Assistive Courseware for Dyslexic Children To Increase Learning Abilities Based on Kinect Technology (ABCDyslexic)

by

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12761

Dissertation submitted in partial fulfillment of

the requirements for the

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CERTIFICATION OF APPROVAL

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Approved by,

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(Assoc. Prof. Dr Dayang Rohaya bt Awang Rambli)

UNIVERSTI TEKNOLOGI PETRONAS
TRONOH, PERAK
August 2012

CERTIFICATION OF ORIGINALTIY

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 reference and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or person.

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Muhammad Shafiq bin Shahat @ Sehat

TABLE OF CONTENTS

TABLE OF FIGURES

ABSTRACT

It is well known that every child whether it be in pre-school or primary school have the difficulties to start to learn about language. They do not recognize the alphabet thus making them to read or write even a word is hard enough. Teachers will teach them and assist them in this situation and usually those children will passed from this stage after some time. But there's a medical conditions where some children have the difficulties to even recognize the shape of the alphabet and effecting in further progress of the studies about language. Those children faced a language-based learning disorder that interferes with the acquisition of print literacy which refers to reading, writing, and spelling. This learning disorder called as Dyslexia which refers to difficulties in reading, writing, and spelling. There is a lot of technique that created special to assists dyslexic children that mainly based on multisensory approach. It optimizes the usage of all sensory organ of a student in learning process. Previous method may not be fully utilized because of the limitation of the apparatus that needed in optimizing the use of sensory organ. So the proposed system is a courseware based on Kinect to help dyslexic to improve learning abilities was presented. The propose system will help dyslexic children to improve their learning abilities by using Kinect that will maximize the use of all sensory organ and based on the English syllabus for primary school in Standard 1 and Standard 2, that officially prepared by the Ministry of Education.

The objective of this study is to identify and limitations of the current ways of teaching English to dyslexic pre-school children. Extend its purpose to the investigation of the use of gesture-based learning approach for teaching & learning to dyslexic pre-school children. Then, it purpose also to develop a courseware that based on Kinect and also to conduct user's perception study towards the develop course. It focuses on dyslexic children at the age of 5-10 years old.

During the development process, the incremental and Iterative methodology is chosen. All the analysis, design, and implementation phases performed at the same time thus producing a prototype on each phase. The cycle repeated continually until the final prototype successfully meets the requirements. At first the system should be develop using Microsoft Visual Studio C# and Kinect SDK, but after a few prototyping process, the system has been changed and develop using Adobe Flash. The Kinect application also unattached between the applications as it will allow user that don't have Kinect to run the application. User may use Kinect or Mouse as a controller for the application.

Mainly the system consists of 4 main modules. Each modules dedicated to train in certain area start from Module 1 continue till Module 4. Module 1 focus on getting to know the letters and numbers. Module 2 design to train children with proper spelling. The third module focuses on the self-introduction. Then the last module is for shapes recognition which will train children to differentiate between letters and numbers.

After the final prototype has been produced, the user perception study was conducted. The study results helps to support the develop application for further improvement and alteration to the application. The study was conducted on 5 primary school situated around Kluang, Johor. The final result shows good feedback on the application towards them.

The application 'ABCDyslexic' has the abilities to help dyslexic children to improve their learning abilities thus improving their learning in other aspect. The development of this application will surely contribute to them and also at the same time provide guidance for teacher in assisting Dyslexic children in today learning environment. But further development on this application should be done to improve it even further such as making it compatible in other platform and improving the current modules to really cater and help dyslexic children to improve their learning abilities.

CHAPTER 1

INTRODUCTION

1.1 Background

Dyslexia is a language-based learning disorder that is biological in origin and primarily interferes with the acquisition of print literacy which are reading, writing, and spelling (Gomez, 2000). It is characterized by poor decoding and spelling abilities as well as deficits in phonological awareness and manipulation. The word dyslexia is derived from Greek word "dys" meaning poor or inadequate and "lexis" means words or language (British Dyslexia Association, 2008). Dyslexic children are physically and mentally normal but they have unusual difficulties in reading, spelling and writing. According to a local press the New Straits Times (2009), it is estimated about 5% of school going children in Malaysia are dyslexic (Sidhu, 2011).

Recently, there have been a number of researchers looking at the benefits of multimedia educational courseware and addressing various educational issues in the market (Gomez, 2000) (Ferrer, 2010) (Bradford) (Al-Wabil, Meldah, Al-Suwaidin, & AlZahrani, 2010). This clearly indicates that multimedia approaches in education are widely used within the educational purposes. Multimedia can play a huge role for education purposes whether for preschool, primary school or even high school students. The usage of computer, projector and audio visual material already been used familiarly in education and it is really give a good impact in today's educations. The usage of multimedia don't simply limited to audio and visual material, but, it's come to a new era where augmented reality and motion sensing devices been used for education purposes.

Motion sensing devices such as Kinect that developed by Microsoft is another good approach to be used for education purposes. Kinect is a motion sensing input device that based on a camera that enables users to control and interact with Computer without the need to touch peripherals such as mouse and keyboard through a natural user interfaces using gestures and spoken commands. (Kinect, 2012)

This main objective of this research project is to develop a new system, an assistive courseware for Dyslexic children to improve learning abilities that based on Kinect. Dyslexic children just not focusing in reading books with text and picture, but they actually interact with the application courseware installed within the computer and experience the learning courses in a fun way and more efficient way of learning.

1.2 Problem Statement

In Malaysia, the dyslexic program was initiated by the Education Ministry in 2004 where Sekolah Kebangsaan Taman Tun Dr. Ismail was the first school. At present, it is estimated around 5% or 314,000 of school children in Malaysia are dyslexic (New Straits Times, 2009). Even though the number were fairly high, the number of schools and trained personnel that addressing the problems are relatively small as there are only about 30 schools that offer special programs for the dyslexic and 100 trained teachers in this field. Moreover, due to lack of knowledge, dyslexic children are being left behind and often misjudge by others being lazy and slow learners (Sidhu, 2011).

Based on the limitations mentioned above, a research was conducted on how to overcome this problem by using multimedia approaches that don't need well trained personnel to really guide those dyslexic children. Certain learning module and courseware that based on Kinect were develop to help dyslexic children learn on their own with or without assists from teacher or parents. The excitement from motion sensing devices is undeniable, thus it can also be implemented in pre-school education purposes. The technology behind Kinect that mainly focusing on motion sensing will actually help to improve the learning experience of pre-school students. It will give the students kind of new way to learn together with the books, audios and videos.

1.3 Problem identification

Dyslexic as mentioned earlier is specific learning disabilities that lead to certain difficulties in the child's learning process. It is important for the people around them such as parents, teacher, siblings and friends to understand their problems so that they can get necessary help. Among those difficulties include in difficulties to forming associations between letters and sounds, remembering sequences of letter for spelling, difficulties in recognizing or confusion between letter, mispronunciations, difficulties in carrying out instructions, directional confusion between left and right, match activities and problems with sequencing. (Gomez, 2000)

All of the difficulties mentioned above have an impact on the children's ability to read, write, navigate, comprehend and recall relevant information. The difficulty with visual processing leads to the problems with visual concentration and over sensitive light. Dyslexic children sometimes see words juggle in a paragraphs. They don't have the abilities to recognize well an alphabets or words. This problem is referred to as a scotopic sensitivity which is a visual perceptual disorder that affects primarily reading and writing activities. Besides that, dyslexic children also have difficulties in Mirror opposites or reversal of word or letter. For example, they see letter "p" instead of "q" and "raw" as "war". These mentioned difficulties may seem simple but if not well taken care of, it might affect the learning process of the children itself.

1.4 Significance of the Project

Students acquire knowledge of the letters of the alphabet necessary for emerging literacy through their senses. Activities that utilize tactile, visual, auditory, kinaesthetic, and taste senses grasps the interests of the children. Through the use of small group activities and learning centres teachers can create hands on activities related to thematic units. The new technology of motion sensing should be not put to waste that mainly targeted for gaming purposes. It also should be used in education purposes as it offers a direct connection with the learning environment and it have the potential to create very fun way of learning (Madaio, 2000).

Multisensory teaching understood to be a method of teaching in which strength that dyslexic children appear to response (Great Free and Affordable Activities and eBooks for Your Dyslexic Child, 2008). Extra creativity and stronger sensory receptors are implemented as part of teaching process. Multisensory teaching is a term referring to a teaching technique that maximize the use of eyes, ears, voice and hand movement in the learning module (Sidhu, 2011). The approach taken is to try and engage as many sensory receptors in the learning process as possible, since it is argued that on many occasions; children with learning difficulties appear to have extra receptive sensors that can be used to bookmark learning events within their memory.

