Visual Approach For Educating Autistic Children

by

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14804

Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the

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Approved by,

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(Assoc. Prof. Dr. Wan Fatimah Bt Wan Ahmad)
Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

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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IMAN NUR NABILA BINTI AHMAD AZAHARI

ABSTRACT

Autism Spectrum Disorders (ASD) are a group of disorders with complex neurological growth disabilities with permanent life-long main characteristics which include overly-dependent on others, impairment in communication skills, and troubles in social interaction. It becomes apparent a child has ASD by the time they reach age 3 years old. There is no cure for autistic disorder, however with early intervention and excellent educational practices may result in rapid improvement of child's skills. Numerous educational practices and approaches have been carried out in order to assist as well as develop these children. One of the new approaches is the Visual Approach, which uses pictures or other visual items to communicate with autistic children, as autistic children are visually oriented. With the rise of mobile technology, visual approach has been implemented in many mobile applications to help these children. Nonetheless, there is no specific mobile application that entirely uses visual approach method, which helps these children with their core drawback that is the lack of independence. Therefore, this project aims to study the best suitable visual approach to assist autistic children in their main difficulties and the methods for it to be implemented in a mobile application. Requirement gathering is done through literature review of research papers, interviews and observations. At the same time, this project methodology is based on Rapid Application Development (RAD), which has an outcome of a project's prototype. The tool used to develop the prototype is App Inventor and Android Software Development Kit. Later, usability test was conducted with a specialist, teachers and children to examine the effectiveness of the mobile application. The results showed that the respondents were satisfied with the mobile application. It is hoped that the application will assist autistic children in daily routine.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

In this new high-tech era, mobile application is currently becoming a common trend and needs in world development. People's productivity is able to increase while using these mobile applications, as it is easy to use in daily actions.

Android operating system, the world's most popular mobile platform, is developing fast and has the biggest installed base of any mobile platform. Not to mention, it gives developer a specific application model that allows implementing their apps largely to millions of consumers throughout a broad variety of devices, whether it's phones, tablets and others. Android's openness has prepared it as an ideal choice for customers and developers, thus motivating sturdy advance in app utilization. Android also provides all the developers necessity to develop amazing app experiences. In addition, Android also offers tools for making apps that look stunning and user-friendly which can be attractive for people from all ages and countries.

Therefore, from using Android mobile application, many developers create apps that give benefits and assist people daily. This can also be a platform to aid disabled group such as autistic children. Autism is a developmental disability that naturally happens in the first three years when a child is born. It is known as a neurological disorder that influences the growth of the brain, resulting in

struggles with learning, communication, and social interaction. Children with autism will not be completely alike. They act and respond differently to normal children.

Hence, this project aims to develop a prototype through Visual Approach for Educating Autistic Children. The prototype is an interactive application that teaches autistic children based on their daily surroundings through visual approach. Though auditory skills of autism children are their weakness, visual learning skills are mostly their strong point. Therefore, in order to support their strength, this app will certainly focus on the visual approach.

The development of this mobile app will provide a platform for autistic children to enhance their independence skills, mainly supporting them with their daily routine. As their independence skills is developed, other major drawbacks like communication and social skills will slowly improve as well. Autistic children will feel motivated and attracted to learn more as this app provides an interface that is suited with their interest and strength. Currently, there are no medications that help to treat the autism core symptoms. But it is well known that the best method for autism treatment should involve special educators, and mobile app can be considered as their special educator.

1.2 Problem Statement

According to May Institute (2012), one of the autistic children's main setback is in communication; language progresses slowly or not at all, and exercises gestures instead of words. Autistic children have troubles in comprehending and responding to what other people are saying. This will result in difficulty engaging social interaction with people around them. Not to mention, this also results for them to be overly-dependent with people around them especially their guardians, as they are unable to understood and carry out their daily activities. They need continuous guidance and supports from others to run their day-to-day routine as they cannot survive by themselves at all. Consultations, special educational programs and therapy approaches in early age can aid autistic children to gain self-discipline, social and communication skills. A

visual approach in education can be considered as a new and one of the applicable methods in which can enhance independence, communication and social skills among autistic children (Meadan, et al., 2011). Nonetheless, there are no specific visual approach methods entirely being applied in mobile application that truly assist autism's main setback which is their overly-dependent, specifically in their troubles of carrying out daily routine. Hence, there should be an application to assist them in a more interactive medium such as mobile app that builds their interest and confident in independence skills.

1.3 Objectives of Study

- To carry out a research on the suitable methods to educate and build interest of autistic children in enhancing their daily skills.
- To develop a mobile application prototype on Visual Approach for Educating Autistic Children.
- To evaluate the user experience and usability of the prototype.

1.4 Scope of Study

The scope of study of this project is to focus on:

- Visual approach to assist autistic children in their daily skills.
- Autistic child age from 7 to 11 years old with middle level education.
- Enhancing autistic children in their independent skills.

CHAPTER 2

LITERATURE REVIEW

2.1 Technology and Education

Since the beginning of human civilization, science and technology has progressed in a continuous process. People's understanding towards technology has been increasing for the past decades. They are more driven to use technology for everyday activities that able to increase their productivity.

Thus technology now has come up to assist other sectors as well including the education sector. Education now has change completely with the help of technology. Not to mention, proven to increase students' growth of performance and skills. Advances in information technology will influences the craft of teaching by complementing rather than removing traditional classroom instruction (Lee, 2010).

