KEMBARA: AN ANDROID APPLICATION TO INCREASE ATTENTION SPAN OF CHILDREN WITH ADHD

By

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ABSTRACT

This a project that first studies the criteria of activities and things those children with ADHD finds attractive. Those criteria will be used as a platform to develop a mobile application to assist children with ADHD increase their attention span. In order to achieve that, qualitative depth surveys were undertaken in the locations of the parents of children with ADHD. An expert in childhood studies was also interviewed. It is found out that, children with ADHD displayed high mobile phone usage as well as addictive behavior towards playing mobile phones, which indicates hyper focusing. This condition can be taken advantage of, turning mathematics into mobile applications. Solving simple numerical problems can promote thinking and learning in mathematics as well as in other areas. In addition, visual cues to help stimulate the thinking process of the children with ADHD. Initial survey showed that there is a market for mobile application for ADHD children.

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CHAPTER 1
INTRODUCTION

1.1 Background

Technology can play a big role in supporting children with Attention Deficit/ Hyperactivity Disorder to lead a normal life. This project aims to help the affected children as well as to provide a simple way to enhance their lack of attention through mobile technology.

However, mobile applications that intend to assist improving attention span are hardly available in the market. In addition, the current available technology for this purpose lacks mobile characteristics & mostly western based. Therefore, this proposal is intended to develop an interactive Android solution that is built around the Malaysian context and also to miniaturize current learning tools as an alternative option to help young children deal with their disorder.

1.2 Problem Statement

1.2.1 Problem identification

Attention Deficit Disorder (ADHD) is a behavioural disorder that commonly hinders the learning and execution function of children starting from six years of age and above. The main concern here is that technological advances, especially in mobile technologies, are not fully utilised to help sufferers to cope with ADHD symptoms in early childhood.

1.2.2 Significance of the project

This disorder, if left untreated, often persists into adulthood, resulting in a significant impact on education, employment, and interpersonal relationships. An interactive Android solution should be developed to help young children to deal with ADHD.

1.3 Objectives and Scope of Study

1.3.1 Objectives

- To identify the problems that children with ADHD face in their daily life
- To identify the criteria/s of activities that children with ADHD finds attractive
- To propose an android application based on the criteria/s identified in order to assist children with ADHD for increasing attention span

1.3.2 Scope of Study

ADHD is the one of the most commonly studied and diagnosed psychiatric disorder in children, affecting about 3 to 5 percent of children globally. Dr Milton Lum of the Medical Defence Malaysia (MDM) estimated about 5 percent of the 2.9 million primary and preschool students in Malaysia are diagnosed with ADHD.

CHAPTER 2
LITERATURE REVIEW

2.1 Attention Deficit/ Hyperactivity Disorder

Attention Deficit/ Hyperactivity Disorder (ADD/ADHD) has been defined as a behavioural syndrome characterized by inattention and distractibility, restlessness, inability to sit still, and difficulty concentrating on one thing for any period of time. ADHD has three subtypes: the hyperactive-impulsive type (ADHD-H), the inattentive type (ADHD-I), and the combined type (ADHD-C). ADHD-C, the combined subtype, is defined as showing both signs of hyperactivity-impulsivity and inattentive ADHD symptoms. Nevertheless, there is only a small chance that an individual will fit precisely within only one subtype of ADHD. The cause of ADHD is not known, and studies have indicated that there may be a combination of both genetic and environmental factors. Students' learning suffers due to their disability, and schools attempt to accommodate students with ADHD by providing them with alternate learning methods and environmental settings to assist their learning.

2.1.1 Stimulating attention

Kang and et al. explained that students with attentional problems need brain stimulation to maintain integrity and attentional function [4]. According to Zentall students with ADHD are under stimulated and need more stimulation than their peers [10]. Performing Mathematics tasks is more difficult for students with attentional problems. Studies have indicated that fewer Mathematical questions were attempted and calculated by students with attentional problems. Learning geometry, for example, requires one to focus on a variety of Mathematical principles related to geometry and also requires one to analyze embedded figures and shapes which some may find difficult to understand. Utilizing images may be one of the possible solutions to provide stimulation for students with attentional problems and direct their attentional function in learning Mathematics, thus may improve attention span. There has been little research done in high level Mathematics and none in geometry to address these questions adequately [7].

2.2 Applying technology to assist ADHD

Regarding the use of available technologies for addressing the ADHD issue, it appears that most results from technological tools are scarce and dispersed. Chunzhen, Robert, Allen (2002) have reviewed empirical studies that have assessed the usefulness of technology as a tool for students with ADHD. The research is reviewed in five categories: computer-assisted instruction (CIA), computer-assisted cognitive training (CACT), biofeedback training, computerized assessment, and behaviour modification.

Studies were identified through computerized bibliographic searches of the ERIC and PSYCHLIT databases. The following descriptors were used for the literature search: attention deficit hyperactivity disorder (ADHD), attention deficit disorder (ADD), hyperactivity, computer-assisted instruction, computer, technology, EEG biofeedback, EMG biofeedback, continuous performance test, and assessment. An ancestral search was conducted to locate additional studies by reviewing the reference lists of all identified studies.

The most obvious conclusion that can be drawn from this review is that the amount of research aimed at investigating the use of technology with students with ADHD extremely limited and scattered. While some promising findings were presented in the literature, very little empirical data exist to support claims of effectiveness or to guide effective implementation of technology. Three major concerns arise from this review. First, much of the available research has serious methodological shortcomings. Second, the available research is limited to very narrow areas. Third, available research provides little practical guidance for implementing technology for children with ADHD.

2.3 Cost effectiveness of current ADHD treatments

According to Jensen, Garcia, Glied, et al (2005), ADHD is a costly public health problem. Treatment costs varied fourfold, with medication management being the least expensive, followed by behavioural treatment, and then combined treatment. The recommended 40 treatment sessions at a cost of approximately one hundred dollars per session represents a large investment of time and money. This is approximately 10 times the cost of a full year of medication.

Under certain conditions, combination treatment (medical management and psychotherapy) were somewhat more cost-effective, as demonstrated by lower costs per

additional child treated among children with multiple disorders. Medical management treatment, although not as effective as combined medical management and behavioural treatment, is likely to be more cost-effective in routine treatment for children with ADHD, particularly those without multiple disorders. For some children with multiple disorders, it may be cost-effective to provide combination treatment.

Lower costs of medication treatment were found in the community care group, reflecting the less intensive (and less effective) nature of community-delivered treatment. Medical management, with technology included was more effective but more costly than community care and more cost-effective than combination treatment and behavioural treatment alone. Thus, by applying mobile technology as a part of ADHD treatment is expected to reduce cost even more.

2.4 Mobile applications for ADHD

Mobile technology offers many possibilities for treating ADHD. Shrieber and Seifert (2009) explored the use of an Android handheld computer (HC) by college students with learning disabilities and ADHD, as well as its practicality as an aid to the planning and organization of learning in academia and in daily scheduling. The study describes 3 case studies tracking three students: Two of them used a handheld computer, while one student kept a conventional planner. The study's findings clearly show that the students using a handheld computer reported an increased reliance on the device compared to the other student. The device compensated for the students' organizational and memory related difficulties: the students keyed in tasks, notes, memos and especially reminders. However the study lack details on which mobile technology (phone, tablet, pocket PC) was used for their research, causing concerns on which type is more effective. Another concern is since ADHD patient tends to hyper focus on things that they are interested, extreme reliance on mobile technology is not properly addressed in this case.

The lack of focus would always cause time management issues, which affect most ADHD patients. To address this problem, Hribar (2011) developed the TaskTracker which incorporates several features focused on task completion into one useful Android mobile phone application. Time management devices are meant to aid in executing daily, time-dependent tasks, and prompting systems provide feedback to help a user accomplish a task.

According to Hribar, there are no existing devices that combine these two components to specifically aid in daily, time-dependent task completion. However, this study lack results from real users, which raises the question of its effectiveness to ADHD time management issues and its usability.

As this research aims to increase attention span, it is best to find what interest people with ADHD the most. Kang and et al. (2007) studied the effects of images during Mathematics instruction that provide stimulation for students with attentional problem (ADHD-I and ADHD-C). The study assessed the value of images with Low-level Visual Cues (Image-LVC) and images with Additional Visual Cues (Images-AVC) that are represented on a computer screen display in the learning of geometry. The result shown that Images-AVC were helpful for students in ADHD-I group, indicating better performance in the Images-AVC than Images-LVC condition when learning difficult geometry terminology and calculations of perimeters. The Images-AVC condition was especially helpful for both ADHD groups, who performed better in that condition than the comparison group in that condition. The main concern is that the research only limited to computers and whether results differ if used on a mobile platform is not known. Nonetheless, the results and techniques used in the studies are useful for the development of the author's system.

2.5 Conventional learning tools for kids with ADHD

To know what the kids with learning disabilities learn with, a visit to the PERMATA Taska at Universiti Pendidikan Sultan Idris (UPSI) has been made. The following figures display the current tools used similar at most kindergarten and childcare centers.