Multisensory teaching approach has been well known by using graphic and strong colours to make dyslexic children able to associate between shapes, letters, words, and numbers (Great Free and Affordable Activities and eBooks for Your Dyslexic Child, 2008). Teachers use books with lots of colours and symbols that highlight the learning module. It surely help student to be more attracted to the learning subject and help them to recognize those subject. This approach only limited to the usage of books and reading material without the help of multimedia part. Multimedia, if design it very well, able to help boost the learning activities of dyslexic children. Multimedia will help the students to understand well the alphabet as it provides total interactions with the learning subject. The usage of Kinect is essential in this part as it acts as a controller that recognize user motions that at the same time interact with the learning subject. At some point, the usage of Multimedia or to be specifically, Kinect, provide the students an interactive and fun way to learn languages.

1.5 Objectives and Scope of Study

1.5.1 Objectives

- To identify the problems and limitations of the current ways of teaching English to dyslexic pre-school children
- To investigate the use of gesture-based learning approach for teaching & learning to dyslexic pre-school children
- To develop a courseware on that will help to increase learning abilities that based on Kinect technology for dyslexic pre-school children
- To conduct user's perception study on the developed courseware

1.5.2 Scope of Study

This study focus on preschool children that have difficulties in learning new alphabet that called Dyslexic children. Main propose of this project is to design a courseware that based on Kinect that specially design for dyslexic children at the age of 5 – 10 years old. This courseware not limited for dyslexic children but also for normal children to learn English in a better way and at the same time for parents and teachers.

The study also conducted to analyze what is the suitable platform that will be used in further development of the application. Microsoft Kinect SDK, Open Ni SDK and also Adobe Flash has been identifies as the suitable platform to work with. But further research will be conducted to choose which one is the most suitable platform to work with.

Study also will be conducted on the device itself which is the Kinect peripherals.

CHAPTER 2

LITERATURE REVIEW

2.1 Dyslexic

Dyslexic is a brain-based type of learning disability that specifically impairs a person's ability to read (Dyslexia, 2012). These individuals typically read at levels significantly lower than expected despite having normal intelligence. Although the disorder varies from person to person, common characteristic among people with dyslexia are difficulty with spelling, phonological processing (manipulation of sound) and rapid visual-verbal responding (Dyslexia Information Page).

Symptoms of dyslexia often occur in conjunction with other learning disabilities; although it is not known whether these disabilities share the same neurological causes of dyslexia. Below are these disabilities:

- Dysgraphia – "a neurological disorder characterized by writing disabilities. Specifically the disorder causes a person's writing to be distorted or incorrect. In children, the disorder generally emerges when they are first introduced to writing. They make inappropriately sized and spaced letters, or write wrong or misplaced words, despite thorough instruction." (Dyslexia Information Page)
- Discalculia – a neurological disorder affecting mathematical aptitude but which does not restrict or impair the general mental function. (Dyslexia Information Page)

The brain of dyslexic children processes information differently from other children that in the same age group. But IQ tests and other studies confirm the fact that they are a lot smarter than they perform in classroom environment (Ferrer, 2010). One of the reasons they encounter these problems is because they have difficulties in organizing, sequencing and integrating though. The children resulting in inability to retelling stories, following steps requiring sequential instructions, remembering spelling and retelling number values in digits with multiple place value.

2.2 Category of Dyslexic

Dyslexic can be categories in 3 different category which are (Khas, 2009):

1) Visual Dyslexic

This type of dyslexic refers to a child that has problems in remembering and recognizing alphabet and sentences. They have problems on how to differentiate each symbol of the alphabet thus resulting in harder pronunciations. They also may see the alphabet in reverse order such as ‘p’ as ‘q’.

2) Auditory Dyslexic

Refer to problems with remembering the sound of the alphabet, sentences and arranging a full words and sentences. They also have problems in recognizing the sound of the vocal and consonant.

3) Visual and Auditory Dyslexic

This is the worse category of dyslexic where the child have disabilities in processing the alphabets, words, or sentences visually or auditory. Its more or less the combination of both visual and auditory problems.

2.3 Reading Offenses Committed by Children with Dyslexia (Khas, 2009)

- Make up a story that based on the pictures shown but the story has nothing to do with the content of the reading.
- Read slowly and with hesitation.
- Reading and at the same time shown the word with fingers.
- Frequent loss of place of reading, either lost or read the line twice.
- Read loud but confuse with intonations
- Trying to spell but it sounds wrong.
- Read in reverse order.
- Arrange the words with the wrong order.
- Shortening the length of words.
- Read words that have the same shape wrong.
- Replacing a word that has similar meaning.

2.4 Writing Offenses Committed by Children with Dyslexia (Khas, 2009).

- Write the letters in a wrong order. Write in mirror writing.
- Reversing letters such as ‘b’ as ‘d’.
- Write the heard words. Using the odd word like ‘mjeik’, ‘pojktc’ and many others.
- Missed letters in a word like
- Add some letter into a word.
- Unable to write the letter mentioned.
- Unable to select letters mentioned.
- Inability to recognize the same letter.

2.5 Dyslexic in Malaysia

The term Dyslexic in Malaysia has not yet been known among the local. They local people here may know dyslexic as “disleksia” and they don’t have enough knowledge about these disabilities that may affect their children’s life (Sidhu, 2011). The local seems to use the term “disleksia” in a broad and simple sense mean to children who ‘stuck with print’. The Ministry of Education prefers the term ‘specific learning difficulties’ as it is a more functional definition. It refers to children who have significant difficulties in reading, writing, spelling or manipulating numbers, which are not typical of their general level performance. They may gain some skills in some subjects quickly and demonstrate a high level of ability orally but still encounter difficulty in gaining literacy or numeracy skills. Those children may become frustrated and have emotional and behavioural difficulties.

There is a panel that responsible in assisting dyslexic programme in Malaysia which is National Dyslexic. They come up with definition that refers children with dyslexic have a general level of performance which is similar to other children but have significant difficulty in fluent and accurate word reading and spelling. Until now, there is no research evidence that indicate the prevalence of dyslexic in Malaysia. A study (Gomez, 2000) conducted in a representatives primary school of 2000 pupils in Kuala Lumpur indicated that 7% of Standard 2 Malay pupils had experience dyslexic. It reveals that there are children face these difficulties in Malaysia.

Teachers in Malaysia need an appropriate knowledge and skills to facilitate identification and intervention about dyslexic. The Specialist Teacher Training College in Kuala Lumpur has courses to train teachers in Special Educational Needs, inclusive of dyslexic. Other than that, few local universities also initiating courses in dyslexic to increase awareness and train teachers in this specialized areas. The Kuala Lumpur Dyslexia Association also always conducting a seminars and workshops to educate the community about dyslexic and other specific learning difficulties (Suet, 2007). They also conduct psychological and educational assessments to diagnose children with dyslexic and then give the psychologist the chances to offered tutoring the students in Bahasa Malaysia, English and Mathematics (Suet, 2007).

2.6 Methods to Teach Dyslexia Children to Read and Write

- Simultaneous Multisensory Instruction (Teach dyslexic children, 1998)

Multisensory teaching approach basically is helping a child to learn through more than one of the senses. It involves visual, auditory, tactile and kinaesthetic. To teach a dyslexic child, it not just limited to visual and auditory but the children itself must involve in the teaching process. They have to see what the teacher do, listens to teachers instructions and move hands or hold to something related to the teaching process. Multisensory method also known as VAK Modalities (Bradford):

VAK stand for **V**isual, **A**uditory and **K**inaesthetic.

The best teaching method is to involve the use more of the child's senses especially the use of touch and movement.

For example, many dyslexic children have difficulties and confusion over the alphabet 'b' and 'd'. They both may see as a stick with a circle at its base. But children confuse on which side the circle sits. A teacher may give the children tactile experience by getting the children to draw the letter on a really large surface such as the carpet. This will involve the child to move, use their arms, balances and whole body. Thus it makes them to use the memory next time they come to write the letter. Writing the letter 'b' in the air by moving their hand also helps in this kind method.

Another way to give a strong tactile memory of 'b' is to make the letter by using a plasticine or clay. A commonly use trick is to ask the children to create a word 'bed' and draw a child lying on top of the word to symbolize a bed. This gives the children strong memory on how to differentiate between letter 'b' and 'd' (Bradford).

