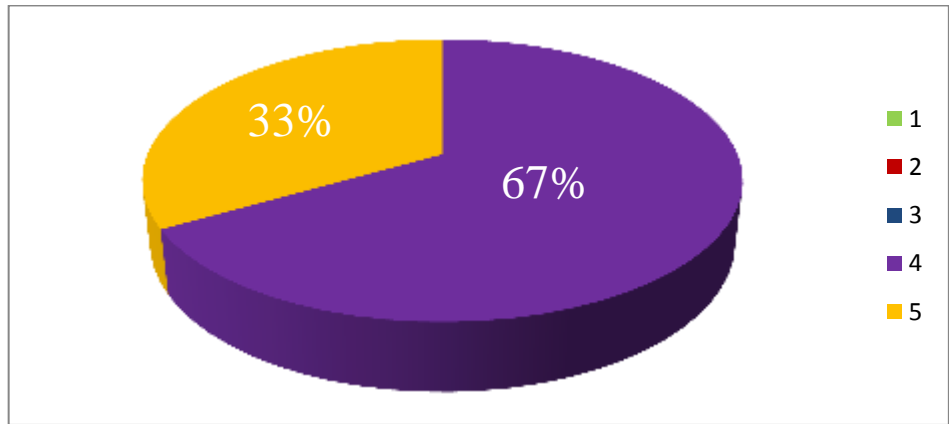
- a. Complicated   b. Difficult   c. Moderate   d. Easy   e. Very user-friendly



As mentioned by the students three of them agreed that the ease of navigation of this application falls under moderate. However, one student said it is very easy to navigate the application while another two more person found the application to be easy to be used in everyday learning in class. They agreed that this application is good in learning difficult subject such as mathematics. The presentation of the application in solving mathematics problems helps to keep tactile learners interested in answering the problem and help them to learn in the ways most conducive to them.

2. How do you think the application would help you to learn?  
(with 1 being less beneficial and 5 being highly beneficial)

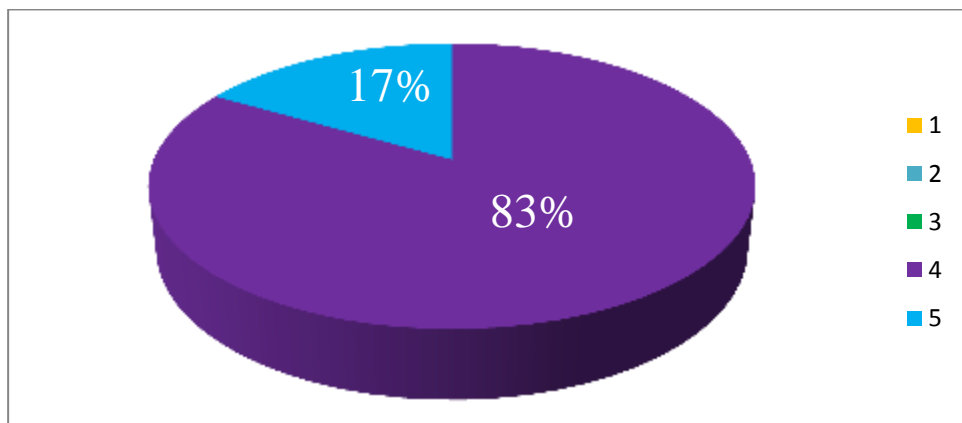
1      2      3      4      5



Four students said that this application is beneficial and two more students said that this application is highly beneficial to help them learn mathematics. However, all of them are fully agreed to use this application again in the future because they believe this application is a more attractive approach in learning mathematics.