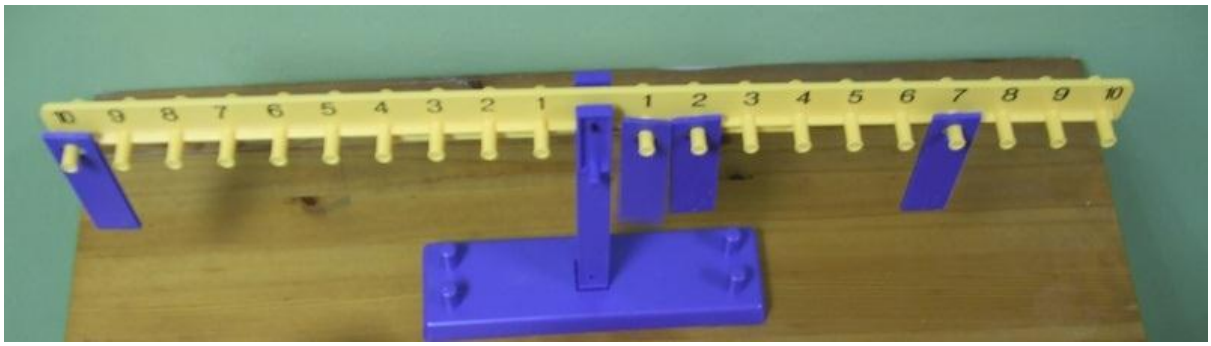


Figure 2.1: Number line model

Figure 2.2(a)

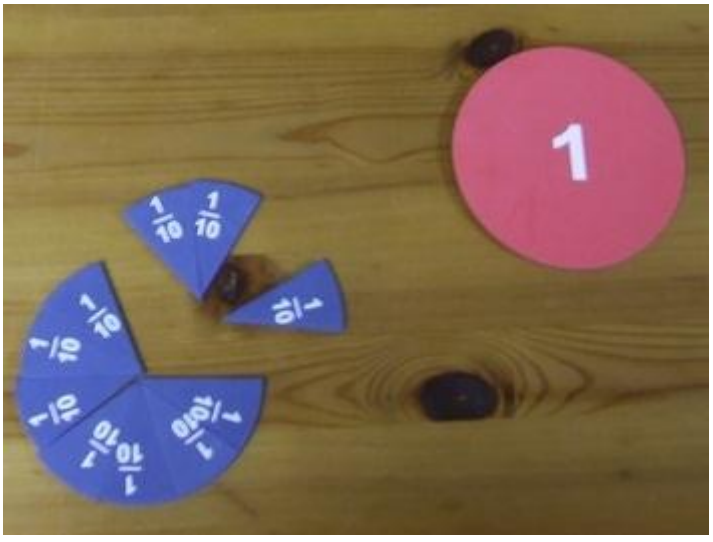


Figure 2.2(b)

Figure 2.2(a) & Figure 2.2(b): Fraction pie charts

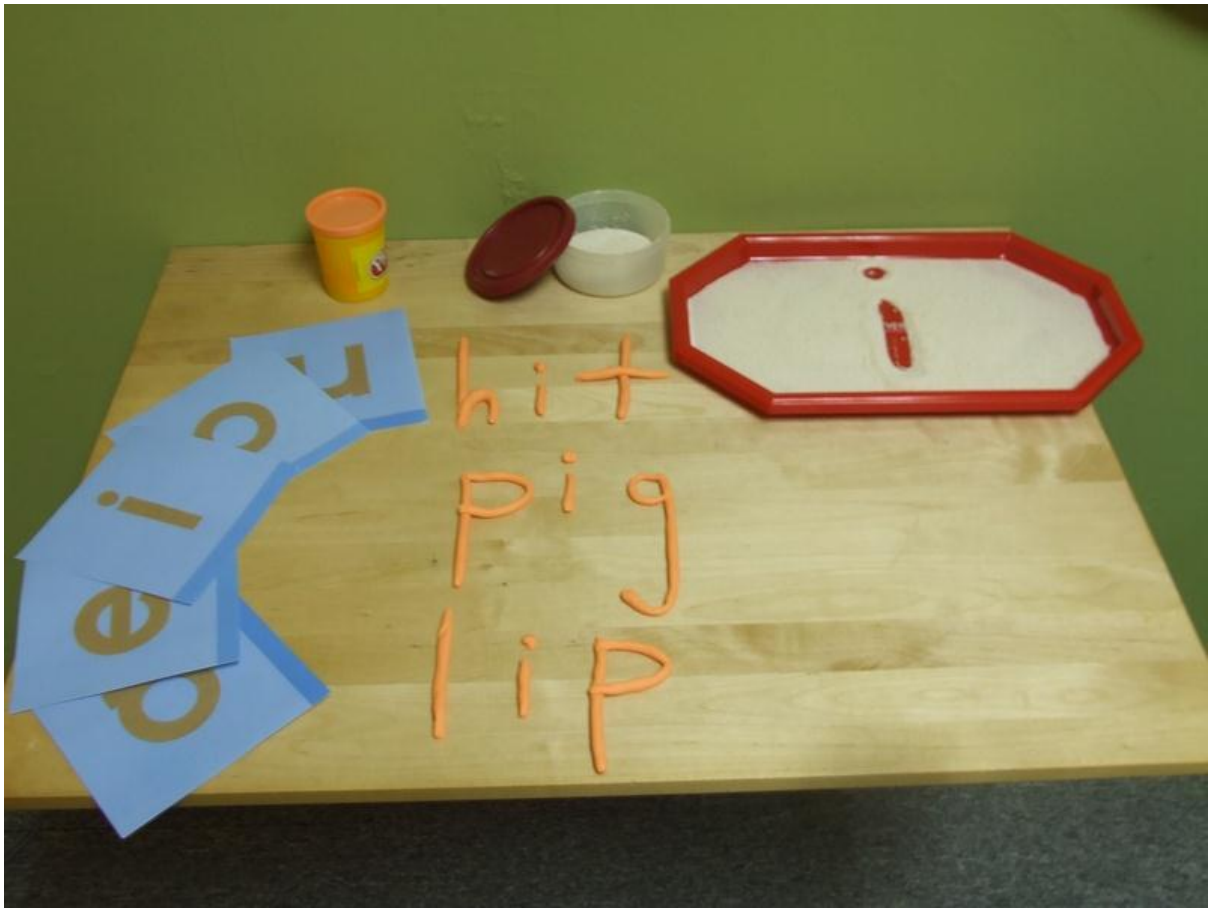


Figure 2.3: Flash cards and modeling clays

CHAPTER 3
METHODOLOGY

3.1 Research Methodology

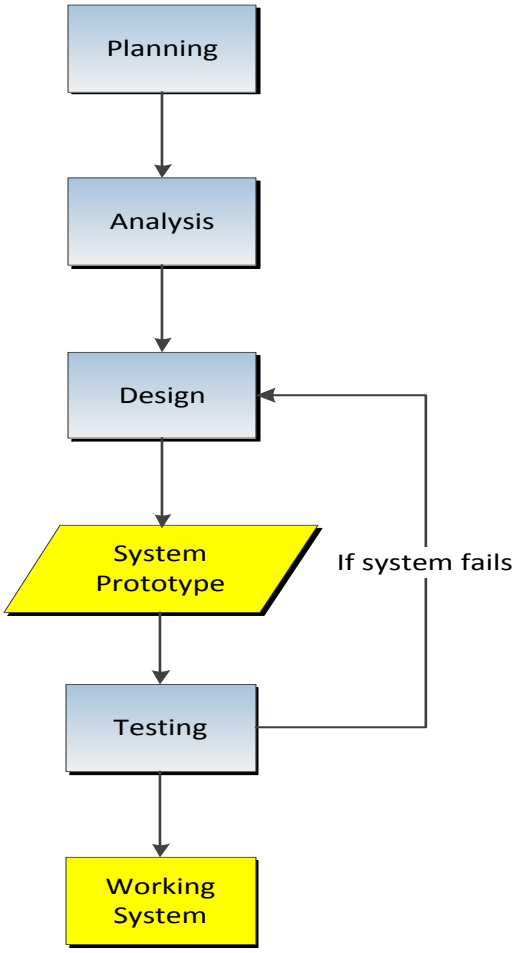


Figure 3.1: The methodology for the Final Year Project

This methodology is usually used when the process is likely to be changed as the project proceeds or when the stakeholder has little idea of what system to be built. All the Analysis, Design, and Implementation phases performed at the same time and on each cycle in producing a *system prototype*. The cycle repeated continually based on the comments until the system prototype successfully meets the requirements. The last prototype will then be called the system. Prototyping development needs only initial basic analysis and design. Thus there is a possibility to revise the initial design decision and start all over again from the beginning. [6] As for the advantage of using this model is that it can deliver system quickly to users.

The processes are divided into four stages where it will be thoroughly followed by the author in order to make the project usable.

- **Planning – Data Gathering**

  The first stage is planning where the author finds the main reason why the system should be built as well as understanding its requirement by:

  - Questionnaires

    Questionnaires or survey are generally a common way to gather data and allow a quantitative analysis of results. The questionnaires will be designed to discover the level of awareness of the use of multimedia in treating ADHD, market availability and whether practitioners or parents need the system.

  - Qualitative interviews

    As Rubin (1981) has suggested that interviews are used at the beginning and end of an evaluation, initially to gather general information to form the basis for a questionnaire and afterwards to clarify its results and fill in gaps [7]. In this case, the behaviours of children with ADHD and details such as preferences, issues, and approaching techniques can be learned by interviewing experts on childhood development.

- **Analysis – Data Analysis**

  During this stage, the author should identify the importance of mobile technology towards improving ADHD. The information gathered during planning stage will be analyzed to develop the storyboard of the system, preferably from the Malaysian context.

- **Design – System Development**

  The design phase determines how the system will work in the system environment. In this case, how the imagery in the application helps improve attention span for the children. For this stage, the illustration of the interface is done based on the findings received. To complete this part, Android Development toolkits are needed.