Figure 1: Word made up a picture

- Intense instruction with ample practice.

  All instruction given to dyslexic students must be much more intense. Told the children in a specific way and keep remembering them on how to do such task. Plus, all those task or practices must be much more comparing to regular children (Teach dyslexic children, 1998).

- Direct and explicit instruction.

  Each and every rule that governs the written words must be teach first to the children until they stable in both reading and spelling the letters or words. Then, introduce them to a new rule on how to spell or read the new words or letters (Teach dyslexic children, 1998).

- Systematic and cumulative.

  Dyslexic children always confuse about written language. They must be taught from the beginning with a solid foundation. Dyslexic children have to learn basic rule to write or spell and let them understand it first before continue with more complex rule. After they mastered the basic rule, it will automatically be applied to the next rule on how to write and spell (Teach dyslexic children, 1998).

- Diagnostic teaching

  Dyslexic students sometimes only remembering the pattern of the letters or words but fail really understands and remembering the letter. When failed, these children must be taught again until they really understand and remember the letter (Teach dyslexic children, 1998).

2.7 Applications to teach language

2.7.1 Games

According to a study conducted by (Al-Wabil, Meldah, Al-Suwaidin, & AlZahrani, 2010), children with dyslexia and attention deficit hyperactive disorders (ADHD) often have problems in short term memory, and yet can benefit from learning strategies for remembering. They prepare an approach to develop those children's cognitive skills in designing educational games that help specific learning difficulties for children which are dyslexic and ADHD. They introduce a multimedia game called Memory Challenge that uses combinations of audio and visual cues. The main focus of the games is to develop a cognitive skill by teaching young children different strategies to improve their working memory.

Meanwhile a study conducted by (Ohene-Djan & Begum, 2008) indicated that multisensory approach that best works with dyslexic children over non-dyslexic children. They proposed multisensory games that include techniques for linking eyes, ears, voice and hand movement to symbolic learning. The approach tries to engage as many sensory receptors in the learning process as possible. The games also use graphics and strong colours to make associations between shape, letter, words and numbers that will help dyslexic children to recognize and differentiate between each character. The screen shoot of the sample exercises conducted in the games are show below.

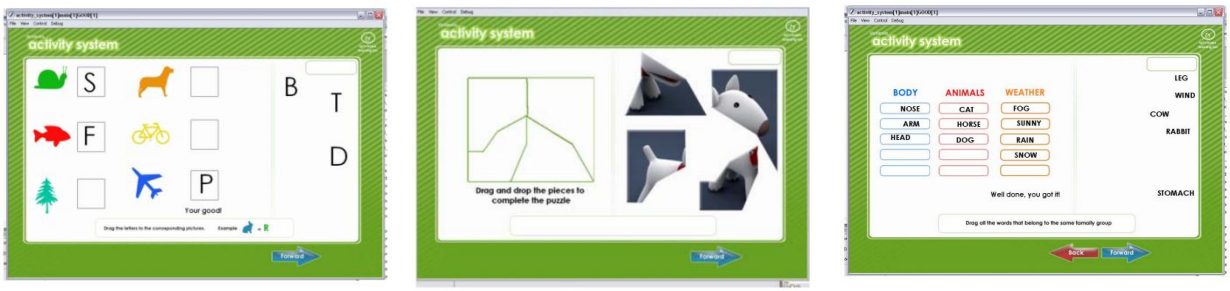


Figure 2: Sample games for Dyslexia

2.7.2 Multimedia

The usage of computers as a learning tools in classes have help teacher to teach students. But those computers were not fully utilized in teaching students that faced certain difficulties such as Dyslexia. According to (Ismail & Jaafar, 2011) computers will never replace important of play and learning materials such as paint, blocks, sand, flash cards and books but proved that using computer in classroom could increase their interest and help in engaging their attention toward acquiring knowledge. They study and doing research on how to introduce multimedia learning in classroom and at the same time not loses any interest and knowledge that should be gain from the students. They introduce a courseware that offer a fun and safe learning environment and encourages student to think and engage with the activities.

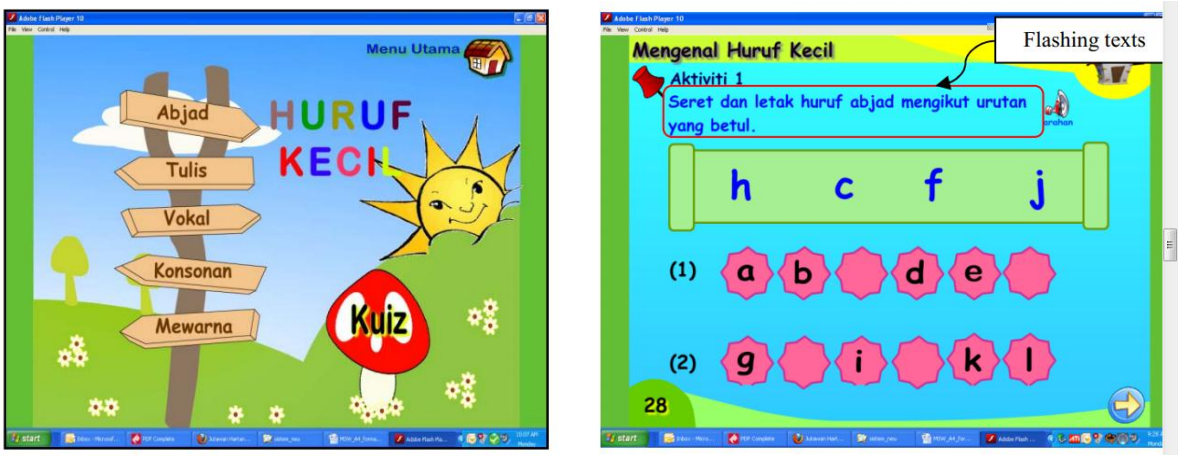
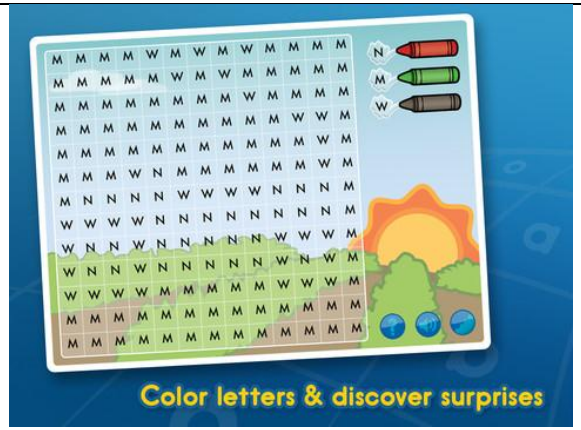


Figure 3: A preview of Multimedia application for Dyslexic Children

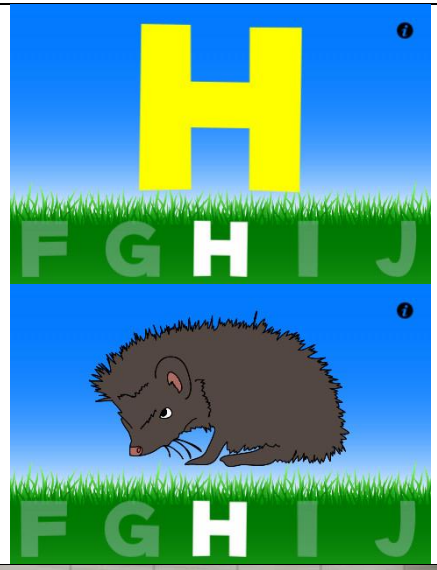
2.8 Application suitable for Dyslexic

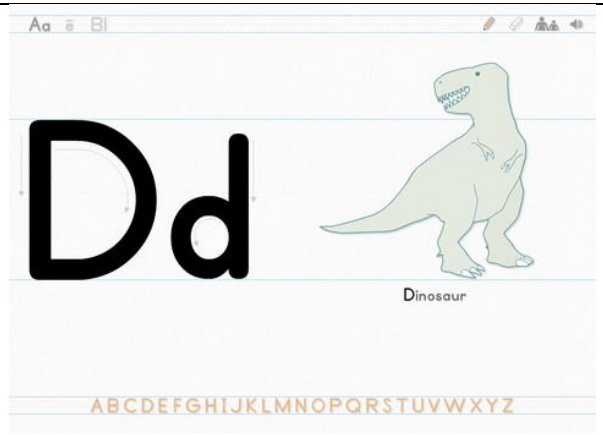
As we know, dyslexic children commonly have problems or confuse on how to recognize the shapes of the alphabets. They confuse between certain letter such as ‘b’ and ‘d’ , ‘m’and ‘w’, and such letters that are bit identical if rotate either vertically or horizontally. So from there, many developers of today technology wanted to build an application that specifically design to cater and help all these dyslexic children. They build an application focusing on certain area that these dyslexic children have problems in such as in: (University Center for The Development of Language & Literacy)