The constant computing and communications uprising has plentiful cost-effective and social influences on modern society, especially on education. Education now become more comprehensive with technology influences. Such influences would be appreciated for children as to increase their productivity and then will give contribution to the community. Therefore, with the rise technology, education can now become more stimulating and interactive.

2.2 Education for Disabled Children

Helping the disabled children always have been a key issue in today's education revolution. There are always new and exciting ways to help cater this problem as disabled children are special in their own ways.

The prompt of approach of educating them must be continuously as their need for guidance is very important to live a better life. Disabled children like slow learner, Down syndrome and autistic children, each have their own approach and method to educate them. As each of them have their own personal strength and weaknesses.

It is known that educating disabled children is a worthy investment for the future. Educating these children help decreases welfare costs and upcoming dependence. Not to mention, it releases other family members from caring duties, permitting them to rise employment or other useful obligations (Mattingly & Mclnerny, 2012). It also increases children's growth of productivity and prosperity, which then able to contribute to the society. However, for this particular project, it will be more focusing on how to educate autistic children.

2.3 Understanding Autism and Autism Spectrum Disorders (ASD).

Autism Spectrum Disorders (ASD) are a group of disorders with complex neurological growth disabilities with major characters which include social and communication limitation, sensory impairments and repetitive stereotype behaviour (Virginia Department of Education, 2010). ASD is not an uncommon sickness; it affects approximately 1 in every 165 persons (Fambonne, et al., 2006). It occurs naturally and detected in the child by age 3. ASD is also known as a life-long disorder with no exact cure. Nevertheless, with immediate intervention and excellent educational practices, the children may result in rapid improvement.

There are three main disorders considered subset of ASD, which are Autistic Disorder, Asperger's Disorder and Pervasive Developmental Disorder Not Otherwise Specified (PDD NOS) (Ontario Ministry of Education, 2007). The

most common disorder would be Autistic Disorder, thus this paper will focus on the characteristics and learning theories of autistic disorder.

2.3.1 Characteristics of Autistic Children

Every day, people with autism constantly display that they are trying and able to overcome, compensate for and otherwise manage numerous of autism's greatest puzzling features (Notham, 2012). This definitely tells that autism in all ages are trying their best to have an ordinary daily lives like other normal people. Autism's characteristics can be classified into three major areas: unusual/challenging behaviours, speech/language interruptions and impairments, and the indescribable social interaction skills (Notham, 2012). Even though these three fundamentals may be usual to many autism, not large number of autistic children have the exact similar characteristics with one and another. Every autistic child may show different types of symptoms (AHRQ, 2011).

2.3.1.1 Unusual/Challenging Behaviours

Autistic child may show unalike behaviours compared to a normal child. Whether it may concern the way they communicate with others, interests about certain objects or people, and even in day-to-day activities. For instance, they will often seem to be more comfortable playing alone and find it more troublesome to play with other children. This may result from their difficulty to express their feelings and understanding others as well. Some of the other odd behaviours that may occur are obsession with one specific interest or object, obedience to routine and repetitive behaviours (Alberta Learning, 2003). Autistic child can form a strong attachment to a particular routine or object and become extremely upset once it is altered or removed. They also have an engagement to repetitive or stereotypical behaviour, for example, flapping arms, spinning, rocking and repeatedly asking the same question (Millar, et al., 2002). Unquestionably, an autistic child will behave differently from a normal child, thus the approach to engage and understand them will be differ from a normal child.

2.3.1.2 Communication Impairment

Communication is the main medium for humans to interact with each other and to understand their surroundings. It is also a process of exchanging knowledge and ideas between two or more people. Thus it is vital for children to develop their communication skill at a young age. Nonetheless, another major setback of autistic children is their impairment in communication skills. They are having trouble understanding other people as well as conveying their thoughts and feeling to others. Plus, they have a delay in the development of spoken language as well as the capability to initiate or sustain a conversation with the people around them (Brereton, 2011). This delay unable them to connect with other children, thus lowers their self-confidence and encourages them to play alone in their own imaginative world. This impairment also lowers their self-discipline in carrying out day-to-day routine as they cannot convey their needs and having troubles understanding surroundings. Thus results their overly-dependent towards their guardians. In addition, they have poor concentration, constant questioning or repetitive inquiring, and difficulties in understanding body languages like emotions, gestures and eye contact (West Midlands, 2000). As a result, autistic children are not able to have social bonding and getting what they want and need.

2.3.1.2 Social Interaction Difficulties

Socializing is a skill needed for humans to run their everyday lives by understanding other people's needs and desires, exchanging information, and reliance with one and another. Autistic children face countless obstacles daily, however their complications in socializing with people around them are most challenging. Social interaction difficulties include trouble in peer interaction, drawback in using and understanding nonverbal communication, and restricted imitation of other's actions and sounds (Poliakova & Palkhivala, 2008). As they have difficulty in peer interaction, they have hard time in making friends and might not seem attracted to doing so. On top of that, they are unable to recognize people's feelings and actions, besides may express little or no facial expressions in response to others (Brereton, 2011). Consequently, the

disabilities to socialize with others can be upsetting, to the autistic children along with the people around them. This also result in decrease of their independence performance, whereby restricted social interest may decrease the whole impulsiveness in skill demonstration, thus increasing the need of adult provision. Impairment in social and communication field, contribute to the obstacles around independent performance (Hume, et al., 2009).