Implementation

The most resource intense phase of all is the implementation where the system is built, tested and installed for the users to use. This is conducted by engaging selected target users in order to get more information as well as their opinion on what the project had been done so far:

- Thinking aloud

  According to Nielsen (1993), the method of thinking aloud allows us to understand how the users approach the system and what considerations the users keep in mind when using the system [6]. During the test procedure the users will be asked to verbalize and describe their thoughts, feelings while interacting with the system. The main advantage of this method is a better understanding of the user's thoughts and interaction with the android system.

3.2 Tools

3.2.1 Hardware

For this project, mobile devices such as android compatible devices will be used to demonstrate the completed system, in this case, a HTC Sensation smartphone.

Figure 3.2: HTC Sensation smartphone

In the development phase, a personal computer will be used as a workstation before demonstrate through mobile devices. To ensure compatibility to other Android phones with different screen resolutions, the android virtual device manager is used to emulate different phones from the computer.

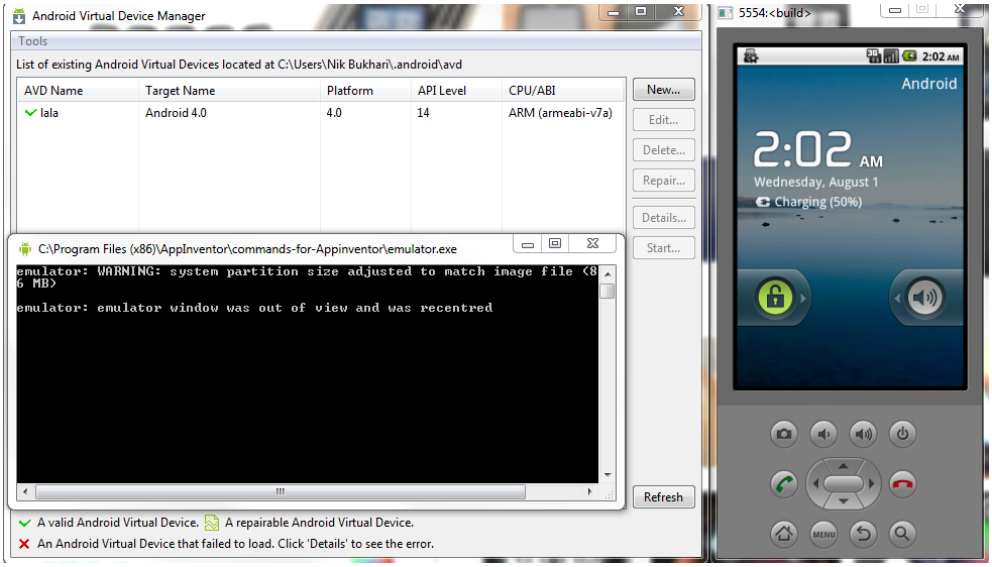


Figure 3.3: Android Virtual Device Manager

3.2.2 Software

The online application creator, MIT App Inventor was chosen for developing the prototype. The ease of creating applications from scratch using programming logics helps cut system development time is the main reason for the choice of application.

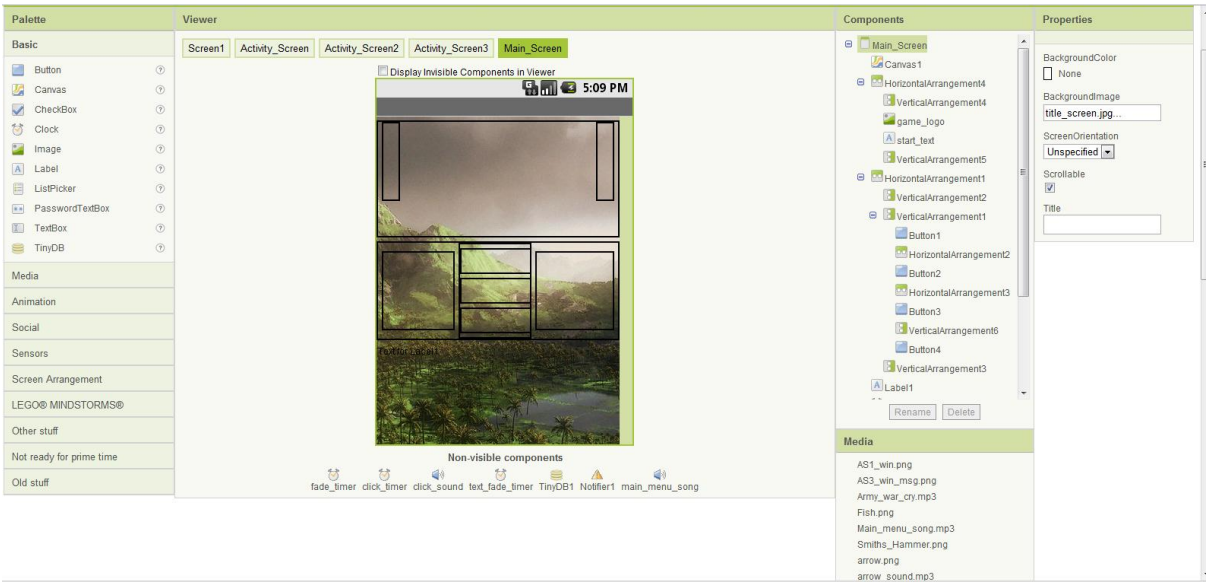


Figure 3.4: MIT App Inventor design screen

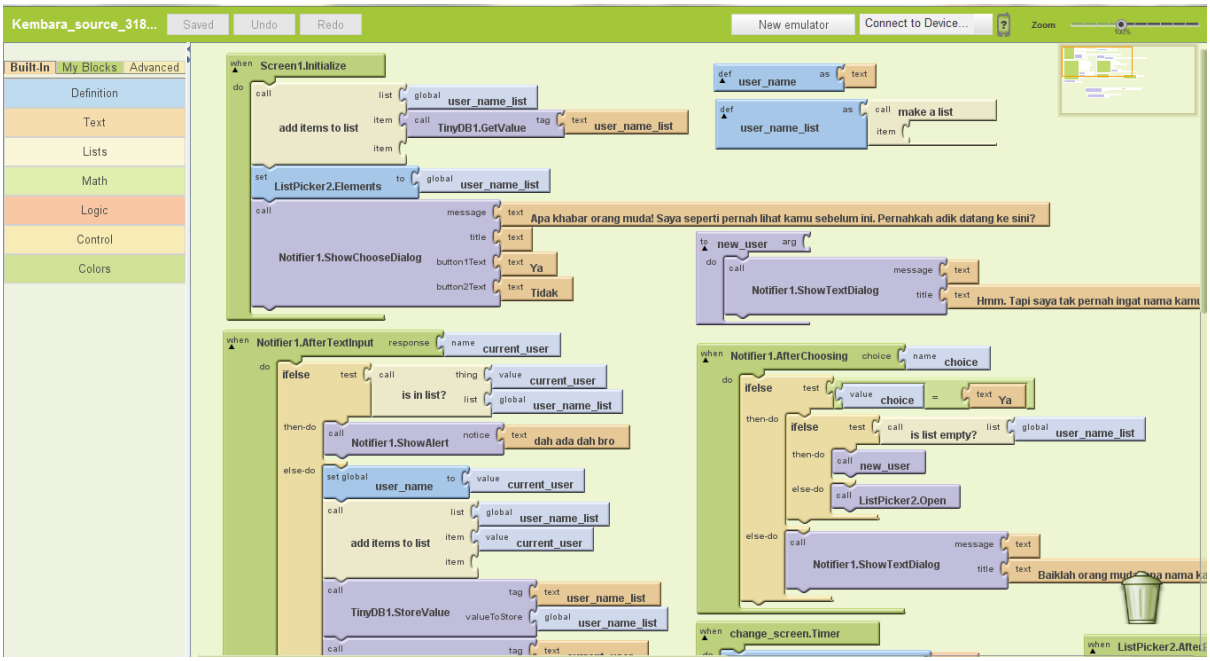


Figure 3.5: MIT App Inventor coding blocks

3.3 Gant Chart

Final Year Project Part I

Detail Week	1	2	3	4	5	6	7	8	9	10	11	12
Selection of Project Topic & Supervisor												
Submission of Proposal to research cluster												
Submission of Extended Proposal												
Research Class												
Interview with expert on childhood development												
Develop questionnaires												
Conduct the survey												
Storyboard design & development												
VIVA I: Proposal defense and Progress Evaluation												
Submission of Interim Report												

Table 3.1: FYP I Gantt Chart

Final Year Project Part II

Detail Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Programming Research														
Prototype Development														
Submission of Progress Report I														
Prototype testing I														
Pre-EDX														
Prototype testing II														
Submission of Dissertation														
EDX														
VIVA II														
Submission of Final Dissertation														

Table 3.2: FYP II Gantt Chart

CHAPTER 4
RESULT AND DISCUSSION

4.1 Findings from questionnaire survey

Market research is required to find out whether a mobile application for children with ADD/ADHD can be practically applied and if the target users need to have it. One of the ways to conduct a market research is by surveying the target users. A survey was conducted among the parents of children with ADHD at PERMATA Taska at Universiti Pendidikan Sultan Idris (UPSI) and their acquaintances, using a questionnaire.

The first five questions in the questionnaire intend to gather demographic data of the respondents. The questions ask of the relationship to the child with ADHD, total household income, primary language used, and the child's age & gender. The rest of the questionnaire aims to seek market suitability of the proposed system. 15 people responded to the questionnaire. The questionnaire is attached as Appendix 1.