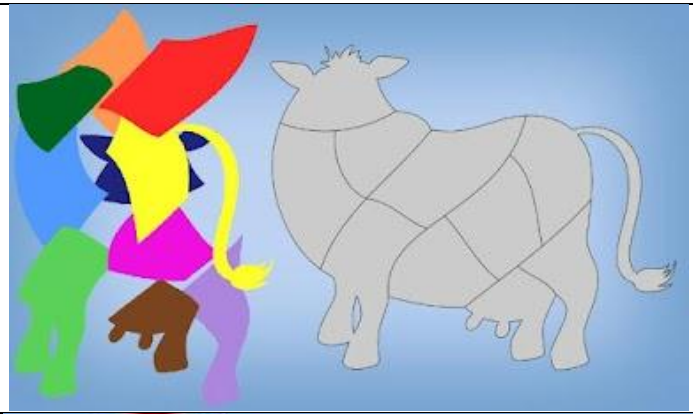
- Reading
- Spelling
- Writing
- Study skills
- Increasing self-confidence
- Shapes and Puzzles

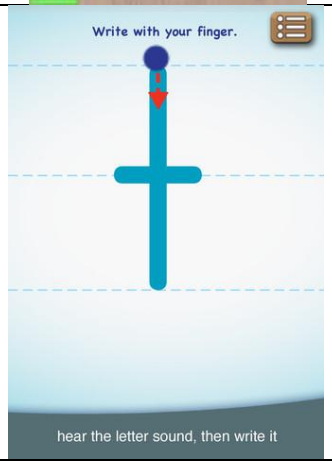
Category	Application's Name	Description	Platform	Screen Shots
Reading	Word Magic	This application focusing on the reading skills and for kids to learn their spellings. This application is ideal for kids in between ages of 3 to 6. This application is simple; it requires kids to select the missing word for the designated pictures. The word for the picture will be read out once the kids press onto the picture. Thus it helps them to recognize what should be the correct spelling for the picture. It also has settings in which kids can choose a missing letter at the beginning or in the middle or at the last of the word. (Anusen Inc, 2011)	iPhone and iPad	
Reading	Find the Letters HD	This application is design specifically for dyslexia children. It main purpose is to improve children's reading skills. The application is an educational tool that designed by special education teachers, psychologists & educators. It helps in improving children's perceptive abilities like position in space, spatial depth orientation, figure-ground perception, form discrimination, and concentration & attention. Children have to finds the letter and numbers in a grid using a corresponding matching color to each symbols. (Club LIA, 2011)	iPad. Requires iOS 4.3 or later.	

Reading	First Words Sampler	This application design to help children on learning about letters and words. It teaches children about letters, how letters relate to sounds, and how to spell words. It is approved and tested for the use of small children and the interface is specifically design for littlest of fingers. The game has beautiful illustrations and each letters matched with sounds and high quality samples of letters and words. (Learning Touch, 2012)	iPhone and iPad	
Reading	Bob Books #1 – Reading Magic	In this application, it mainly focused on phonic-based learning. It based on drag and drop interface which suitable for youngest children. It has characters and full color animations that will encourage kids and help them along the learning process. It helps kids in making the connection between letters and sounds, sounding out simple words, and spells the words they have read. This game includes 12 scenes for a total of 32 words with 4 levels for different challenges to kids as they play. (Learning Touch, 2012)	iPhone, iPod Touch and iPad. Requires iOS 4.0 or later.	

Reading	Alphabet Zoo	This application mainly to teach kids to recognize the letter sounds. It is designed and being reviewed by educators to teach children the letter-sound association. It helps in dyslexia kids in recognizing the letter and the sounds that associate it. From there, kids can further improve their reading skills. With this application, kids also can have fun playing with the animals and creative sound without realizing they are learning. (Third Rail, LLC, 2012)	iPhone and iPad	
Writing and Reading	Alpha Writer	This application based on the proven methodology of Montessori. It includes 2 responsive and sections based on Montessori Activity, Moveable Alphabet. Kids can practice their writing and reading based in a series of self-directed and engaging activities. They can choose an object to write and select the letters that compose the word. Kids also have the opportunities to develop their thinking skills by creating their own story through illustration, letters and sounds. (Montessorium, LLC., 2011)	iPhone and iPad	

Writing	Read&Write: Letters, Sounds and Combinations	This application provides a hands-on approach for learning how to recognize letters pronounce letters and practice blend and it combinations. Each letter, sound and combination has an illustration that makes a sound when touched. It helps kids to increase memory retention and develop motor skills by using touch based mechanism on the letters. It provides kids with animation on how to write alphabets and what word associate with the alphabets. (Todd Mariani, 2010)	iPad. Require iOS 4.2 or later.	
Reading and Writing	Bookworm	This application focusing on the abilities of children to recognize the letters. For dyslexic children, it is really helpful for them, as they confuse between the shapes of the letters. In this application, children needs to link letters and select from the jumble of alphabets and link all those letters to make up words. It has certain challenges which can create a fun learning process for children. (PopCop, 2009)	iPhone, iPod Touch and iPad. Requires iOS 2.2.1 or later.	

Shapes and Puzzles	Kids Preschool Puzzle Lite	This game focuses the children abilities to identified shapes. It uses a jumble of puzzles and requires children to arrange it according to the shapes of animals. It also has many others puzzles in food, transport, geometric figures and even numbers and letters. This game is really helpful for dyslexia kids as it provide them with help to overcome their confusion in determining the shapes of a letters. (Intellijoy, 2012)	Android 2.1 or later	
Shapes	Kids ABC Letters Lite	This game focuses on the children abilities to identify shapes. It provides a fun way to learn the ABCs. It is designed for kids' ages from 2 to 7 years old. Kids may learn on how the alphabets are pronounced and write. (Intellijoy, 2012)	Android 2.1 or later	

Shapes and Puzzles	Kids Jigsaw Puzzle	Kids Jigsaw Puzzle is a fun and free jigsaw puzzle games that suitable for all ages. It helps in improving the cognitive skills, stimulate memory, logical thinking and develop social skills. It is really helpful for dyslexic children as it help them to increase their learning abilities. (YoPuzzle, 2012)	Android 1.6 or later	 
Writing	ABC Pocket Phonics: Letter sounds & writing + first words.	This application teaches kids on 3 basic things which are letter sounds, handwriting and also words from the letters. It was aimed for 3 to 6 years old children. It was build based on the phonics teaching techniques which emphasizing on the sounds of the letters and how the letters should be pronounce. It also guide kids to write the alphabets by touching onto the screen and follow the arrow guided animations.	iPhone, iPod Touch and iPad. Requires iOS 2.2.1 or later.	 

2.9 Kinect Architecture

The Kinect is originally an Xbox peripheral device. It was built for gaming purposes, giving the user a controller-less immersion experience (Kinect, 2012). Originally dubbed Project Natal, it was first launched in North America on November 4th, 2010 and it was so well received it became the fastest selling consumer electronics device in the Guinness World Book of Records (Redmond, 'Kinect Effect' Magic Pushes Beyond the Living Room, 2011).

The Kinect was originally a response for the next generation of human-computer interface (HCI), called the natural user interface (NUI). NUI is a HCI methodology that uses human abilities such as touch, vision, voice motion and higher cognitive functions (that features expression, perception and recall) as method of communication. This is an effort to make human, computer interaction simpler for the user as it uses traditional human interaction, body language, which people understand but machines have yet to comprehend. Therefore making it easier for the user to learn and use the technology, as it is uses controls that are natural to them.

Predecessors of NUI are batch interface (more commonly remembered as the age that used punch cards), command line interface (CLI) (in which users had to use the command prompt to send instructions) and graphical user interface (GUI) (which allows users to interact with electronic devices using images) which is now commonly used in all the latest operating systems.