2.4 Focus Area of Education

Developing the skills of autistic children's daily life is quite a challenge as each of them has different symptoms and are unique in their own ways. Nonetheless the efforts and practices done by parents, teachers and even specialists to assist are non-stop and differ according to each child's behaviours and strengths. In order to help enhance their life's quality, there are few major areas of education that must be concentrated to. Those areas are communication, social and independence.

2.4.1 Independence

As a child ages, slowly and continuously they are trained to become independent, as they get older they will be out in the real world to run their day-to-day activities. Therefore, parents especially will assist their children to differentiate what is good and what is bad. Nonetheless, autistic children however have impairment in daily activities. They could not understand what is happening in their surroundings therefore it's difficult for them to get involved. In addition, their senses are intertwined and this will result to lack of awareness of dangers (Halcyon Foundation, 2009). Henceforth, it is necessary for them to understand and be trained to become independent as to survive in the future. Not to mention, with independence especially on daily skills, this will definitely encourages them to develop their other skills such as communication and social skills. As they get older, there is a possibility that their parents would not be there anymore to look after them. By gaining the skills required for their daily activities, autistic children will be able to function independently (Virginia Department of Education, 2010).

2.4.2 Communication

Communication is basically the ideal way to begin and end everyday life activities. Whether you are at home doing chores, going to work during the day or even engaging social interaction with friends. Communication is highly important to sustain one's life, whether it's verbal or non-verbal communication. However, most children with autism have a problem in this area. They are having difficulties in languages skill whereby it is hard for them to digest what others are saying (NIDCD, 2010). Not to mention, they have problem even in non-verbal communication like hand gestures and facial expression. Thus parents and teachers could not perfectly speak with autistic child as understanding the child's expression is difficult as well as the child themselves could not express what they want. Consequently, it is crucial to assist these children in developing their communication skills by all means possible. By enhancing language, it can aid in developing socialization and interactions of autistic children with other people (Lewis, 2011).

2.4.3 Social

Social skill is vital as it is a practice to engage with other people daily. It is definitely a skill that must be developed in a young age for the children to make new friends and understanding other people's behaviours. However, autistic children are having disadvantage in this area. They display troubles in relating to people whereby there is impairment in peer interactions and social relations (Virginia Department of Education, 2010). This impairment may result from their weakness in communication skills. How can they engage with others, if it is a challenge for them to convey their expressions? Hence, many people would positively agree that developing autistic children's social skill would be another priority. Effective social skills are crucial to build successful interactions in home and society (Stone, 2010).

2.5 Learning Theories

Children with autism have a different way in learning and accepting information that is distinctive from normal developed children. Based on the life-long nature of autism that cause troubles in communication and social interaction, together with limited and repetitive behaviour, numerous treatments, approaches and theories have been conducted to help these children. The main objectives of these theories are to improve the child's self-learning, communication and social behaviour, along with lessening the rate of restricted and repetitive behaviour (American Psychiatric Association, 2000). There are various approaches and treatments applied in educating autistic child. Nonetheless, the main approaches are Applied Behaviour Analysis (ABA), Social Communication, Emotional Regulation and Transactional Support (SCERTS) and Visual Approach.

2.5.1 Applied Behaviour Analysis (ABA)

ABA is the strategy, application, and assessment of environmental adaptations to produce socially meaningful enhancement in human behaviour (BACB, 2012). ABA approach comprises the practice of direct observation, evaluation, along with practical analysis between the interactions of environment and human behaviour. Plus, it modifies surrounding events and activities to create useful and essential transformations in child's behaviour, which include their unusual and repetitive routine. ABA is the implementation of educating and incentive to the solution of social implication's problems (Granpeesheh, 2009). ABA is studied as one of the best practice treatments that was accepted its practicality, quality, and effectiveness. However, this approach may take long time to give result and progress, as a strong ABA program includes endless individual training, supervision, family training and team meeting (ART, 2012). This approach may give an impact to the children; however, they may still need supervision in their daily training and a longer period of time.

2.5.2 Social Communication, Emotional Regulation and Transactional Support (SCERTS)

SCERTS encourages broad educational approach that provides an opportunity and sequence of progressive goals by concentrating on significant, realistic progress within daily routines at school, home, and in the society (Barry, et al. 2010). The purpose of SCERTS is to gain developmental accomplishments such as social interaction, communication language and emotional growth. It also provides an outline for educators and parents to select interactive and learning supports that are effective for their autistic child. SCERTS promotes child initiations in everyday communication, which naturally concern practical and related skills situations and different partners (Wilson, 2010).

2.5.3 Visual Approach

Visual approach is a new technique in educating autistic children, which uses pictures or other visual items to communicate (Loring & Hamilton, 2011). The best suggested approach for educating autistic children is to use visual approach. This is because autistic children are known for their visual oriented characteristic, which visual approach will certainly support them well. They frequently display strengths in concrete thinking, memorization, and understanding of visual relationships, and struggles in abstract thinking, social perceptive, communication, and attention (British Columbia, 2000). Therefore, with the help of visual approach, autistic children are more motivated and are able to develop more as their key strengths are being applied daily.