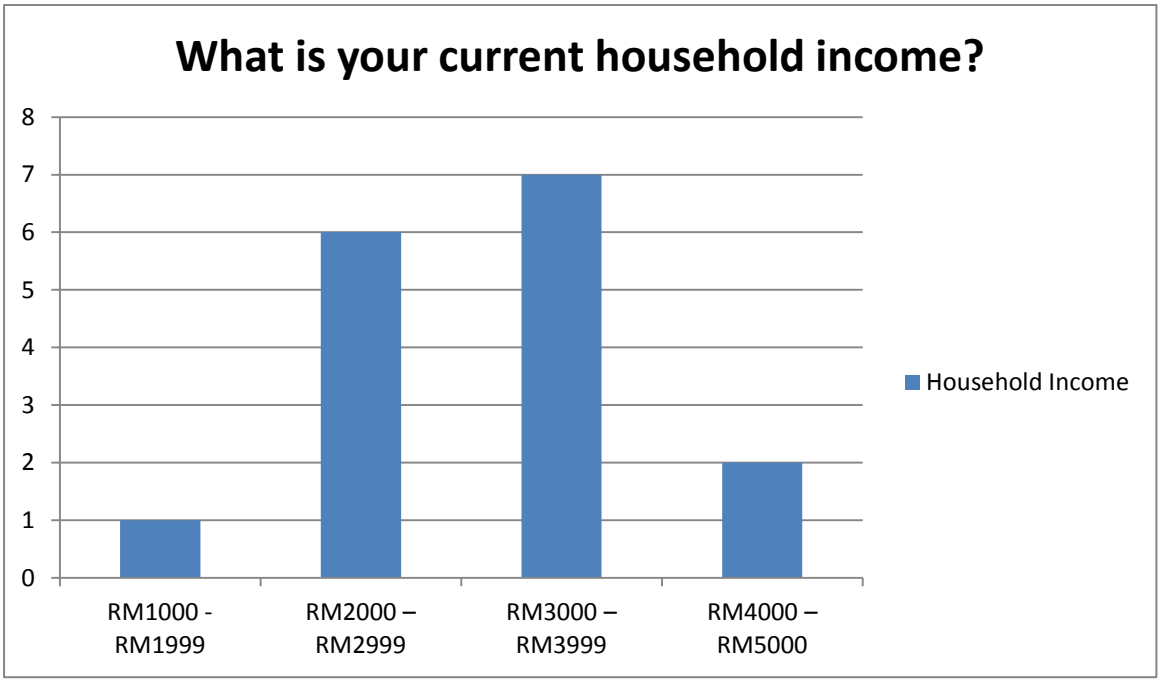


Chart 4.1: Household income of the respondents

The household income for the respondents ranges from RM1000 to RM5000, while most of the respondents are middle income households, earning RM3000 to RM3999. This shows that the survey covers a reasonable amount of different family types from the respondents.

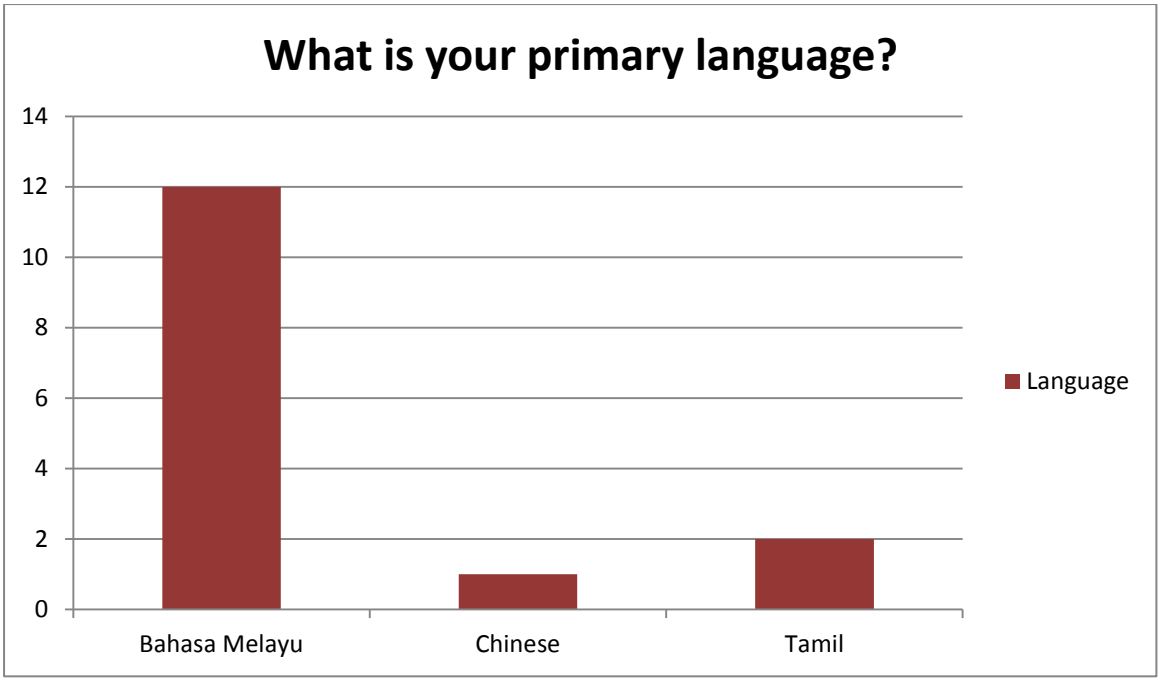


Chart 4.2: Primary language used by the families of the respondents

The majority or 80% of the respondents use Bahasa Melayu as their main language, with the remaining respondents use either Chinese or Tamil. The high amount of Bahasa Melayu users indicates the suitability of that language as the operating language of the proposed system. Bahasa Melayu is also widely recognized regardless of race.

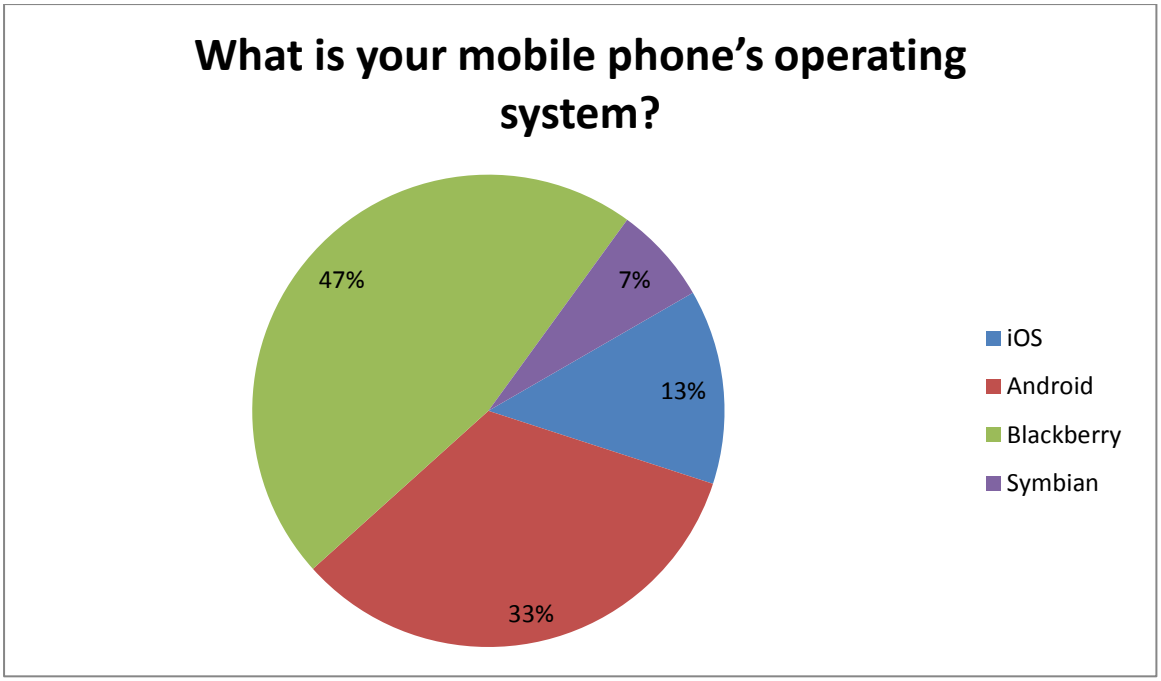


Chart 4.3: The operating system of the mobile phone used by the respondents

Given the wide range of household income, it is presumed that the lower household income would not possess smart phones. However, results from the survey showed that all 15 respondents own at least one smart phone. This is likely due to most phone companies have developed wide range phone models that target different market segments of income, making smart phone affordable even for the lower income families.

The most popular mobile phone's operating system is the Blackberry OS with 47% of the respondents have Blackberries. Blackberries are more popular due to more usage at the workplace with the Blackberry Messaging (BMM) function. The survey also shows that there is a significant amount of Android OS users. Symbian OS users are also considering changing into Android OS phone users when possible due to the outdated feel of Symbian.