NUIs can be characterized by several features such as being user-centered (with the machine adapting to the user instead of vice versa), multi-channel (make full use of one or more of the sensory and motor channels to capture complementary characteristics of the user's intention/command), inexact (the user does not have to be exact but the machine understand the exact intention), high bandwidth (support high bandwidth streams of input), implementing voice-based interaction, image-based interaction and behavior based interaction. The Kinect embraces these definitions and that makes it a good NUI candidate. Games could now be played using the NUI and it gives the gamer a whole new experience, as opposed to regular console gaming.

Figure 4: The Kinect from outside

The Kinect, as illustrated in Figure 4, consists of the body, the stand, the power cable and USB cable. The body houses the IR camera, the IR emitter, a RGB camera as well as an array of 4 microphones at the bottom of the camera. It also houses the main PCB of the Kinect which holds an analogue-to-digital converter, a MOSFET International Rectifier, a USB 2.0 hub controller, an image processor by Marvell Technology, an SDRAM Hynex Semiconductor, a bus transceiver, and 2 regulators (one from STMicroelectronics and another from Marvell technology).

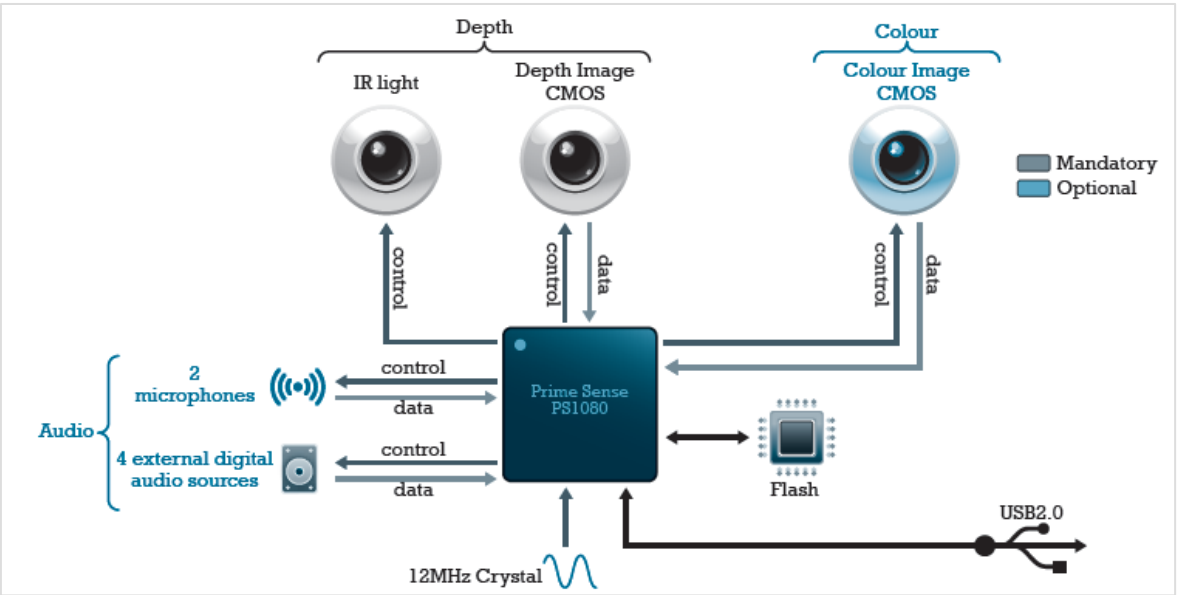


Figure 5: Prime Sense platform design for Kinect

The Kinect was designed by Prime Sense, a Microsoft partner, and it utilizes a proprietary image processor by Prime Sense as well. As we can see in Figure 5, the IR projector is at the left side of the Kinect with the Infrared (IR) camera and the color camera in the middle. It works by utilizing a set of visible and IR cameras that capture both 2D and 3D representations of the gamer in front of the device.

The IR camera and projector would acts as a depth camera and records the distance of the object that is placed in front of it. The IR projector would shine a grid of infrared dots over everything in front of it. The IR camera reads the IR dots that are reflected. The Kinect is calibrated to know where each dot is supposed to appear when it's reflected by a flat surface at a certain distance. It used the displacement of the captured dots to figure out the distance of the objects in the scene. Therefore the Kinect can "see" how far everything is from it. Humans can't see IR with their naked eyes but it's considered safe since humans are naturally exposed to IR rays from the sun. The depth camera also works in the dark as it does not count on surrounding light for the image.

The visible camera is an RGB camera is a normal camera with a relatively low resolution of 1.3MP. It can function as a normal camera but with the Kinect it is used to line up the color image with the depth image, forming a new image -creating 3D scans with realistic color. Or it could even change the color image based on its depth and subtract the background of the scene.

The Kinect also has an array of four microphones that was intended to be used for voice commands. It could also perform active noise suppression. As it is an array of microphones, it could also locate where the sound is coming from using beamforming by getting two angles from the Kinect microphone array, a beam angle and an estimated audio source angle.

The Kinect could also move. The Kinect stand contains a small motor and a series of gears. It can tilt itself by turning its motor. The original purpose is to allow the Kinect to work in a variety of rooms and will adjust automatically according to need, aiming at the best point for capturing the movement of the gamers.

The Kinect is proprietary hardware and at the beginning only commercial developers were able to develop for the Kinect as only they had access to the hardware drivers. However, other developers worldwide wanted to develop for the Kinect for other purposes and wanted to be able to connect it to their PC's. And so they turned to open-source solutions. Adafruit Industries held a competition to create an open source driver for the Kinect. Hector Martin won this competition on November 10, 2010. He created OpenKinect (Open Kinect), a Linux driver that can access the RGB camera and IR sensors on the Kinect. In December 2010, Primesense, a Microsoft partner and the original designers of the Kinect, released their own open source driver called the Open Natural Interaction (OpenNI) (Introducing OpenNI). Microsoft, responding to the massive enthusiasm of the developers, also released their own Kinect SDK in June 16, 2011 (Redmond, Microsoft Releases Kinect for Windows SDK Beta for Academics and Enthusiasts, 2011). Ever since then, the development of the Kinect platform has been booming and it doesn't look like it's going to end.

Looking at the function of the Kinect, it is possible to utilize the features in many ways. There is also research being done on using the Kinect as the gateway peripheral to natural user interfaces (NUI) for other systems, not just gaming. Some examples are the use of the Kinect for altitude control of a helicopter, robot control, in the operating theatre for no-touch handling of medical images, and interaction in augmented reality environments. The Kinect can also be used as a measuring/data input device. There has been development of it in creating low cost 3D imaging, hand tracking, human detection using depth image, sign language translation, object recognition, and motion analysis. These are only some of the examples of what is being done so far. There are just so many projects that are being run using the Kinect and there are also many developer communities out there to help each other out. The Kinect is young technology, having only been available to the public for a little more than a year, and its full potential has yet to be harnessed. With people experimenting on how to use it, it allows more possibilities of how it can be used to be discovered. This helps bring the technology to maturity and stability. And when it's ready, it may be accepted and incorporated into the technologies that we use every day, like how mobile phones and laptops have been adopted.

2.10 The Kinect Skeleton

In this project, an assistive courseware for Dyslexic children to increase learning abilites; is to be done using the Kinect using its skeleton user interface (UI). Originally for NUI purposes, the skeleton UI is a skeleton representation of the individual tracked by the Kinect. The skeleton consists of the positions and orientations for each joint in a human figure. (Suma, Lange, Rizzo, Krum, & Bolas, 19-23 March 2011) Based on the position of the joints the computer would be able to track where the movements of the user (thus figuring out the instructions the user is relaying).

To develop on the Kinect there are several SDKs available. They differ in drivers and functions available. There is the OpenKinect SDK from the competition by Adafruit Technologies, the OpenUI SDK from Primesense and the Kinect SDK from Microsoft. Each development kit has their own merits but for the purpose of this project, OpenUI and the Kinect SDK will be evaluated for implementation. This is because these two development kits have the most stable framework as they're both from the Kinect manufacturers themselves. Furthermore, other projects have used these development kits and have helped with the development of these modules, making them better, adding other functionalities, etc.

The skeleton frame and joints function in the SDK is going to be used. The skeleton frame is a collection of points which represent the joints on a person. The joints are tracked for change and this will show if the person is moving. There are 20 joints tracked on a person which are left ankle, right ankle, left elbow, right elbow, left foot, right foot, left hand, right hand, head, center between hips, left hip, right hip, head, left knee, right knee, center between shoulders, left shoulder, right shoulder, spine, left wrist and right wrist. The complete skeleton is drawn by joining the joints with a line to the adjacent point according to the form of the human body. The skeleton data implementation is slightly different for both SDK's. By trying several of the Kinect skeleton implementations, the functions available are evaluated.