3. What do you think about the GUI, is it suitable for you?  
(with 1 being less suitable and 5 being highly suitable)

1      2      3      4      5

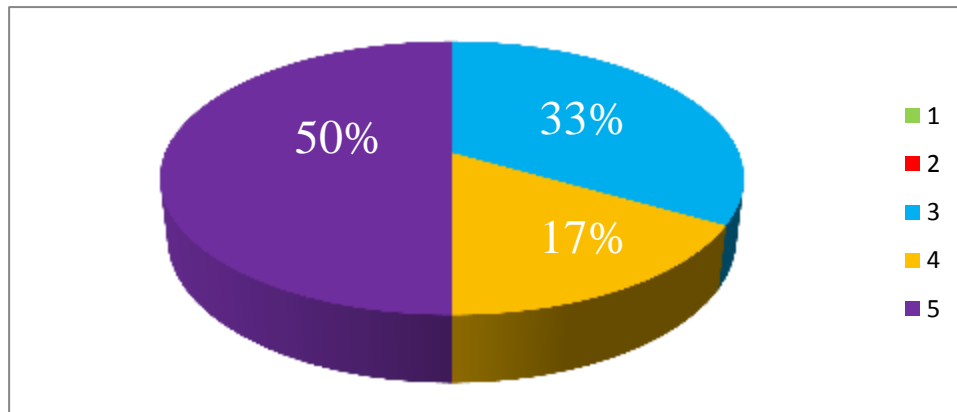


5 out of six children agreed that the GUI of the application is suitable and they love because the application uses a lot of bright colours, clear and eye-catching pictures. The GUI of this application managed to capture students'

attention. This is important especially in dealing with slow learners because they cannot sustain their attention and concentrate in class for a long time.

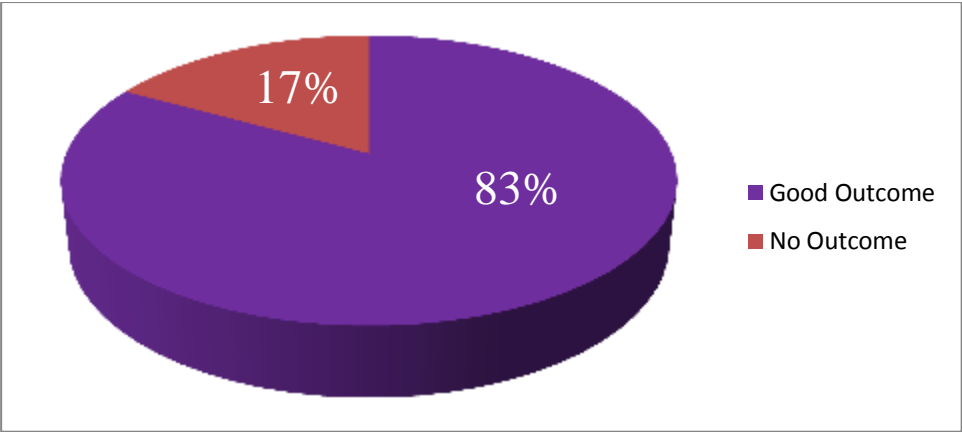
4. How easy do you navigate through the application  
(with 1 being very hard and 5 being very easy)

1      2      3      4      5



Lastly, half of the class or three of them agreed that it is very easy to navigate using this application. They prefer to have an application that is easy to use with less than three click away and does not requires them reading long instruction. Only 1 person said this application is easy and another two person said that they are satisfied and felt that the application ease navigation is moderate but satisfied with the overall application.

5. The experimental result of the android shown a satisfactory result where out of 6 children tested, 5 children shown a good respond to the mobile application. Lastly, 83.33% of the children shown a good result after using this application. In conclusion, this mobile application achieved its aim in developing an android mobile application that can enhance the learning experience of slow learner children with tactile learning style





## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 CONCLUSION**

This project focuses on managing the enhancing the learning experience of slow learners in schools by introducing the usage of mobile application as another alternative to be added in the school to attract the attention of the students and to help them have a longer concentration or focus on the subject of mathematics. Introducing usage of technologies into children early education such as learning mathematics by using tablet allow children to adapt to technologies at an early age and help them to be more open and independent in searching new methods in learning that best suit them. By adapting children to technology at such an early age, these children will be well equip and can easily adapt themselves to the new education method of using an android mobile application.

This project serves as an initial platform for technologies to be incorporated into educations in teaching slow learners at school especially for a difficult subject such as mathematics. In the future, it is hope such project in this field can be developed and expanded using this project as its take off point because the making of an android mobile application definitely has a big potential for future project especially in making an application that can act as a teaching aid in schools.