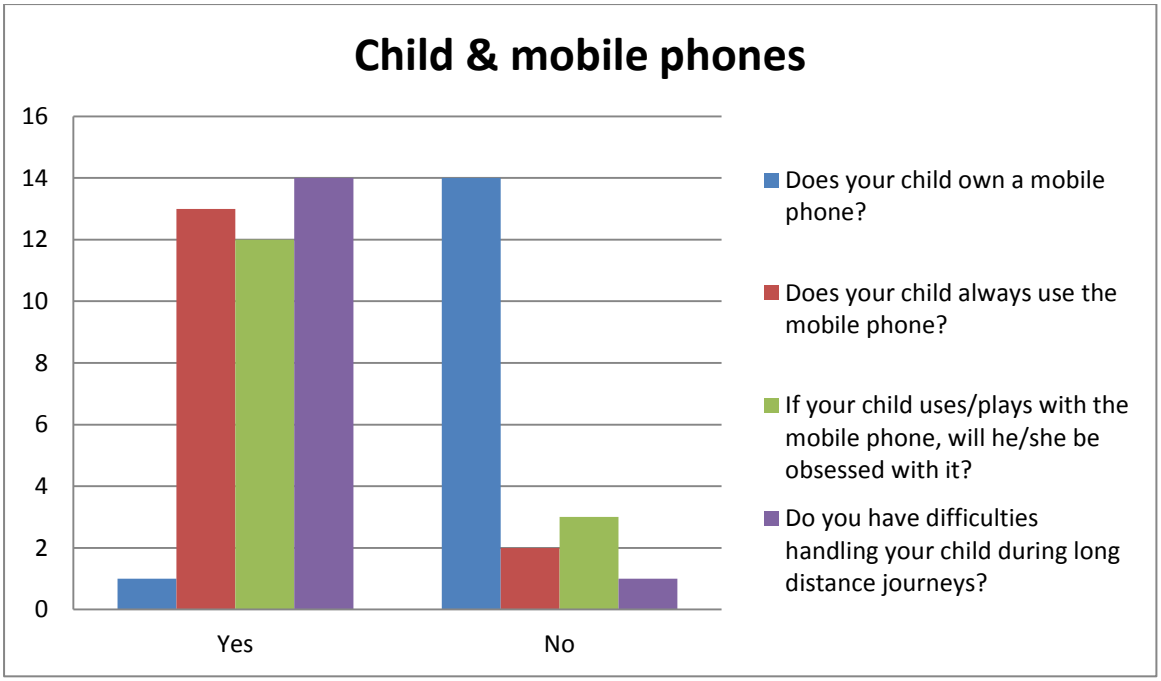


Chart 4.4: Questions regarding children and mobile phone usage

Questions 8 to 10 ask of the behaviour of the child with a mobile phone. The response displayed high mobile phone usage by the children of the respondents. The quantity of children obsessed with playing the mobile phone is also high, which indicates hyper focusing of those children.

Children with ADHD usually become restless in small environment like in a travelling car. Question 11 attempts to find the relationship of giving the child mobile phones as an attempt to keep the child in control, such as in long distance journeys. However, the survey did not show any distinctive relationship in that matter.

The last three questions are related to technological attempts to assist ADHD. When asked if they are aware that there are technological methods that can assist children ADHD, all of the respondents replied negatively. On top of that, all of the respondent's children do not use any technological methods to deal with ADHD. However, when queried if they would be interested if there is a mobile application that can aid their child's ADHD, all of the respondents replied yes. One of the respondents gave a reason, "that it would be good to try multiple methods to help out the kids".

4.2 Results from consulting an expert on early childhood

An expert is needed to give consult on the behavior of children with ADHD and also guideline that could help design the proposed software. Pn Aishah Hanun Azizi from the National Child Development Research Centre (NCDRC) has been approached and agrees to help the project. She graduated from the University of Southern Queensland (USQ) as a Bachelor of Early Childhood, gained her Master's degree from Universiti Perguruan Sultan Idris (UPSI), and is now currently completing her Doctorate in Griffith University of Queensland. She was also the former manager of PERMATA Taska of UPSI. Regarding the design of the software, she gave comments on the following issues to be considered:

- **Android application**

  Pn Aishah likes the idea of having a mobile application to help children with ADHD.

- **Application in Bahasa Melayu**

  As also displayed by the results of the survey, she agrees that Bahasa Melayu is suitable as the operating language of the system. However, since most of the system is about mathematical problems, applying English as the system's language will not entirely affect the response of the user, if not improve English comprehension.

- **Performs simple mathematical tasks**

  Play is important to young children's development. Children's play is a good source of their first mathematical experiences. Solving simple numerical problems can promote thinking and learning in mathematics as well as in other areas.

- **Use images for stimulation**

  She also suggests visual cues to help stimulate the thinking process of the children with ADHD.

- **Improve time management**

  ADHD will often cause organizing problems especially in managing time. If possible, the software could help the children to be more aware of what they used their time for.

Figure 4.1(a) & Figure 4.1(b): Pn. Aishah during teaching session

4.3 Outline and design of proposed system

The system has 3 mini games, all simple mathematical problems that are suitable for children age 5 to 7 years old. These screenshots shows the design of the application is in Bahasa Melayu. By developing the game in the national language, it provides Malaysians with an option to use a program that operates in the native tongue. Programs in English are abundant, while educational tools for ADHD in Bahasa Melayu in non-existent based on a survey within the Android market. This program also incorporates elements from the Malay folklore, such as Hang Tuah and Sang kancil.

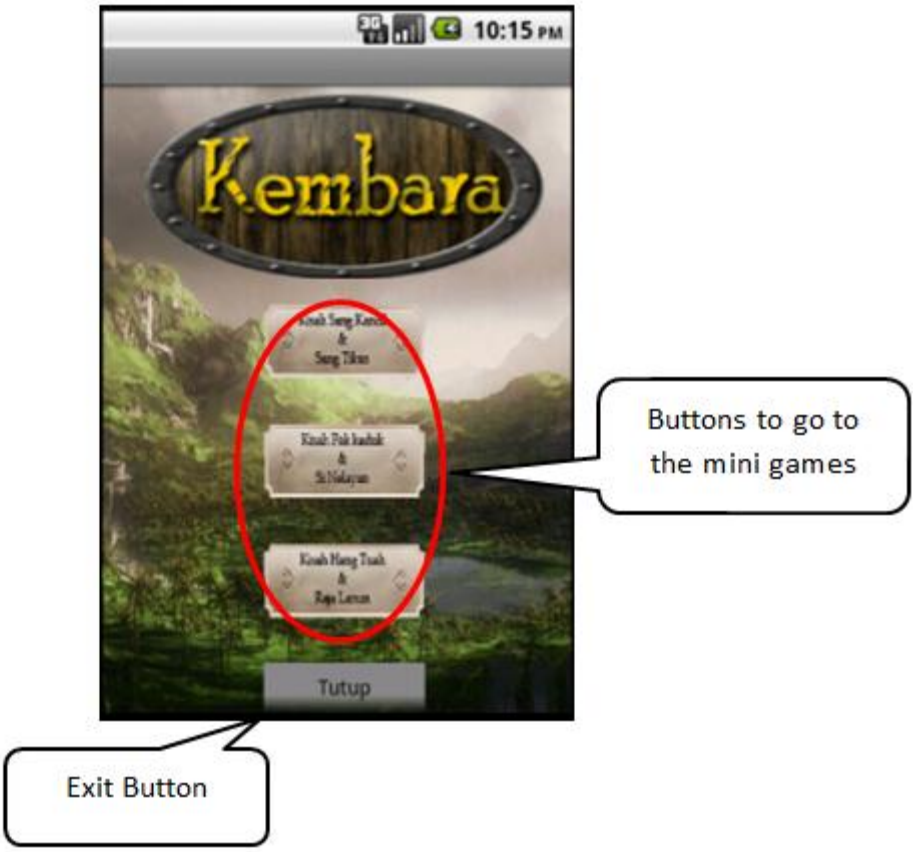


Figure 4.2: “Kembara” starting page

4.3.1 Kisah Sang Kancil dan Sang Tikus (The Tale of Sang Kancil and Sang Tikus)

Figure 4.3: "Kisah Sang Kancil & Sang Tikus" starting page

Figure 4.4: Choosing the length of gameplay time

This mini game starts with a simple storyline, where Sang Kancil, a small deer character from an old Malay folklore, encounters Sang Tikus, a rat. Sang Tikus is trying to steal a farmer's crop & Sang Kancil decides to stop him. The user can help Sang Kancil to trick Sang Tikus by answering a series of questions. The before the game starts, the game prompts the user's name. The user then chooses duration of the game, either 1 minit, or 3 minit.

Setting the game's playing time is an attempt to create time awareness to the user. The study done by Shrieber and Seifert (2009) has shown that ADHD sufferers usually have difficulties in time judgement. Those with ADHD are also known to hyperfocus, a situation when one becomes so absorbed in a task, one completely lose track of time. Most conventional games do not apply timed gameplay, which may cause the game player, especially ADHD kids, to keep on playing, giving the impression of being addicted to games. By creating a timed gameplay system, the play time is limited to the chosen time (1 minute or 3 minute), thus avoiding continuous play. This feature is further enhanced by the bonus point awarded when the user finishes the game below the allocated time.