In the Kinect SDK, the internal pipeline in the beta SDK runtime processes depth frame data to create skeleton frames. There are two tracking modes: active tracking and passive tracking. The joints are saved as JointID in a skeletondata file.

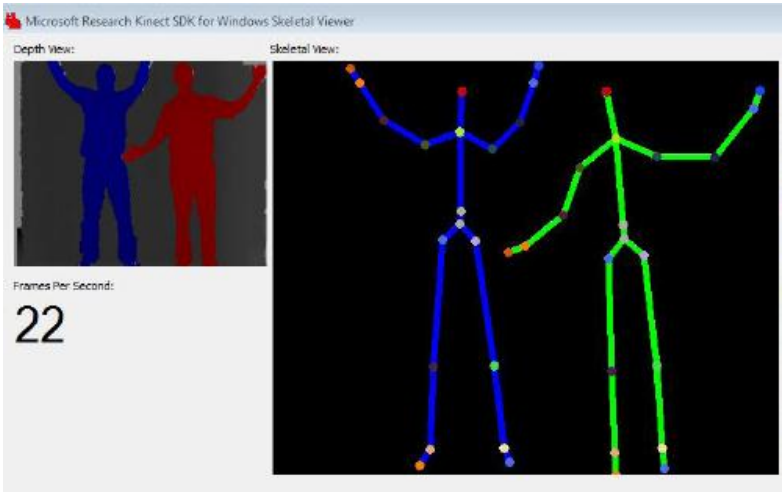


Figure 6: Microsoft Kinect SDK skeleton implementation

In OpenUI, the skeleton representation provides user calibration data (including location and size of the joints of a skeleton) and the ability to track skeleton position. The skeleton must first be calibrated (using a custom calibration method like a pose). The points are defined by position, compromising of the joint's position coordinate and confidence.

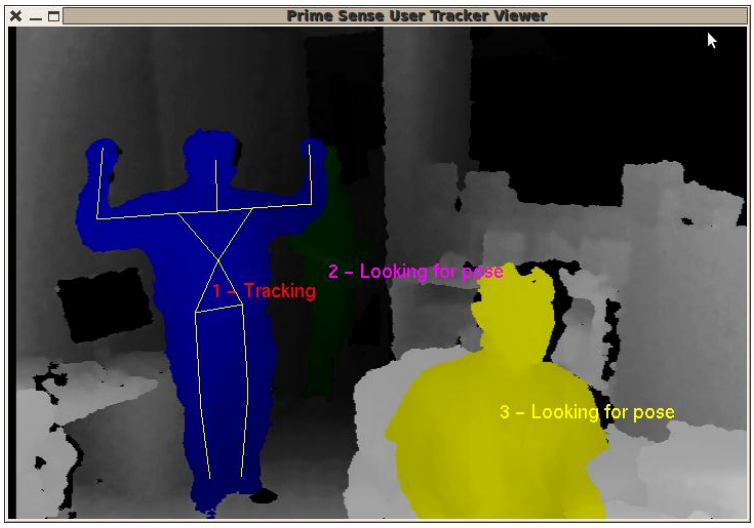


Figure 7: OpenNI skeleton implementation

2.11 Evaluating SDK

The two SDK's are evaluated to see which would be a better platform to develop on. When the skeleton systems were compared, both track 20 unique joints on the human body and both have lag times of milliseconds and can also handle the tracking of 2 persons simultaneously. The tracking initialization however is slightly different. In OpenNI the user would have to hold a calibration pose until the tracking system can detect enough joints to recognize a person, while Window's Kinect SDK has a specialized system that compares human images to the incoming data from the depth stream allowing quicker recognition (<1 second in most cases) by determining human shaped objects and generating a joint set.

As for joint accuracy, both systems detect the same number of joints and there is no observed difference. The Kinect SDK however, has a tracking system that can do predictive tracking of joints, allowing high accuracy in situations where the sensor loses track of the user.

However, the Kinect SDK features allow a higher degree of false positives and require higher processing power than the OpenNI implementation.

The Kinect SDK also is able to get the full 1024x786 resolution from the Kinect camera while OpenNI could only get a resolution of 800x600.

The Kinect SDK also provides drivers for the microphone array on the Kinect, giving full access and recording capabilities. The noise cancelling effect is available too. The speech recognition library for the Xbox 360 is also accessible; allowing speech files to be generated using XML, imported and tested. This allows the project to incorporate a multi-feature biometric identification system.

CHAPTER 3

METHODOLOGY

Basically, it is important to understand and develop through practice the skills needed to successfully design and implement new information systems or application. Many failed systems were abandoned because analysts try to build wonderful systems without understanding the organization. In order to have a brilliant system with organize functions, the project need to be manage phase by phase.

3.1 Research Methodology

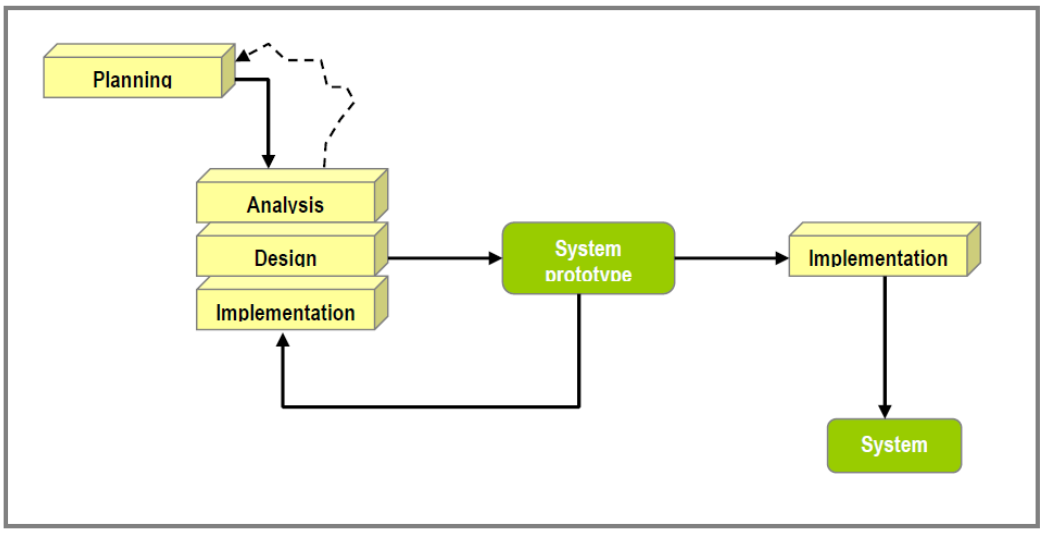


Figure 8: Methodology Diagram

The Incremental and Iterative methodology is chosen for this 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. As for the advantage of using this model is that it can deliver system quickly to users, though it not exactly meeting the requirements.

The phases of the project will be divided into as shown in Figure 8:

- Planning & Requirements Gathering
- Application Analysis & Design
- Application Implementation
- Application Testing
- Application Deployment

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

3.1.1 Planning & Requirements 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. During this stage, it is necessary to be aware of the theory of Kinect motion sensing devices. It is important to know the capabilities of the devices to control a programme that design for pre-school students. Author also needs to know on what kind of modules that will be needed and essential to help Dyslexic children to increase their learning abilities.

3.1.2 Application Analysis & Design

The activities such as problem identifying and predicting the potential problems of the project in the future are arise during this stage. The information gathered during planning stage are being analysed therefore the literature review are done. At this stage, author should know on what kind on modules that suitable to be included into the application that will help in the development Dyslexic children learning abilities. During this stage, the author should identify the importance of Kinect motion sensing devices in helping pre-school students to learn alphabet and numbers. The analysis design phase also includes taking into account the type of software that should be used in developing this application which are Adobe Flash as software to build the main application. Adobe After Effects would be used to develop the animation to be incorporated into the main system.

3.1.3 Application Implementation

In the project implementation phase, the project prototype was built based on the system analysis and design. This phase involves the building of main application using Adobe Flash and certain animation that is based on Adobe After Effects.

3.1.4 Application Testing

The most resource phase of all is implementation where the system is built, tested for the users to use. This stage has been done to a few of the target users in order to get more information as well as their opinion on what the author had been done so far. The tests include the User Acceptance Testing which will test on the user acceptance of the system. This testing phase also used to identify and fix any bugs that occur within the built application. Once the users satisfied with the prototype, the author will install the application to the users.