2.6 Visual Approach in Teaching Autistic Children

According to Gray (2003), the visual approach has been very applicable in enhancing reading skills for young students with autism. The procedures, progressive development is well defined and simple for teachers and parents to apply and keep record of the child's improvement. A rising understanding of the visual learning practice of autistic children was becoming popular in the academic society (Janzen, 1996). Autistic children go thru their daily routine by

visual supports. It eases them from the pressure to recall what happens afterward, give a clear path between actions, and aid them to manage time. The directions and info that shown to them visually can last a long time, as well as they may refer to it whenever they want, as it will not change. Most applicable pictures or visual items used to assist these children is by using real pictures. Studies shows that by using real pictures, children able to better understand and apply those visual items as it is related to their surroundings. Animated pictures or symbols might be confusing to them, as those are not similar and not actual to what they see in the real world. Thus by using visual approach, autistic children are able to secure their understanding and being independent with their daily routine as there is a visual guidance that they able to refer continuously. Not to mention, children are more motivated to always use the visual aids as they are not feeling pressured or burden using them.

2.7 Mobile Application on Android for Autistic Children

Mobile technologies are a popular trend nowadays. With technology's uniqueness and interactive interfaces, day-to-day events now appear to be more simple and entertaining to participate with. Additionally, mobile technology has already begun to penetrate the education market as well as making disabled children's lives simpler. Education is now considered more enjoyable with the help of technology. Children are more interested and learning further with the use of technology as the interfaces presented are more eye-catching. For an autistic child, it is essential to keep them interested in learning, as they are easily distracted with other things. Therefore, with the aid of mobile technology devices like iPad or tablets, they can be more focus and motivated to learn and thus continuously using it. Most autistic kids respond well with the visual display that iPad offer and even though sometimes technology is inconvenient, with iPad is definitely easier for kids with autism than without (Stone, 2011). Moreover, mobile devices can also act as a medium of communication for autistic children. This will assist them in understanding and developing their skills as well as engaging with others. Mobile devices provide a way to communicate their needs and feelings (Coppin, 2011).

2.8 Previous Related Work

There are a few development of mobile application for autism that has been done on the past few years. Nonetheless, these works may have minor setbacks in assisting the autistic children.

2.8.1 Choiceworks by Bee Visual, LLC

The Choiceworks app is a learning tool for assisting children to accomplish their daily routines (morning, day and night). This app is aimed for caregivers to offer clear and reliable support to adoptive a child's independence, progressive behaviour, and emotional directive at home and in public. However a few setbacks of this application are the interface of the application is quite crowded and consistently uses symbols. For an autistic child, they cannot concentrate too many things at one time, this will give them confusion and stray away from focusing the app. They also cannot understand symbols and what their meanings are. It also does not using real pictures in its interface, which may be difficult for an autistic child to relate with their surroundings. Figure 2.6.1 shows the example of Choiceworks interface that has symbols and animated pictures, giving difficulty for an autistic child to comprehend.

Figure 2.1: Choiceworks by Bee Visual

2.8.2 Proloquo2go by Assistiveware

Proloquo2go is an alternative communication application designed for autistic children. The idea was to help them by constructing sentences using symbols, which will enhance their communication skills. However this particular app only focuses on communication and lack of routine assessments that can improve their independent skills. It also does not using real pictures in its interface, which may be difficult for an autistic child to relate with their surroundings. Figure 2.2 shows the example of Proloquo2go interface that has too many elements on a single interface. This may be too crowded for an autistic child, as they cannot focus on too many things at one time.

Figure 2.2: Proloquo2go Interface

2.8.3 ABA Flash Cards & Games by Innovative Mobile Apps

Figure 2.3 is an ABA Flash Cards & Games interface, a simple application that helps children to understand human activities around especially on emotions. This application uses visual approach by implementing real pictures that can help autistic children to relate in their daily lives as well as to improve their

social skills. However, this ABA Flash Cards & Games does not promote the routine assessments and thus unable to improve the independence of a child.

Figure 2.3: ABA Flash Cards & Games interface

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Software Development Life Cycle (SDLC)

For this particular project, Software Development Life Cycle (SDLC) is implemented to assist the project development. SDLC is fundamentally a sequence of phases, which construct a model for the progress and lifecycle management of this mobile application. The SDLC methodology commonly contains the following phases, which are analysis (requirements and design), development, testing, release, and maintenance (response from client). Thus, in order to build the prototype, the appropriate tools and technique must be recognized. One of SDLC model that is Rapid Application Development (RAD) will be applied as the development method. RAD uses prototyping approach in the project progress, hence it is also termed as prototyping model.

3.1.1 Rapid Application Development (RAD)

SDLC model that applied for this project is Rapid Application Development (RAD). By following RAD model, developers are able to produce a prototype at a much early stage and the end users can examine this live system then give feedback for improvements. Understanding the autistic children is quite difficult in terms of what their likes and dislikes, thus by producing an early prototype and having it tested, it will assist in knowing what they want in the final result. Moreover, in progress to create the final product, few prototypes will be needed to further testing from the autistic children whether it is accepted as their daily education. Figure 3.1 shows the RAD diagram that comprises of four phases,

which are Requirement Planning, User Design, Construction and Cutover.