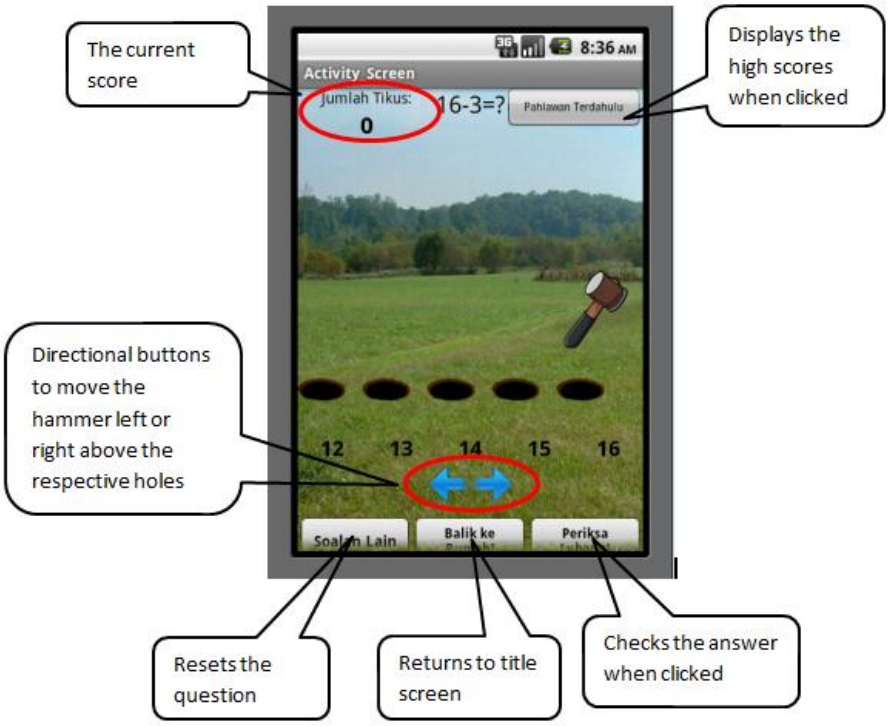


Figure 4.5: "Kisah Sang Kancil & Sang Tikus" game main functions

In basic mathematics, a number line is a picture of a straight line on which every point is assumed to correspond to a real number and every real number to a point [9]. Here, Number Line is a game of addition and subtraction with visual aids to help children to visualize the counting process. The number line technique is particularly useful to ADHD kids, where the movement between numbers provide visual stimulation. Each of the numbers will be shown and arranged in a straight line, hence the name. The game will generate random questions from 0 to 20 in steps of 1, which means the line number displayed will be

from 0 up to 20 with each numbers has a difference of 1. The operation will also be random either addition or subtraction.

There will be a marker above the number line to mark the first number. The user then can use the marker to move up or down the line number. Moving the marker helps the user to visualize the counting process. In this mini game, the marker is represented by a hammer, and the holes with number labels represent the number line.

Figure 4.6: “Kisah Sang Kancil & Sang Tikus” start game

Figure 4.7: “Kisah Sang Kancil & Sang Tikus” Wrong answer selected

Figure 4.8: "Kisah Sang Kancil & Sang Tikus" Right answer selected

The question for this example is "5 - 2 =?", so the user can move the marker 2 values down the number line to reach the number 3. If the answer is right, an animation of the mole being hit by the hammer will be triggered, then the user will get 1 point. If the answer is wrong, the mole animation will appear on other holes to tease the user, then the user is able to attempt to find the right answer again, but no points shall be awarded.

Figure 4.9: "Kisah Sang Kancil & Sang Tikus" Level completed

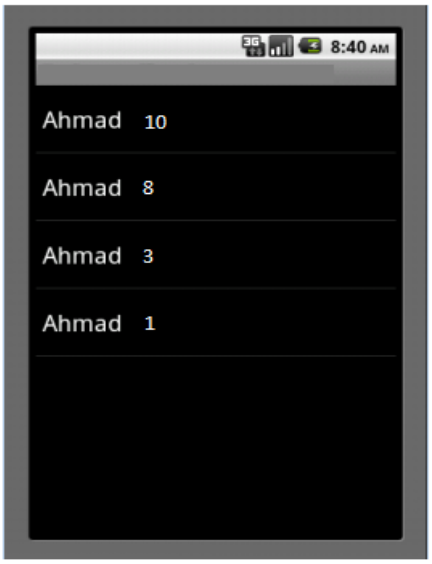


Figure 4.10: “Kisah Sang Kancil & Sang Tikus” High Scores

After designated time is up, a pop up message will appear, notifying the user that the level is complete and how many questions were correct. The user has a choice to try the level again, check the high scores, or exit to the main menu.

4.3.2 Bulatan Nombor (Number Hoops)

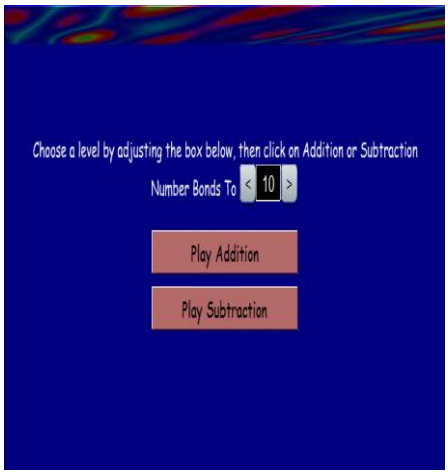


Figure 4.11: Number Hoops starting page

Number hoops is also an addition/subtraction game, but differs on the game play. First the user gets to choose either to solve addition or subtraction problems. Difficulty of the level is set by changing the number bonds. The higher the number bond, the higher the number limit of the questions.

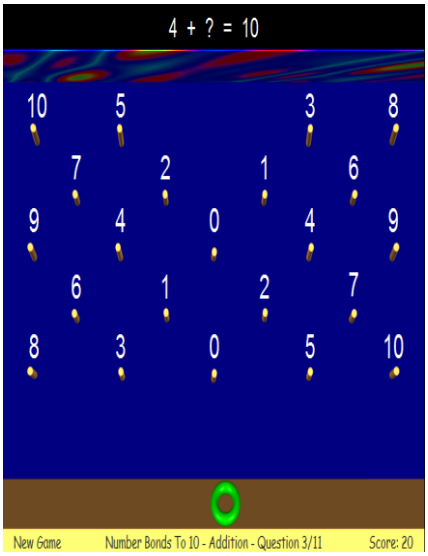


Figure 4.12: Number bond to 10

The number in the middle of the equation in each of the question is left unknown, so that the user must figure out how many is needed to be added or subtracted from the first number to get the number bond. In this case, how many is needed to be added to 4 so that it equals to 10. At the bottom of the screen there is a green hoop.

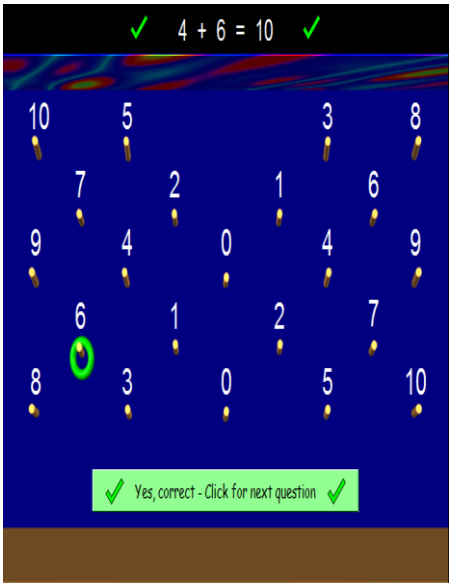


Figure 4.13: Number bond to 10

The question for this example is “4 +? =10”. The user must throw the green hoop at the right answer. If the answer is right, the user will get 10 points. If the answer is wrong, user will be able to attempt to find the right answer, but no points shall be awarded. One level has 10 questions.

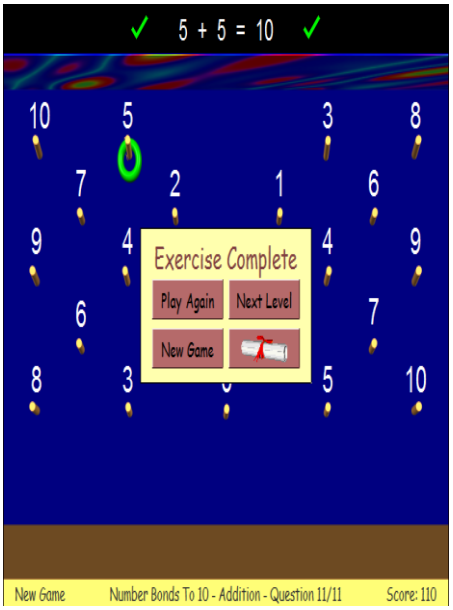


Figure 4.14: Number bond to 10, level completed

After completing 10 questions, a pop up message will appear, notifying the user that the level is complete and how many questions were correct. The user has a choice to try the level again or move on to the next level.

4.3.3 Kisah Hang Tuah & Raja Lanun (The Tale of Hang Tuah & the Pirate King)

The mini game starts with the Sultan of Melaka asking us to help Hang Tuah, the Legendary Malay folklore hero. The user & Hang Tuah will fight off invading pirates of the coast of Melaka from stealing the Sultan's treasure. The game again prompts the amount of playtime desired. The difference between the timed game mechanism of this mini game and the first one is that the amount of time can influence the total score of the user.

The random question generated for this mini game also differs from the "Kisah Sang Kancil dan Sang Tikus" mini game. The question will randomly either leave the middle of the question blank or the answer blank, compared to the first mini game where only the answer will be left blank. This mini game aims to be more challenging than the first one.