Methodology discussed was used in gathering all data and information needed to ensure the success of this project. Research has been done in studying the effectiveness of this application and show a good respond on showing how mobile application technology can help slow learners. In conclusion, students shown a good respond towards this mobile application with a total percentage of 83.33%. The

research meets the main objectives of the research which is to study and develop a mobile application that can help to enhance the learning experience of the slow learners with tactile learners in schools.

## **5.2 RECOMMENDATION**

This research will be a stepping stone for future mobile development in the making of teaching aid for special children in schools to help them to learn better. However, there are several concern to be taken into consideration and to be improved in future development work.

As for this prototype, several limitations have been encountered as the components of the AppInventor is lacking of some technology and lack of certain function due to limited application size. Future modification that can be done to the project is to add more content to it so children will have more exciting new content to discover and stay relevant to the children. A different mobile application developer can be used to build this application in the future to overcome the limitations and storage problem.

Moreover, other media such as animation and video can also be added in this application to make it more lively and attractive to the children. These modifications can help the application to be better and more suitable to be commercialized and used as a permanent tool in schools for special school for special needs students. More interactivity on the application should be added in the future so it will be more attractive and user friendly especially in sustaining the interest of the children for a longer period of time.

## CHAPTER 6

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## CHAPTER 7

### APPENDICES

Appendix 1 : SYLLABUS COVERED

KURIKULUM STANDARD SEKOLAH RENDAH PENDIDIKAN KHAS :

ASAS 3M (MASALAH PEMBELAJARAN : TAHUN DUA

<b>TAJUK</b>	<b>STANDARD KURIKULUM</b>	<b>STANDARD PEMBELAJARAN</b>
1. Konsep nombor	1.1 Menamakan nombor 1-20 1.2 Membilang nombor 1-20 1.3 Menentukan nilai nombor dalam lingkungan 20 1.4 Menentukan nilai tempat sehingga 20 1.5 Menulis nombor dalam lingkungan 20 1.6 Penggunaan nombor lingkungan 20 dalam kehidupan harian	1.1.1. Menyebut nombor, mengenal simbol nombor, menamakan nombor 1.2.1 Membilang secara menaik dan menurun, melengkapkan rangkaian nombor 1.3.1 Menentukan nilai nombor dengan kuantiti, membuat perbandingan nilai nombor 1.4.1 Menentukan nilai tempat 1.5.1 Menulis nombor 1-20 dalam angka dan tulisan 1.6.1 Menggunakan nombor dalam kehidupan harian

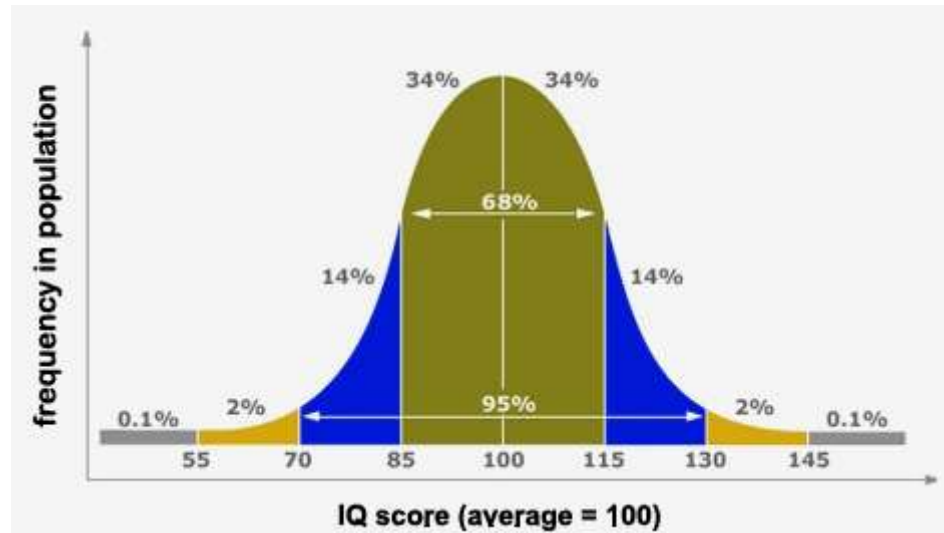
<p>2. Operasi tambah dalam lingkungan 20</p>	<p>3.1 Menatakan secara lisan situasi tambah dalam lingkungan harian</p> <p>3.2 Menulis ayat matematik bagi operasi tambah</p>	<p>3.1.1 Menambah dengan membilang semua dengan menggunakan pelbagai perbendaharaan kata yang relevan dalam konteks tambah (seperti tambah lagi, masukkan lagi, jumlah, semua), menyatakan hasil tambah dua objek</p> <p>3.2.1 Mengenal simbol '+' dan '=', menulis operasi tambah dalam bentuk ayat matematik</p>
<p>3. Operasi tambah dalam lingkungan 20</p>	<p>3.1 Menyatakan secara lisan situasi tolak dalam kehidupan harian</p> <p>3.2 Menulis ayat matematik bagi operasi tolak</p> <p>3.3 Menolak dalam lingkungan fakta asas</p> <p>3.4 Menolak sebarang dua nombor dalam lingkungan 20</p>	<p>3.1.1 menyatakan hasil tolak dengan mencari perbezaan dia kumpulan objek</p> <p>3.2.1 mengenal simbol '-' dan '=', menulis operasi tolak dalam bentuk ayat matematik</p> <p>3.3.1 menolak dua digit dengan satu digit tanpa mengumpul semula</p>