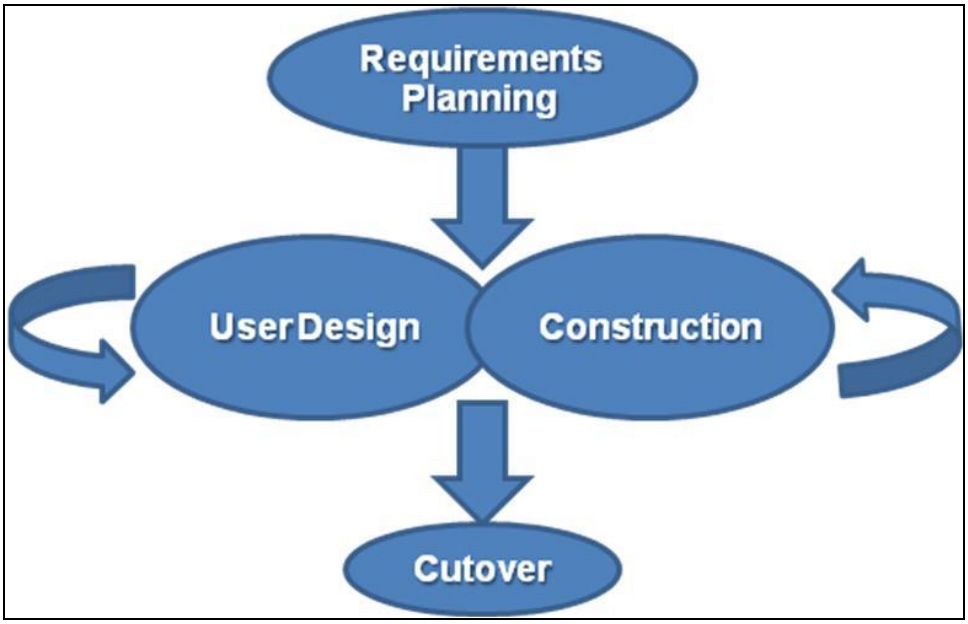

Figure 3.1: Rapid Application Development (RAD) Diagram

3.2 Project Activities

The project activities are based on RAD model, which comprises of four phases in the software development life. The project activities are as follows:

3.2.1 Requirement Planning Phase

In requirement planning stage of RAD model, the requirements are identified. A few stages of research will be done in order to identify what are the requirements needed for this project. Stage 1, a research is done to determine the characteristics of autistic children. Whereas Stage 2 will be concentrating on identifying the focus area of education including teaching methods for autistic children. Lastly Stage 3 focuses on the vital requirements of prototype development.

Various methods are used to gather those research requirements. These methods include reading through research papers on autistic children and their effective

education theories, carrying out interviews from teachers, and lastly, engagement and observing the autistic children's daily routine.

3.2.2 User Design Phase

In this phase, the design work is prepared for the system; the design is studied and constructed based on data gathering and user's requirements. During this phase, developers and user will join in the discussion, which used to combine tools needed for the prototyping of system design. The product of the end user design should result with a primary draft of the user interface and scheme describing the connections of data and process.

3.2.3 Construction Phase

The prototype code is developed with the design as the base in construction phase of RAD model. Supervisor and user will contribute to certify, evaluate and other aspects of the application design. This phase will give outcomes of finalized design prototype, framework of system process and prototype builds using App Inventor.

3.2.4 Cutover Phase

The app prototype is implemented in user devices or emulator, and thus the user acceptance testing and user training is performed. Testing is important to see whether the autistic children are accepting with the new change of routine with the application implemented. This would be a best practice, to understand further want they desire.

3.3 Tools and Software Involved

3.3.1 App Inventor

An open-source App Inventor for Android is Google's powerful visual programming tool to support developers to create apps for Android-based devices. App Inventor is able to develop applications for Android phones by a web browser and either they are connected to phone or emulator. App Inventor also has servers that store developers' work and assist them to keep track with their tasks. It is definitely easy to use and recently now becoming more advance. In addition, App Inventor is not only known for a prototyping system or an interface designer, but developers are also able to create complete and functioning apps. App Inventor includes a designer, block editor, compiler and an app. App Inventor also encourages exploration and innovation, and is able to build an app precisely how users want it.

3.3.2 Android Software Development Kit (SDK)

Before developing Android applications, Android SDK must to be installed. Android software development is the procedure by which innovative applications are produced for the Android operating system. The applications are mostly coded in the Java programming language using the Android SDK, but there are further development tools available. Nonetheless, Android SDK is far more compatible and user friendly compared to the others.

3.3.3 Android Devices

During the testing phase or in RAD, the cutover phase, the prototype application will be installed in the Android devices, to better understand the smoothness of running program. Not to mention, this is crucial, to get feedbacks and responses from clients regarding on what to improve for the end product.

3.4 Project Gantt chart

Table 3.4.1 and table 3.4.2 displays a Gantt chart for the project study plan for FYP 1 and FYP 2 respectively, which includes of the project processes and milestones. These project processes and milestones will be set as guidance to satisfy all requirements needed to achieve the end product of this project.

No.	Detail/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Selection of Project Topic	■	■												
2	Preliminary Research Work		■	■	■	■									
3	Submission of Extended Proposal						●								
4	Proposal Defence								■	■					
5	Project work continues										■	■	■		
6	Submission of Interim Draft Report													●	
7	Submission of Interim Report														●

● Suggested milestone
■ Process

Table 3.1: Study Plan FYP 1

No.	Detail/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Project Work Continues	■	■	■	■	■	■	■								
2	Submission of Progress Report							●								
3	Project Work Continues								■	■	■	■	■			
4	Pre-SEDEX										●					
5	Submission of Draft Final Report											●				
6	Submission of Dissertation (soft bound)												●			
7	Submission of Technical Paper												●			
8	Viva													●		
9	Submission of Project Dissertation (Hard Bound)															●

● Suggested milestone
■ Process

Table 3.2: Study Plan FYP 2

CHAPTER 4

RESULTS

The result of this project comprises of the design of the prototype and the findings from the user testing conducted. The prototype was designed according to the requirement gathering based on research papers and interviews done. The user testing was consist of several important users include an autism specialist, teachers and autistic children.