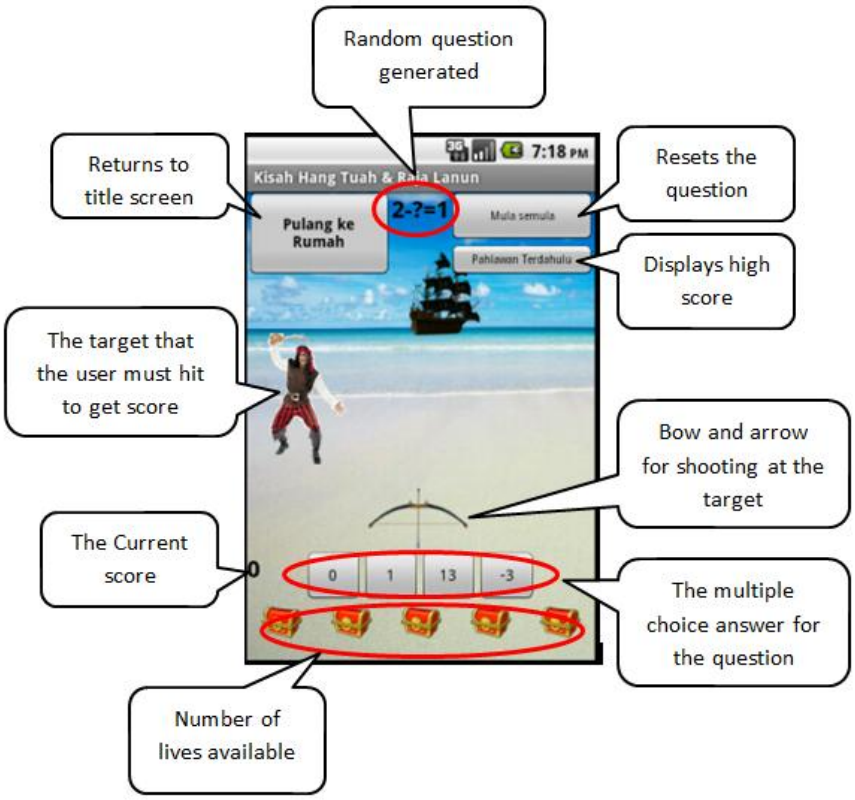


Figure 4.15: "Kisah Hang Tuah dan Raja Lanun" game main functions

The main goal of the game is to answer 10 questions within the allocated time and before the chances runs out (number of lives). There are five chances for each session which is represented by the treasure chests.

Figure 4.16: "Kisah Hang Tuah dan Raja Lanun" Choosing the length of gameplay time

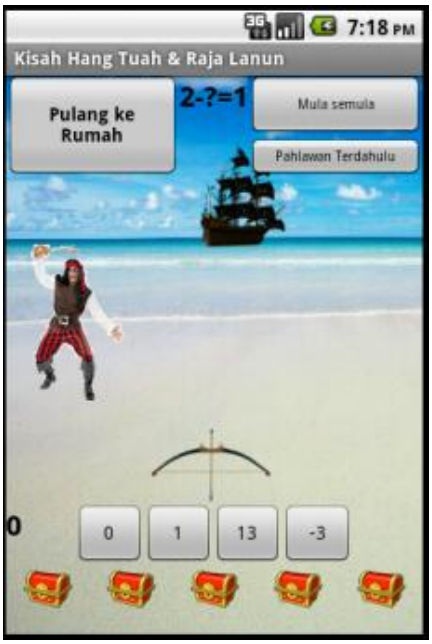


Figure 4.17: "Kisah Hang Tuah dan Raja Lanun" start game

Similar to the first mini game, the program prompts the amount of playtime from the user, either one minute or three minutes. Once the user has clicked on their choice, a random question will be generated. A pirate will come out from the sea, approaching the treasure chests by moving down the screen.

Figure 4.18: "Kisah Hang Tuah dan Raja Lanun" Wrong answer selected

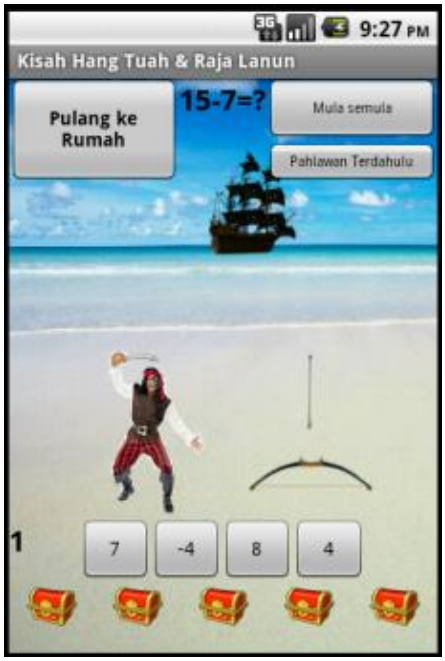


Figure 4.19: "Kisah Hang Tuah dan Raja Lanun" Arrow shoots when right answer selected

The pirate will move down slowly approaching the treasure chests. When the user selects the right answer, an arrow shoots at the pirate, and the user gains one point. If the user did not answer the question correctly by the time the pirate reach the bottom of the screen, one live (treasure box) will be deducted, and a new pirate emerges from the sea (top of the screen).

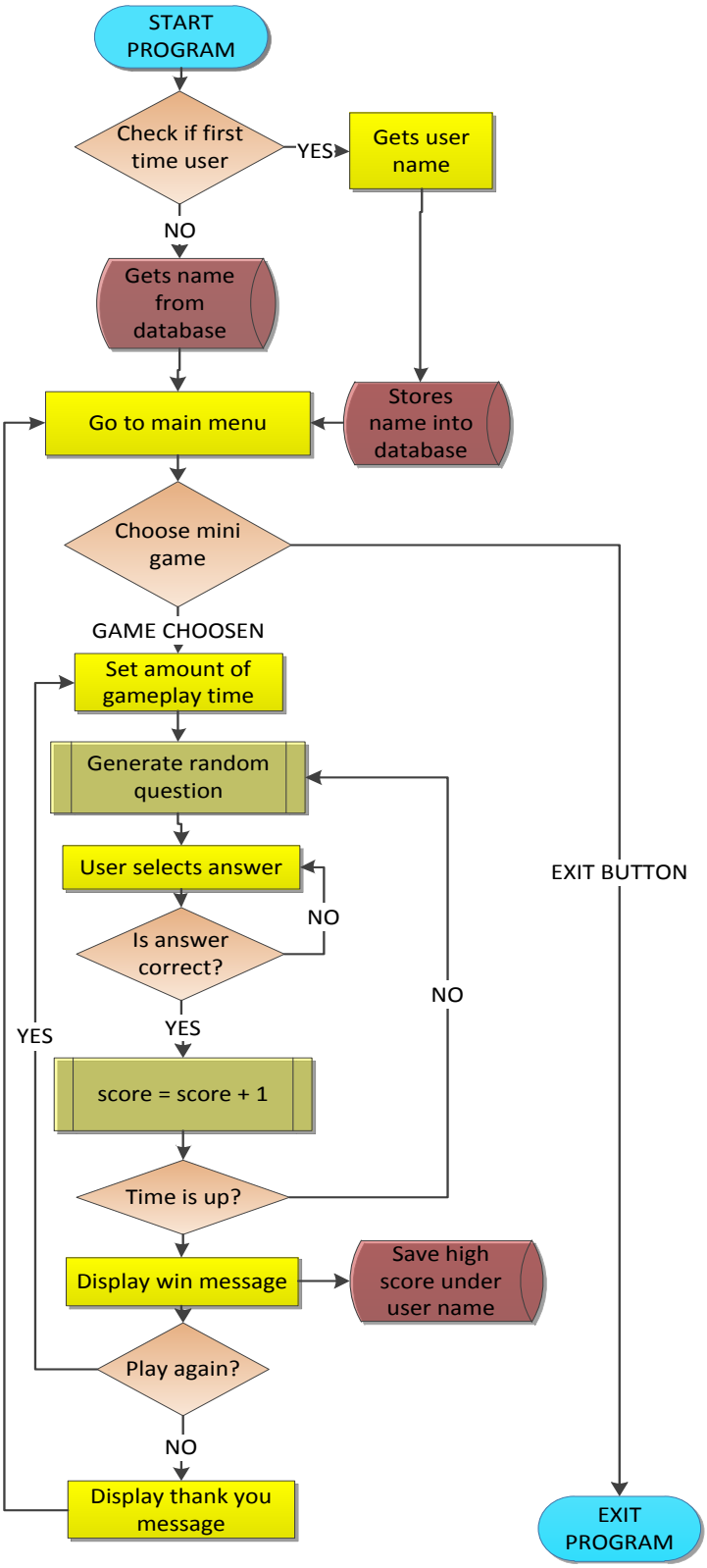
Figure 4.20: “Kisah Hang Tuah dan Raja Lanun” game over