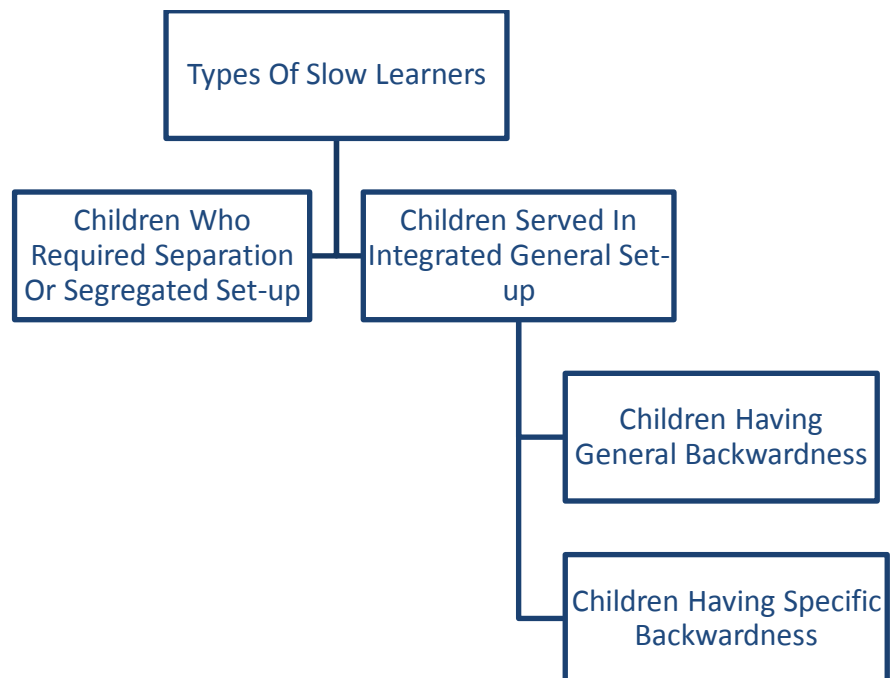
Appendix 2 : IQ ratio formula calculation

$$\text{IQ} = \frac{\text{Mental Age (MA)}}{\text{Chronological Age (CA)}} \times 100$$