4.1 Prototype

The end result of this project is to build a mobile application prototype on visual approach for educating autistic children. Thus a user interface was designed and created in order to attract autistic children as well as to enhance their independence in their daily routine. This prototype is based on the user requirement gathered from literature reviews and interviews from the teachers and specialist. It mainly provides an interactive and fun medium for autistic children to learn and improve their independent skills. Children now able to further understand and apply the skills learn from the app to real lives activities.

'Little Routine' is a name given to this particular mobile application. The main idea of Little Routine is to teach and lead the children with autism to recognize and learn daily activities as well as routine in various places at home, such as in bathroom, living room, kitchen and bedroom. For more fun and interactive experiences, these routines will be shown through a video display. All the children have to do is click the pictures based on the routine they want to do and

then video of the routine will be shown. Figure 4.1 shows the flow of the prototype app that comprises of routine activities. Children able to choose which routine they want to do at home.

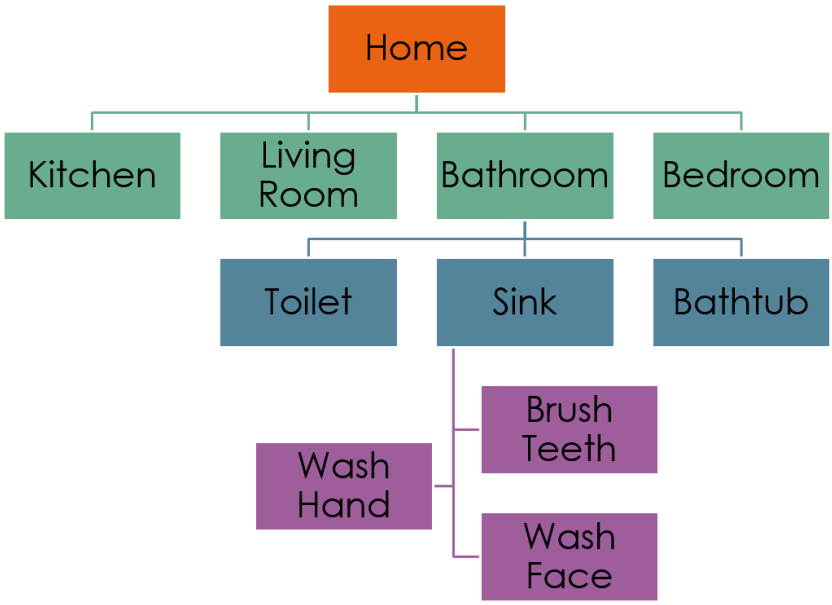

Figure 4.1: Flow of Prototype

Figure 4.2 displays the main page of the app, which shows a picture of a house. The app interface is simple with sound effects and applies colourful real pictures to attract autistic children's attention and thus will motivate them to continue using the app. In the main page of Little Routine also has a few animations like a moving tree, flying bird and open-close door. These animations definitely will assist and help them to be more attracted and motivated to continue using the application. As they click the front door of the house, the app will lead them to the inside of the house.

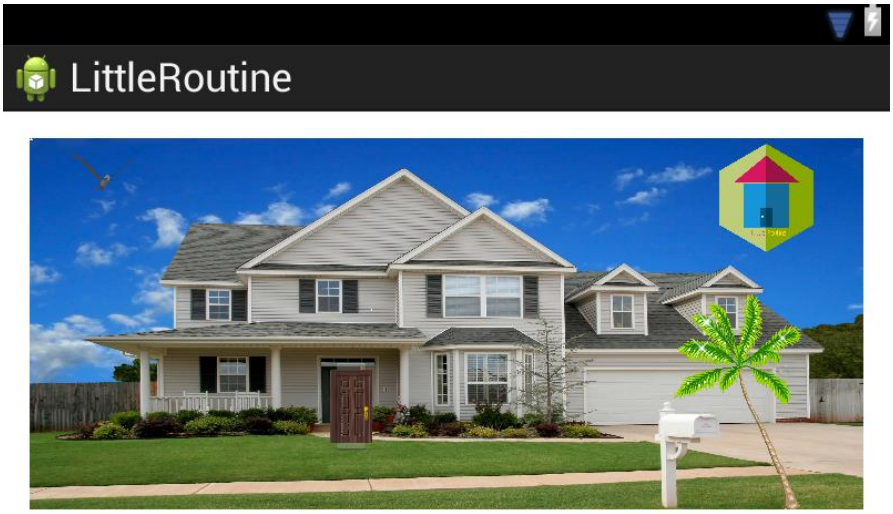

Figure 4.2: Main Page Home

Figure 4.3 shows the Routine Selection Page whereby children can choose which routine location they want to perform. There are three options, which are Bathroom, Kitchen and Bedroom. These locations are basically related with the children's lives, and thus will assist them in improving their independence. At this moment, only the bathroom routine can be used and played by the user.