3.1.5 Application Deployment

The final phase is the system deployment where the project is ready for use. This activity will measure the effectiveness of the courseware when used in the actual learning situation.

3.2 Project Activities

- **Thinking aloud**

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. During the test procedure the users are 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 Kinect system.

- **Questionnaires**

Questionnaires or survey are generally a common way to gather data and allow a quantitative analysis of results. The questionnaires that are well-designed can gather information on both the overall performance of the system as well as information on specific components of the system.

- **Qualitative interviews**

Although interviews may be different from questionnaires in the concept of their formality they should not be considered less important. Instead, they should be used in a better state that makes the best use of their strengths

3.3 Gantt chart

There are 2 Gantt chart related to the project. The first Gantt chart (Appendix 1) is the planned Gantt chart. This Gantt chart was prepared in the planning phase of the development. The second Gantt chart (Appendix 2) is the actual Gantt chart. This Gantt chart represents the actual time line of the development. Kindly proceed to Appendixes.

3.4 Tools

3.4.1 Hardware

For this project, Kinect peripherals will be used as a motion sensing devices that control the programme that help pre-school student to learn alphabet and numbers. In the development phase, a personal computer will be used as a workstation before demonstrate using Kinect.

3.4.2 Software

The main platform for development is:

- Adobe Flash CS3 (Figure 9)
- Adobe After Effects CS3 (Figure 10)
- Audacity (Figure 11)

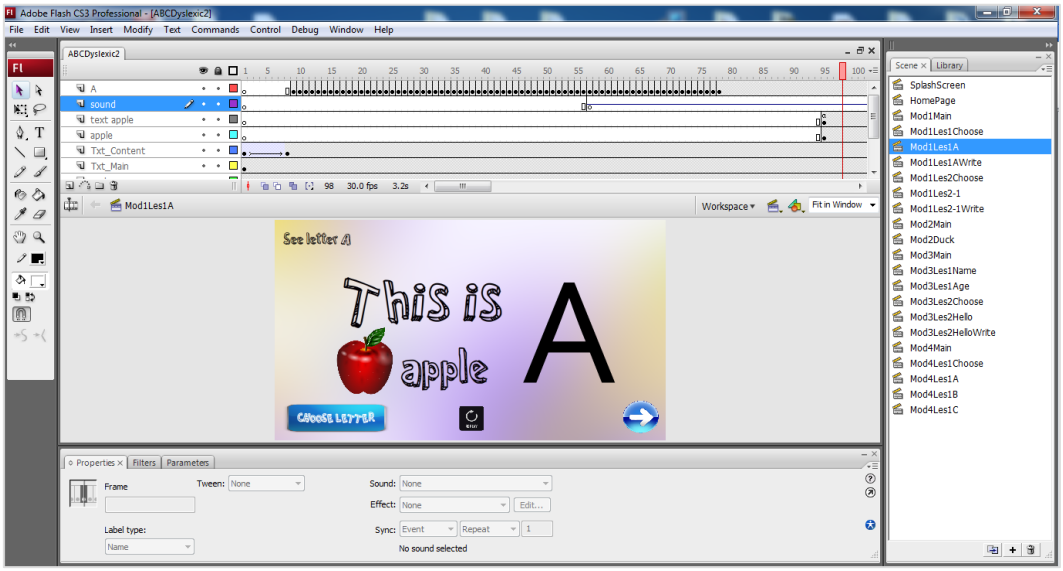


Figure 9: Adobe Flash CS3 Interface

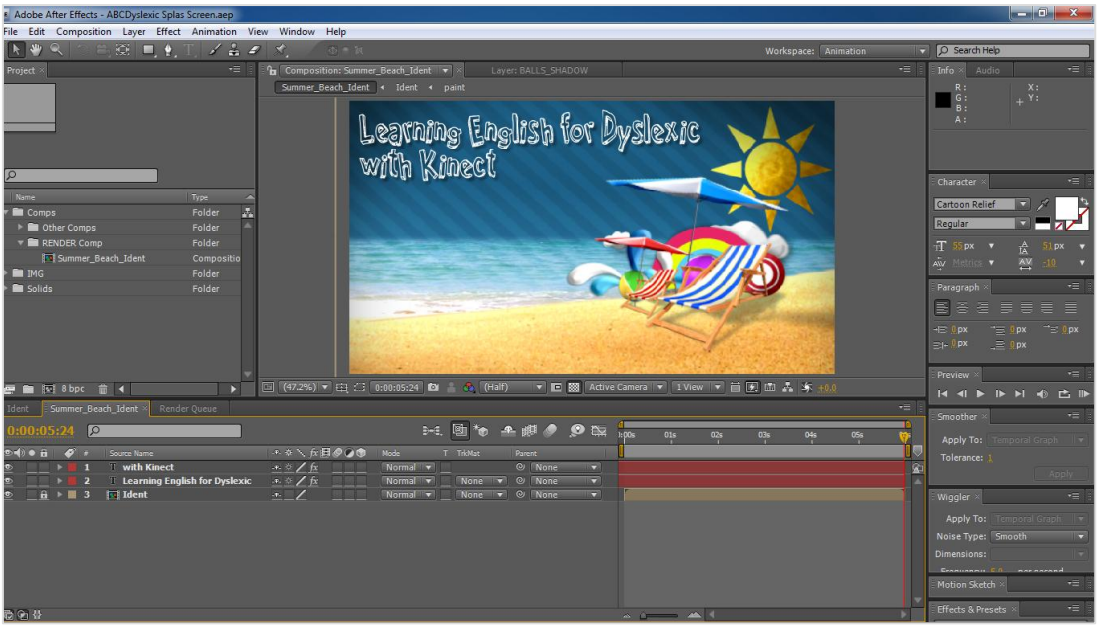


Figure 10: Adobe After Effects CS4 Interface

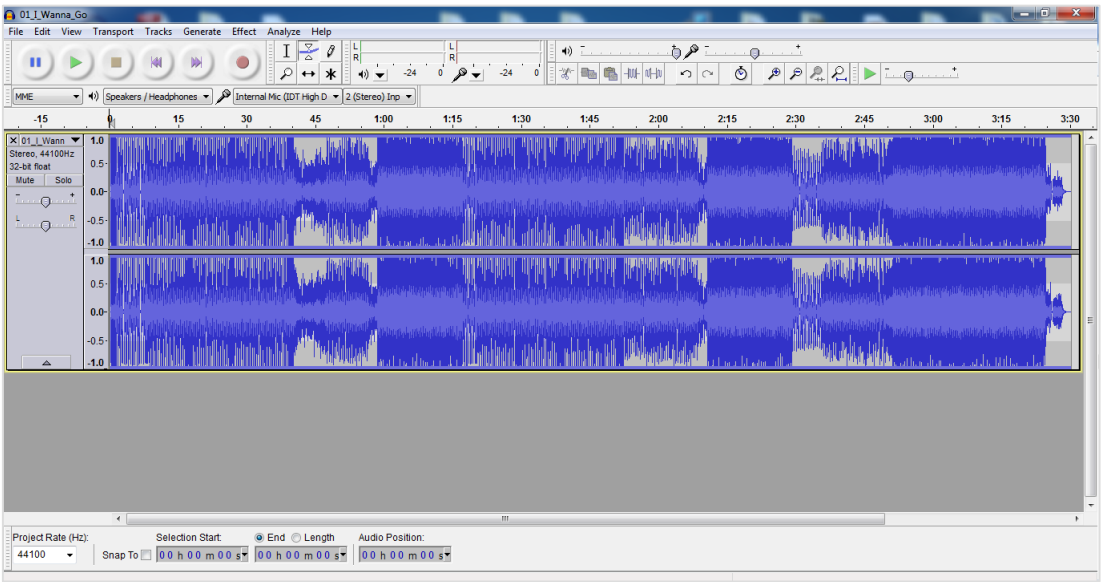


Figure 11: Audacity Interface

3.5 The development

At first, based on the literature review given earlier, there are two SDK that can be used in developing this application which are Microsoft Kinect SDK and also Open Ni SDK. Both SDK has great approach in implementing the usage of Kinect inside the application, but it is really focusing on the development of the Kinect itself rather than the main application which are courseware for Dyslexic children. The courseware should contain a lot of animation and illustration that will help in the learning process of Dyslexic children. After some research done, author has choose a new platform that most suitable to develop the courseware which is Adobe Flash. Adobe Flash can provide fun learning environment full with animations and illustrations.