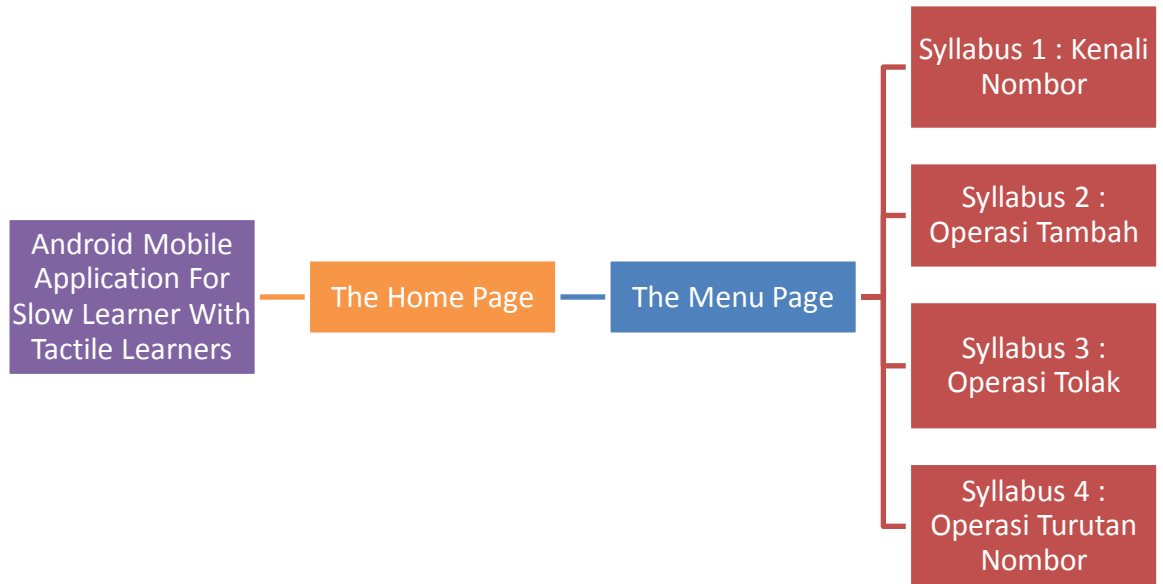
Appendix 3 : Distribution Of Abilities



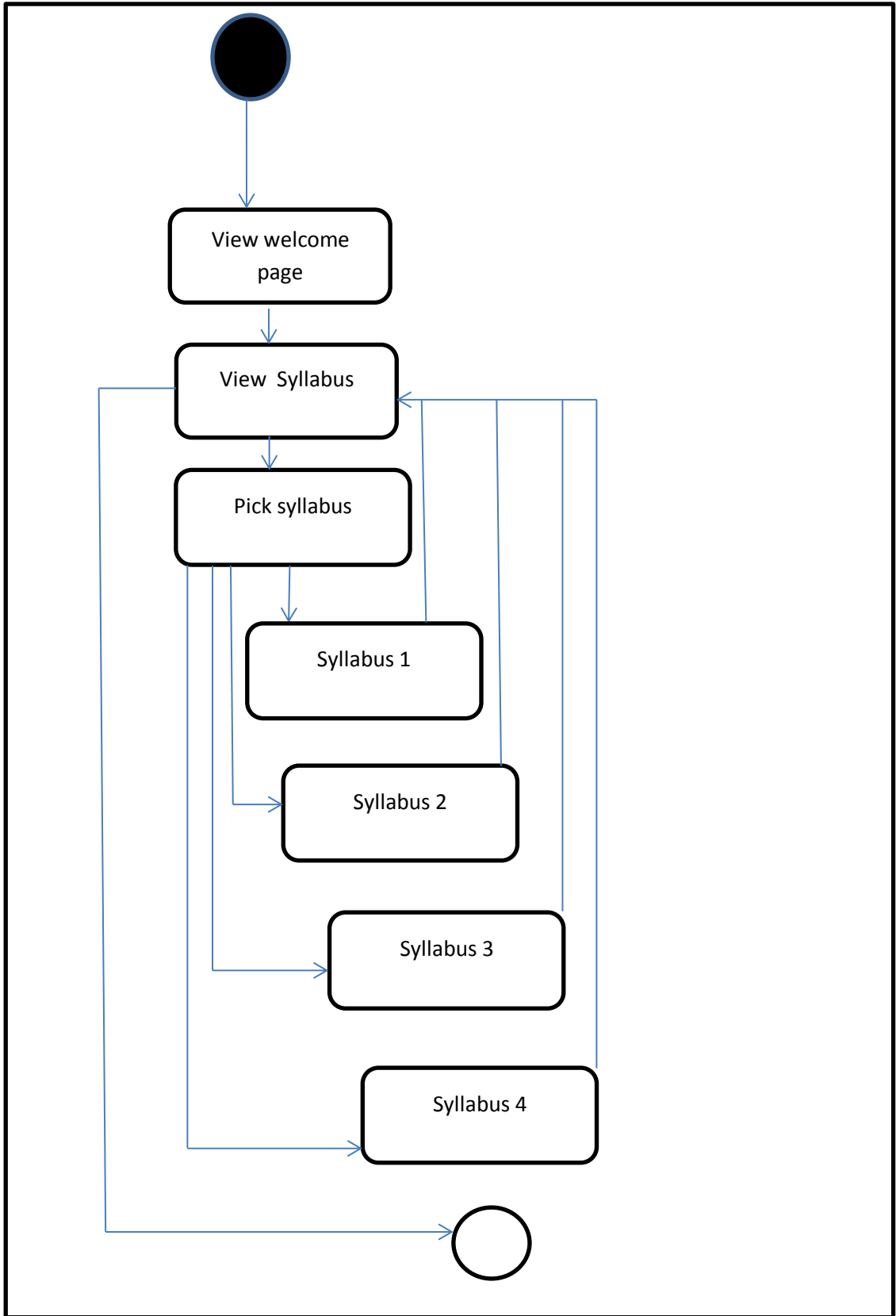