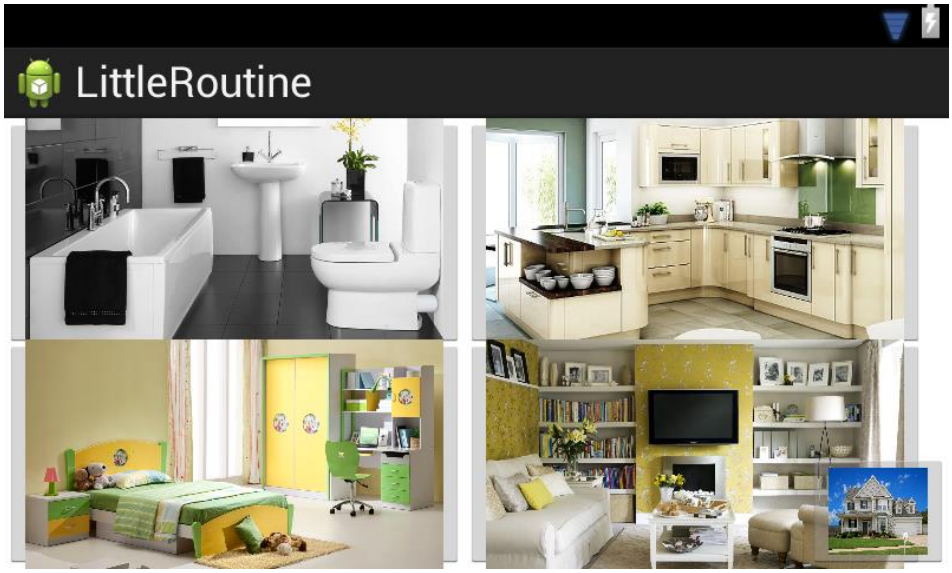

Figure 4.3: Routine Selection Page

Figure 4.4 displays one of the routine examples, which is the bathroom routine. The interface is simple and easy to understand, as well as using real pictures as children can relate them to their real life activities. Children will just have to

click on the spaces of the picture, which routine they prefer to do. They can either click at the bathtub, toilet, sink, and toothbrush. Each of the picture will then be directed to a routine video.

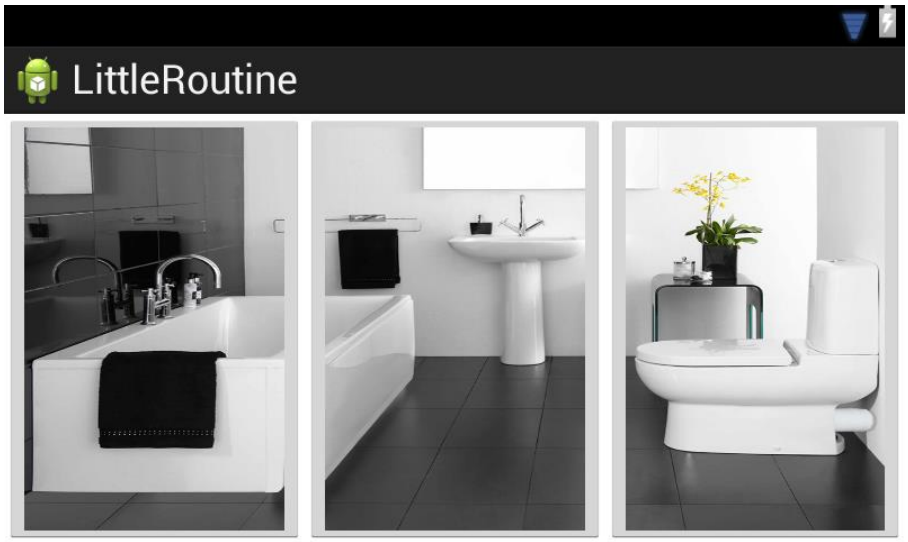

Figure 4.4: Bathroom Routine Recognition

Figure 4.5 displays the next phase of the routine that is the routine training page. This page shows an easy way to perform child's everyday routine through an interactive video display. Thus assist in developing their independence by viewing the video shown. They can also repeat the video or pause it according to their needs.

Figure 4.5: Routine Training Video

4.2 User Testing

As the user design and prototype has been developed, the next phase of the project process which is the cutover phase has also been done. The cutover phase include several user testing processes from specialist, teachers and autistic children to further understand the effectiveness of the mobile application developed.

4.2.1 User Testing with Autism Specialist

User testing done with the specialist was the first cutover phase done. The specialist has observed the design of the prototype and the result of the user testing are as below:

- The application is focusing to improve too many children's setback at one time, which eventually become difficult to implement to an autistic children. Thus, the application should however focus to overcome one specific setback of an autistic child.
- The mobile application does uses a few animated pictures and symbols. This is not an appropriate method to help these children, as they could not understand what those visual items meant.
- The mobile interface is too crowded. Children could not process too many visual items at the same time. The application interface should be simpler.

As a result from the user testing, this project manage to come up with a second version of the mobile application with a few major improvements. From focusing to more than one major autism's setback, the application now focusing to one setback to improve, which is to develop the child's independent skills. The mobile application is now only uses real pictures and simpler interface to make it more understandable and interactive for the children to learn from.

4.2.2 User Testing with Teachers

One of the user testing is done by interviewing teachers to further understand and experiments the reliability of the application prototype. Two primary

schools were involved in the user testing, namely SK Coronation Park Ipoh and SK Seri Tronoh. 4 teachers were involved in the user testing process, and it is believed that it is important to for teachers to test the application as they know best what the children need as medium to improve their daily skills.