Figure 4.21: “Kisah Hang Tuah dan Raja Lanun” game won

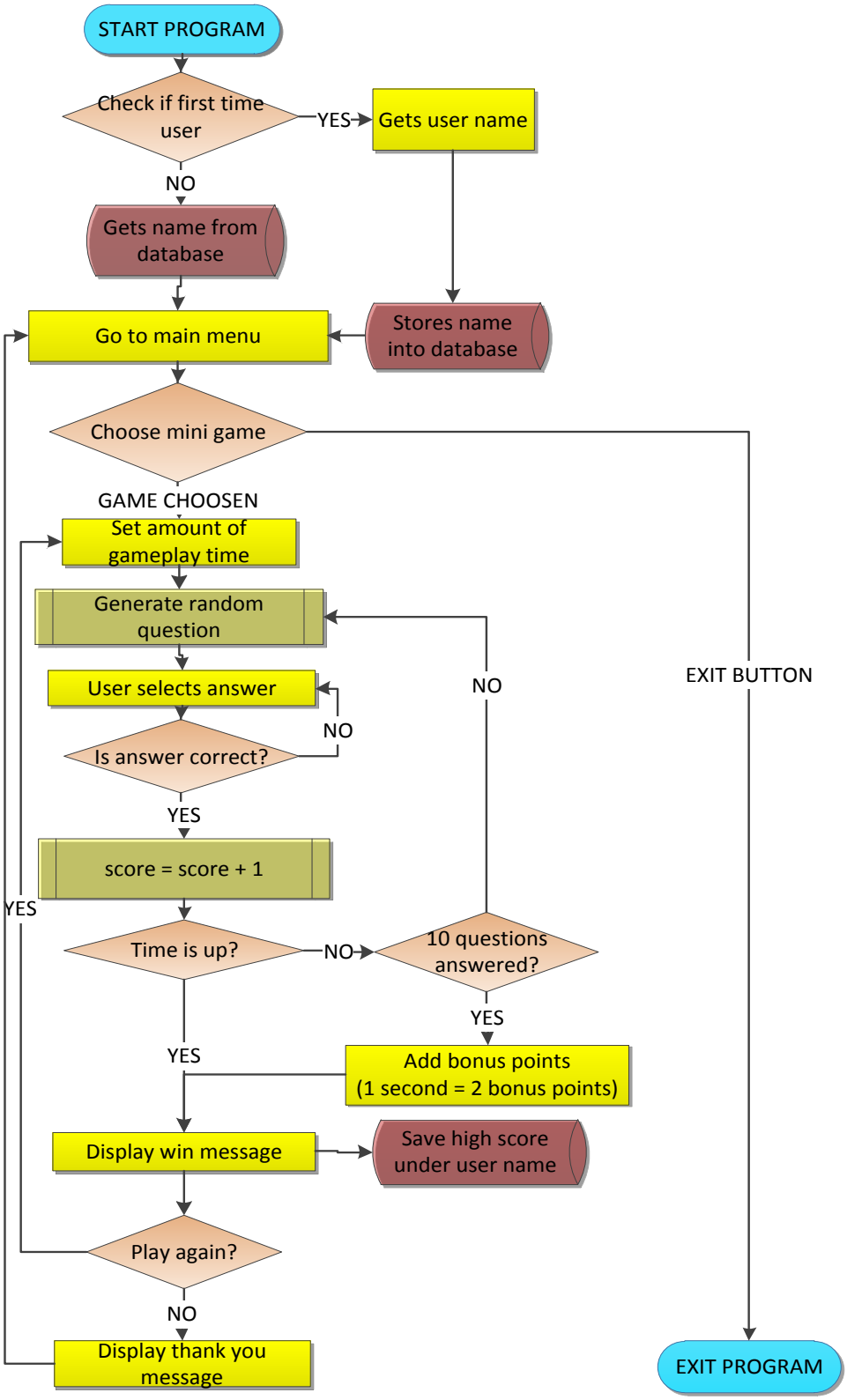
After designated time is up, a pop up message will appear, notifying the user that the level is complete and how many questions were correct. If the user manages to finish the 10 questions before the designated time, bonus points will be awarded based on how many seconds left. The user has a choice to try the level again, check the high scores, or exit to the main menu.

4.4 Program flow chart

4.4.1 “Kisah Sang Kancil dan Sang Tikus”



4.4.2 “Kisah Hang Tuah dan Raja Lanun”



4.5 Post Testing Results

The purpose of the testing phase is to find out how well the system works among the target users and how well can it serve as an alternative for current tools for educating kids with ADHD. The prototype was tested by a 5 year old child with ADHD at PERMATA Taska at Universiti Pendidikan Sultan Idris (UPSI).

4.5.1 Target user reception

- First Impression

  The target child is 5 years old. When first attempting the game, the child was guide partially by the parent to get through the introduction and choosing the mini games. This behaviour suggests that the user interface may have been at a higher comprehension level than the child's level.

- Playing the Game

  The child shows interests while playing the "Kisah Sang Kancil dan Sang Tikus" and "Kisah Hang Tuah dan Raja Lanun" mini games but not the "Bulatan Nombor" mini game. There are no problems during the child's playtime. The line number method employed in the first mini game proves effective as the child play the game smoothly. However, some questions generated are beyond the capabilities of a 5 year old, thus creating confusion for the target child.

- Timed Game Mechanism

  The time limit set during the game does not show any obvious changes in the child's perception of time. More tests is needed for conclusive results.

4.5.1 Alternative for current tools

Generally in Malaysia, most learning tools intended for kids with ADHD or other learning disabilities are non-digital (as shown in the previous section 2.5). However, visual kinaesthetic applied by conventional learning tools, can also be digitalized, as this research attempted. The testing with the child was conducted smoothly. This displays a sign that mobile application can be an alternative for current teaching methods for children with learning disabilities and can be explored further.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Kembara is hoped to be as useful as possible for educationists in order to provide an alternative, if not a compliment to current methods of teaching especially dealing children with ADHD or other learning disabilities.

This mobile educational app can be used to address the need to assist children with ADHD with the assistance of Android OS powering mobile devices.

5.2 Recommendation

1. Creating a storyline for the whole game instead of small mini games.
2. The limit age should be increased to 6 years old instead of the previous 5 years old.
3. Provide record to display children's improvement instead of high scores.
4. Incorporate features that will help other organizing capabilities other than time management.
5. Reduce difficulty level of the questions

5.3 Future plans

The prototype will be further improved for the second testing session. The difficulty level of the program will be decreased slightly due to some of the children find the questions too hard. The prototype will add a third new mini game to be tested by children with ADHD at PERMATA Taska at Universiti Pendidikan Sultan Idris (UPSI).

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APPENDICES

Appendix 1: Questionnaire form

[For each item, please mark the box with the appropriate answer. It would help us if you answered all items as best you can even if you are not absolutely certain or the item seems daft. Please give your answers on the basis of the child's behaviour over the last six months or this school year.]

Untuk setiap soalan, sila tanda kotak yang mempunyai jawapan yang paling sesuai. Ia akan membantu kami jika anda menjawab semua item dengan sebaik yang anda boleh, walaupun anda tidak benar-benar tertentu. Sila berikan jawapan anda berasaskan kelakuan anak anda sejak enam bulan lepas atau tahun ini.0

1.[What is your relationship with the child?]

Apakah hubungan anda dengan anak anda?

☐ **Father**/ Bapa ☐ **Mother**/ Ibu ☐ **Guardian**/ Penjaga

2.[What is your current household income?]

Apakah pendapatan isi rumah semasa anda?

☐ **Under**/ Bawah RM1000 ☐ RM1000 - RM1999 ☐ RM2000 – RM2999 ☐ RM3000 – RM3999 ☐ RM4000 – RM5000 ☐ **Over**/ Lebih RM5000

3.[What is your primary language?]

Apakah bahasa utama anda?

☐ Bahasa Melayu ☐ English ☐ Chinese ☐ Tamil ☐ **Other** / Lain-lain

4.[How old is your child?]

Berapakah umur anak anda?

☐ **5 years old**/ 5 tahun ☐ **6 years old**/ 6 tahun ☐ **7 years old**/ 7 tahun

5.[What is your child's gender?]

Apakah jantina anak anda?

☐ **Male**/Lelaki ☐ **Female**/Perempuan

6.[Do you own a Smartphone? Example: Apple iphone, Blackberry, Samsung Galaxy, Sony Ericsson, Nokia N-series, etc]

Adakah anda memiliki smartphone? Contoh: Apple iphone, Blackberry, Samsung Galaxy, Sony Ericsson, Nokia N-series, etc

☐ **Yes**/Ya ☐ **No**/Tidak

7.[What is your mobile phone's operating system? Tick more if you have more than one smartphone]

Apakah perisian telefon bimbit anda? Tanda lebih jika anda mempunyai lebih daripada satu smartphone

☐ iOS (iPhone) ☐ Android (Samsung, HTC, Sony Ericsson, CSL) ☐ Blackberry ☐ Symbian(Nokia) ☐ Windows Phone 7 ☐ **Other**/Lain-lain: _____

8.[Does your child always use the mobile phone?]

Adakah anak anda selalu menggunakan telefon bimbit?

☐ **Yes**/Ya ☐ **No**/Tidak

9.[Does your child own a mobile phone?]

Adakah anak anda memiliki telefon bimbit sendiri?

☐ **Yes**/Ya ☐ **No**/Tidak

10.[If your child uses/plays with the mobile phone, will he/she be obsessed with it?]

Jika anak anda menggunakan/bermain telefon bimbit, adakah dia akan taksub dengan telefon bimbit itu?

☐ **Yes**/Ya ☐ **No**/Tidak

11.[Do you have difficulties handling your child during long distance journeys?]

Adakah anda mempunyai kesukaran mengendalikan anak anda semasa dalam perjalanan jarak jauh?

☐ **Yes**/Ya ☐ **No**/Tidak

12.[Are you aware that there are technological methods that can assist ADHD?]

Adakah anda sedar bahawa terdapat kaedah teknologi yang boleh membantu ADHD?

☐ **Yes**/Ya ☐ **No**/Tidak

13.[Does your child use any technological methods to deal with ADHD? State the method, if any.]

Adakah anak anda menggunakan mana-mana kaedah teknologi untuk berurusandengan ADHD?
Nyatakan kaedah, jika ada.

☐ **Yes**/Ya, _____ ☐ **No**/Tidak

14.[Would you be interested if there is a mobile application that can aid your child's ADHD? If yes/ no, why?]

Anda akan berminat jika terdapat aplikasi mudah alih yang boleh membantu ADHD anak anda? Jika ya / tidak, mengapa?

☐ **Yes**/Ya,_____

☐ **No**/Tidak ,_____