Appendix 4 : Types Of Slow Learner



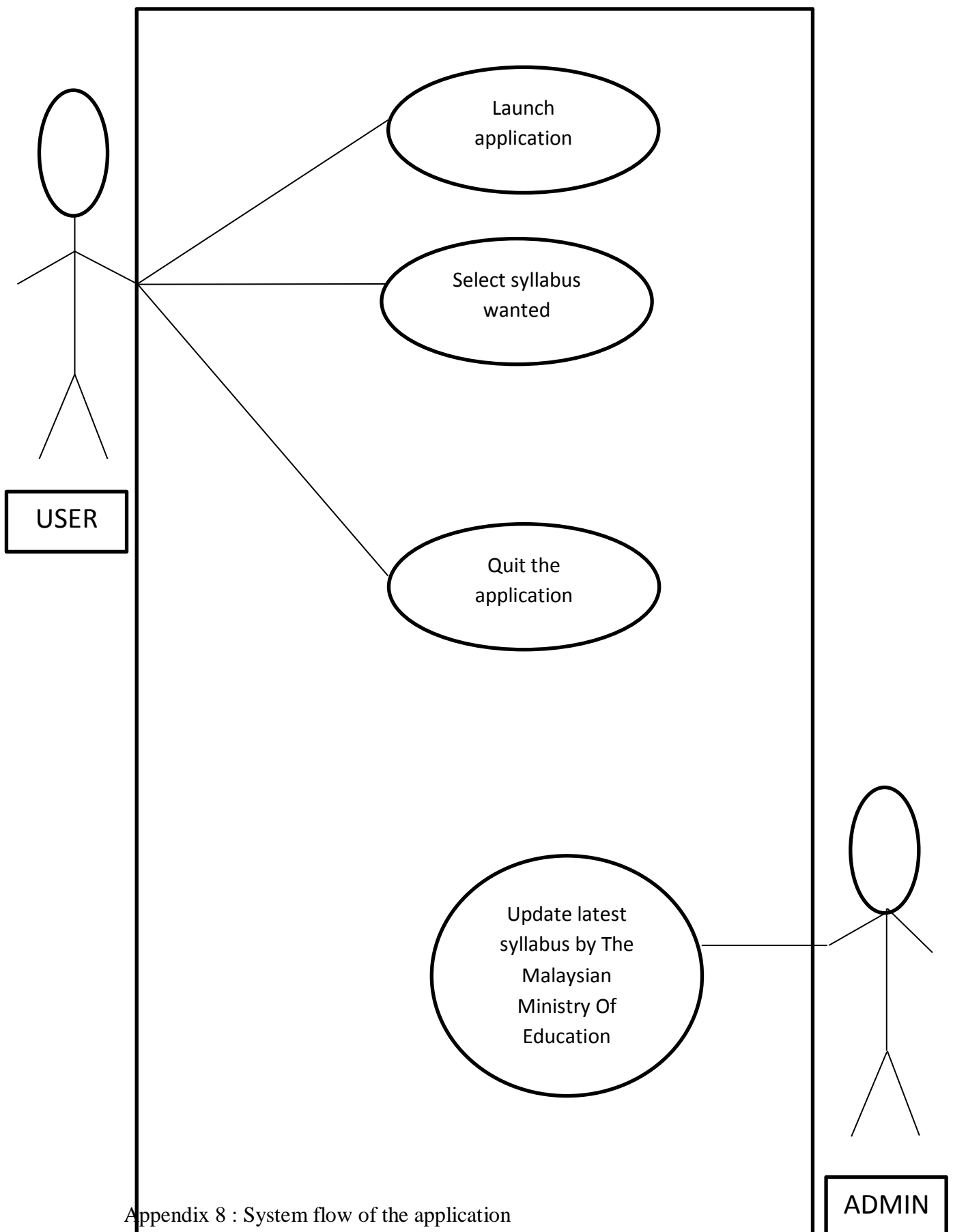
## Appendix 5 : Functional Decomposition Diagram