Figure 4.6 displays the result from the user testing of the teachers. From the user testing, all of the teachers claimed that the application is definitely helpful for the students to use. Next, 3 of them said that the application is positively interactive, and 1 of the teachers denied it. This is because, the 1 teacher claimed that the application is too dull and should have a simple animation to make it more interactive. Furthermore, all of them do agree that the application is easy to use and they would all certainly use it again in the future.

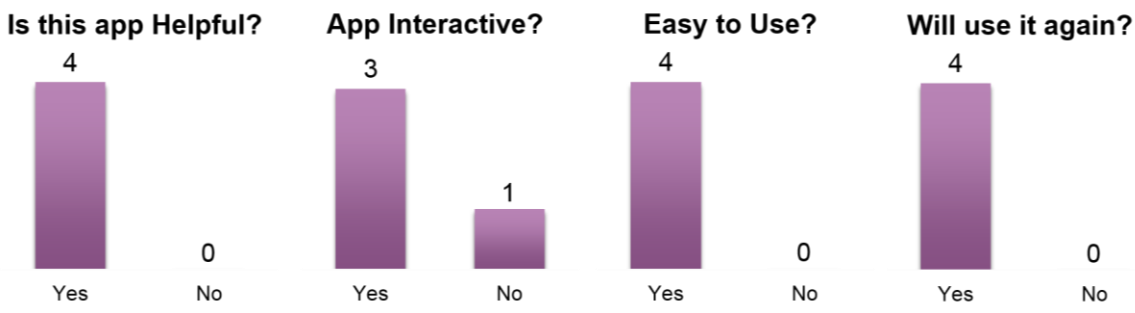

Figure 4.6: Teacher User Testing Result.

4.2.3 User Testing with Children

Another of the user testing is done by observing the autistic children to further comprehend and tests the dependability and effectiveness of the application prototype. Two primary schools were involved in the user testing, namely SK Coronation Park Ipoh and SK Seri Tronoh. 5 students were involved in the user testing process. The students were given a chance to use the application, and observation were done to know whether the application manage to assist the children in their daily activities.

Figure 4.7 displays the result from the user testing of the children. From the user testing, it is found out that 4 out of 5 children continue and motivated to

use the application. While one of them, did not continue and began to do other activities. Next, all of them did had fun from using the application as they were excited to start using the application. Furthermore, 2 out of 3 children however did not understand what the video shown application is about. They cannot really see what is the routine is showing. Lastly, the most important observation was to see whether they children follow the routine shown in the application. Fortunately, only 1 of them did not follow or imitate the routine shown. The child had trouble to comprehend what the routine is about.

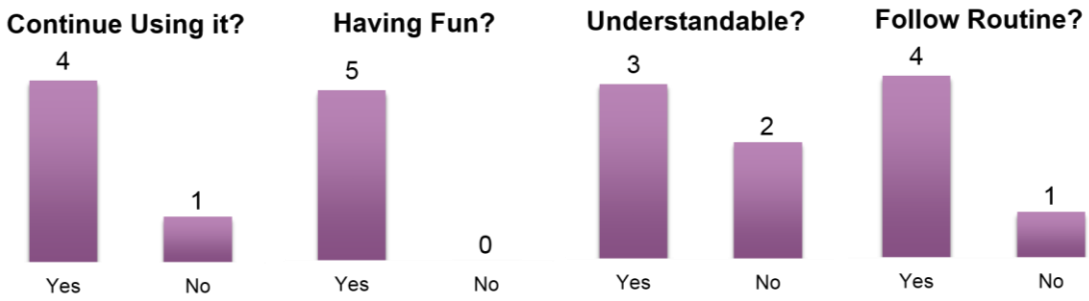

Figure 4.7: Children User Testing Result.

The result gathered luckily does show positive feedbacks from the most of the children. However, minor number of them still having a hard time to understand and continue motivated to use the application. The next phase of the project prototype is to enhance the application by adding more interactive moving real pictures and high definition video display so that the children could clearer observe what the routine is about.

CHAPTER 5

CONCLUSION & FUTURE WORK

The aim of this project is to create a mobile application prototype based on visual approach to educate autistic children. Thus a prototype named 'Little Routine' was develop to satisfy the objectives of this project. Little Routine is a simple yet interactive mobile application that targets to attract and motivate autistic children to learn daily routine skills as well as assist to enhance their independent skills.

Based on the user testing done, the project found out that most of the teachers are very interested with the development of the application. They also believe that the application is definitely helpful to aid and develop autistic children. Moreover, testing with the autistic children also produces good respond as well. Most of them are attracted and motivated to use the application and have no trouble understanding what the routine shown is all about.

Nevertheless, not all user testing produces good feedbacks and the application receive some recommendations. Thus, the mobile application do need several amendments in order to improve the application in the future. One of the main recommendations is to create a more animations and jiggles in the application. The current application is quite dull and too simple in order to attract the children. By adding more animations and jiggles, this will positively help to make the application more attractive.

The next recommendation is to add more possible routines in the application to further aid autistic children in their daily activities. These routines will allow

them to learn and explore more knowledge by themselves, which will develop their self-confidence and independent skills. The next phase of Little Routine will include routines at school, playground and other places.

To conclude, this mobile application strive to support and assist autistic children in enhancing their daily activities especially in their independent skills, which subsequently give an impact on their communication and social abilities. This project is expected to achieve its objectives successfully, thus creating an application that improves and motivates autistic children's everyday accomplishments.

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