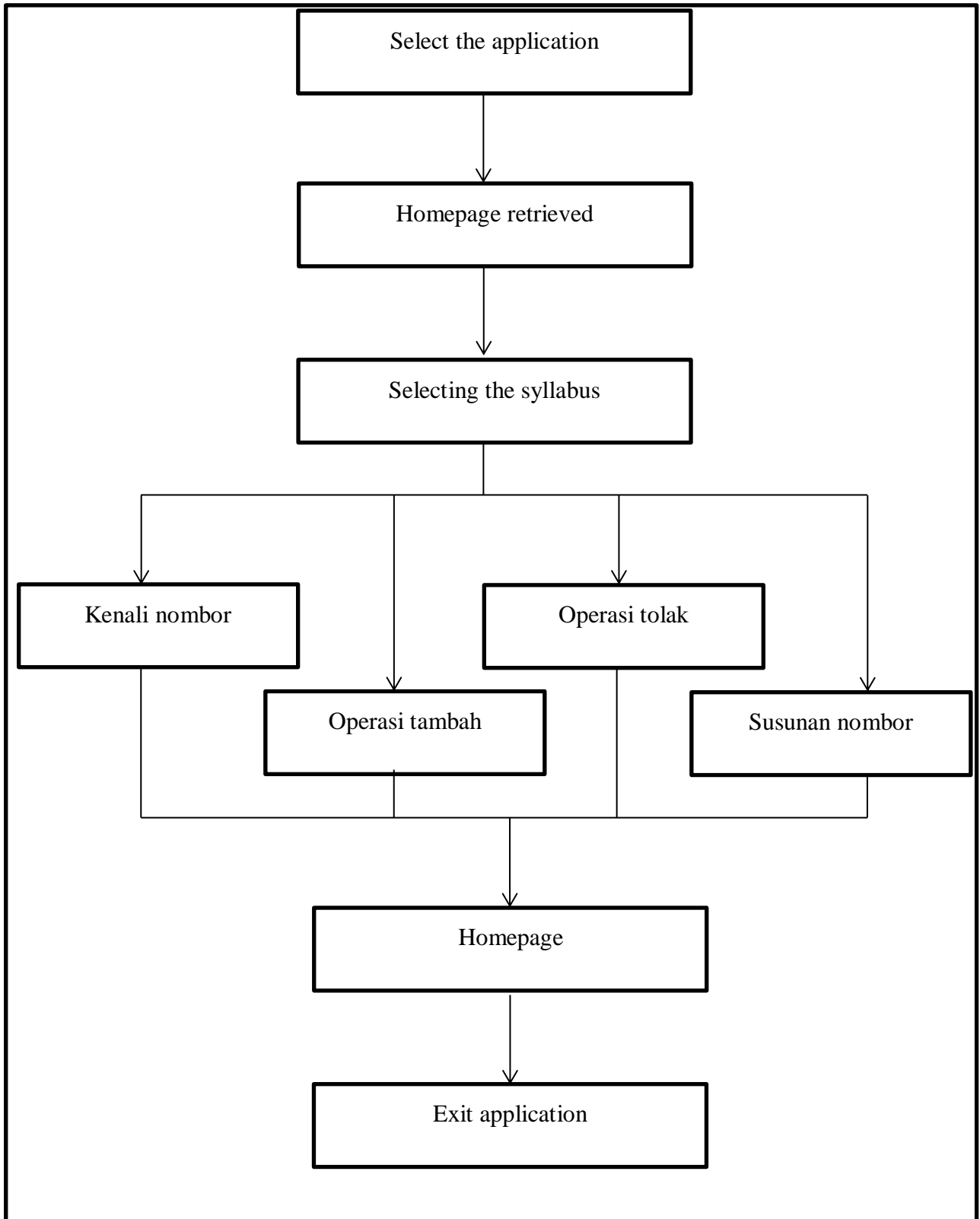
Appendix 6 : Activity Diagram



Appendix 7 : Use Case Diagram



Appendix 8 : System flow of the application



**FINAL YEAR PROJECT : SLOW LEARNERS LEARNING PROBLEM OBSERVATION**

The objective of this questionnaire is to determine the fulfilment of functional requirements of the system application. It is aim for user evaluation to better provide further enhancement on the application.

SECTION 1 : TEACHER DETAILS

NAME		HOUSE ADDRESS	
AGE		IQ LEVEL	
GENDER	M / F	ROLE IN SURVEY	
CHILD'S DIAGNOSIS		SCHOOL	

6. How do you rate the ease of navigation of the application?  
 a. Complicated      b. Difficult      c. Moderate      d. Easy      e. Very user-friendly

7. How do you think the application would help children to learn?  
 (with 1 being less beneficial and 5 being highly beneficial)  
 1      2      3      4      5

8. Do you think the application is useful to your daily work in teaching the children?  
 (with 1 being least useful and 5 being very useful)  
 1      2      3      4      5

9. Will you continue using the application in the future?  
 YES      NO

10. What do you think about the GUI, is it suitable for children of Year 2?  
 (with 1 being less suitable and 5 being highly suitable)  
 1      2      3      4      5

11. How easy do you navigate through the application  
 (with 1 being very easy and 5 being very hard)  
 1      2      3      4      5

12. Do you think the application is attractive, interactive and suitable for children at age seven?  
 (with 1 being not suitable and 5 being very suitable)  
 1      2      3      4      5

13. Do you think the application follow the standards?  
 YES      NO

14. Comments/Feedbacks:

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Appendix 10 : STUDENTS SURVEY FORM

**FINAL YEAR PROJECT : SLOWLEARNERS LEARNING PROBLEM OBSERVATION**

The objective of this questionnaire is to determine the fulfilment of functional requirements of the system application. It is aim for user evaluation to better provide further enhancement on the application.

SECTION 1 : STUDENT DETAILS

NAME		HOUSE ADDRESS	
AGE		IQ LEVEL	
GENDER	M / F	ROLE IN SURVEY	
CHILD'S DIAGNOSIS		SCHOOL	

15. How do you rate the ease of navigation of the application?  
c. Complicated      b. Difficult      c. Moderate      d. Easy      e. Very user-friendly
16. How do you think the application would help you to learn?  
(with 1 being less beneficial and 5 being highly beneficial)  
1      2      3      4      5
17. Will you continue using the application in the future?  
YES      NO
18. What do you think about the GUI, is it suitable for you?  
(with 1 being less suitable and 5 being highly suitable)  
1      2      3      4      5
19. How easy do you navigate through the application  
(with 1 being very easy and 5 being very hard)  
1      2      3      4      5
20. Do you think the application is attractive, interactive and suitable for children at age seven?  
(with 1 being not suitable and 5 being very suitable)  
1      2      3      4      5
21. Do you think the application help you in mathematics?  
YES      NO
22. Comments/Feedbacks:  
\_\_\_\_\_  
\_\_\_\_\_