But, Adobe Flash has very limitation on implementation of Kinect within the develop application. In order to make sure that Kinect still can be used with the courseware, author had decided to use an open source application that make use the Kinect to control the cursor. So, the courseware and Kinect is not merging together but it is a two different application that make use one of the others. User now, has the abilities to use the courseware with normal mouse or use it with Kinect. Further explanation on the open source application for Kinect is further explained in the Literature Review part earlier.

3.5 Framework

The framework of the project would be best describe using the Figure 12

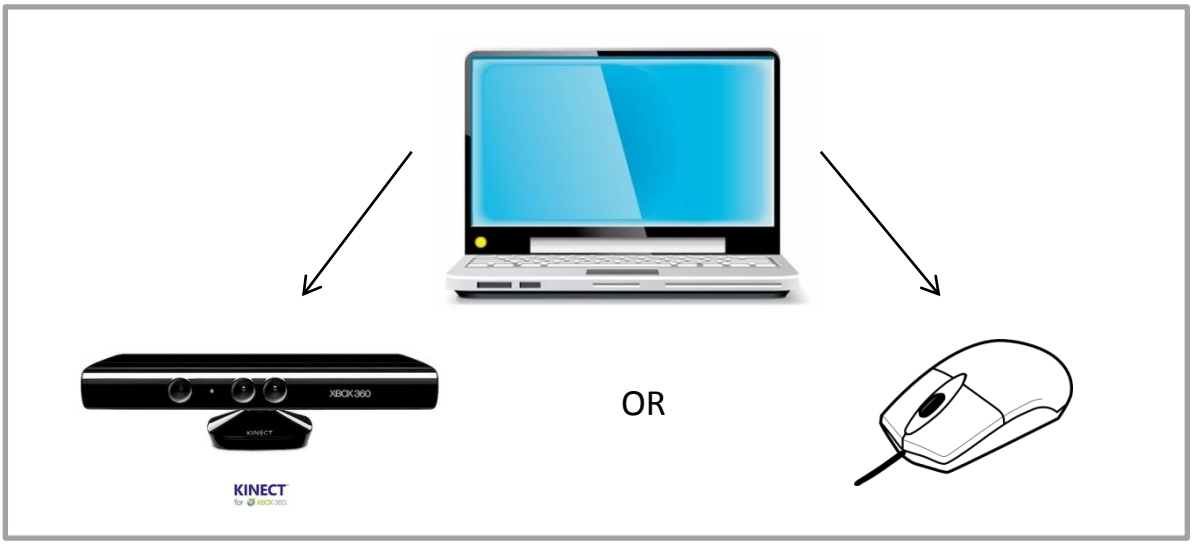


Figure 12: Framework of the application

As explained earlier, the project will make use the open source code provided by Microsoft and compile it to a 'Kinect Cursor Control' application that will enable user to use Kinect to control the cursor. So, user basically has the option on whether to use a conventional mouse or use the Kinect to control the cursor. It will provide much flexible approach for user that does not have the Kinect to use the application by using the conventional mouse.

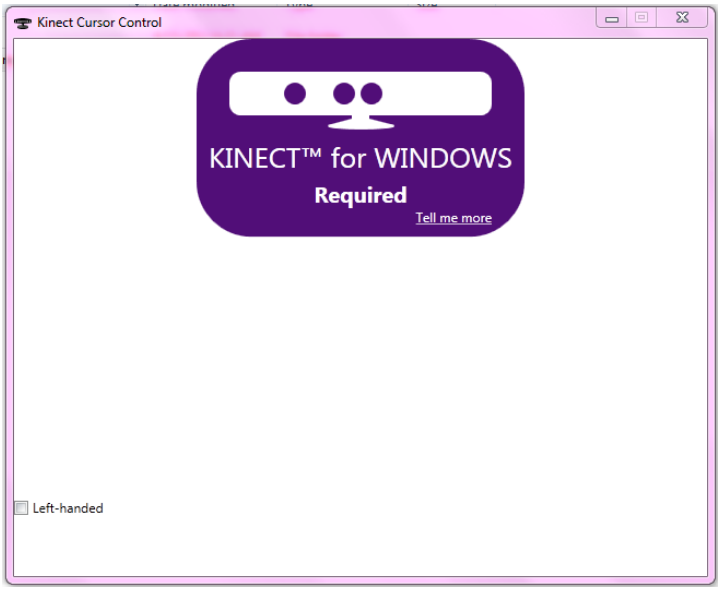


Figure 13: Kinect Cursor Control screenshot

3.6 Structure of Application

3.6.1 Courseware Syllabus

The syllabus used in the courseware were mainly based on the English Learning Modules that released by 'Bahagian Pembangunan Kurikulum Kementerian Pelajaran Malaysia' (Dr. Ng Soo Boon & Pn. Zaitoon bt. Zakaria, 2010). The syllabus was designed for preschool students and suitable to be for standard 1 and standard 2 that have dyslexia. Some alterations were made to make sure that it will be suitable for dyslexic children by make sure that it will optimize the use of sensory receptors as many as possible. The syllabus will be divided into 4 modules which are:

- Module 1: Introducing and Getting To Know Vowels and Consonants

  - At this module, user will be introduced to the vowels. User will listen and speak according to the sound of the vowels. Below is the sample of the sound of vowel 'A' as the courseware will pronounce it. Along in this stage, user will then try to write the vowel 'A' by using hand movements.

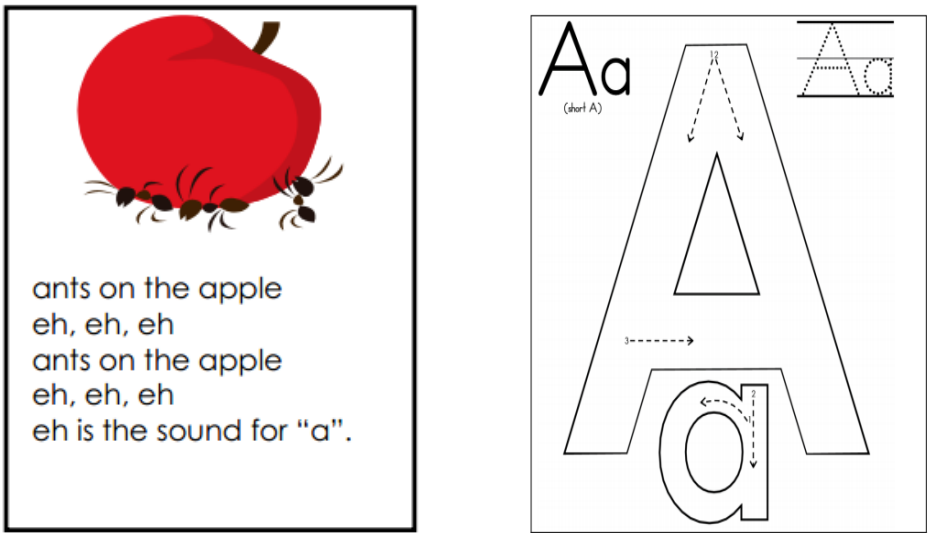


Figure 14: Sample of Vowels Pronunciations and Writings

- Module 2: Recognise Shapes
  - In this module, user will be introduced to certain shapes. This is just an activities to help dyslexic children to recognise shapes and differentiate between shapes. The activities in this module are placing correct shapes into the correct place and complete a shape puzzle. The samples were shown as below.

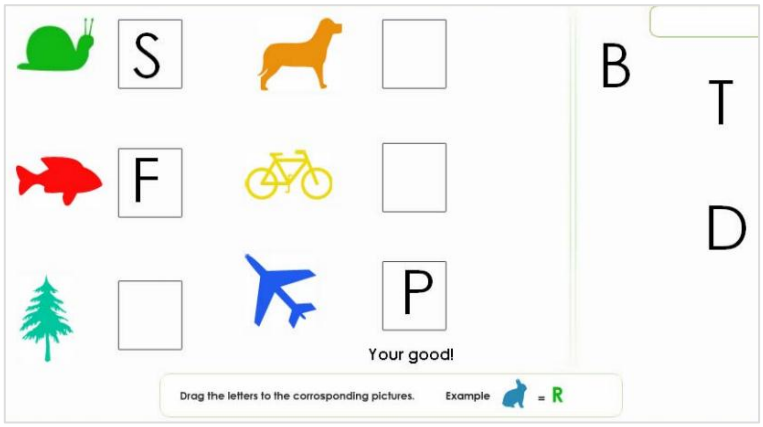


Figure 15: Sample of games using alphabets

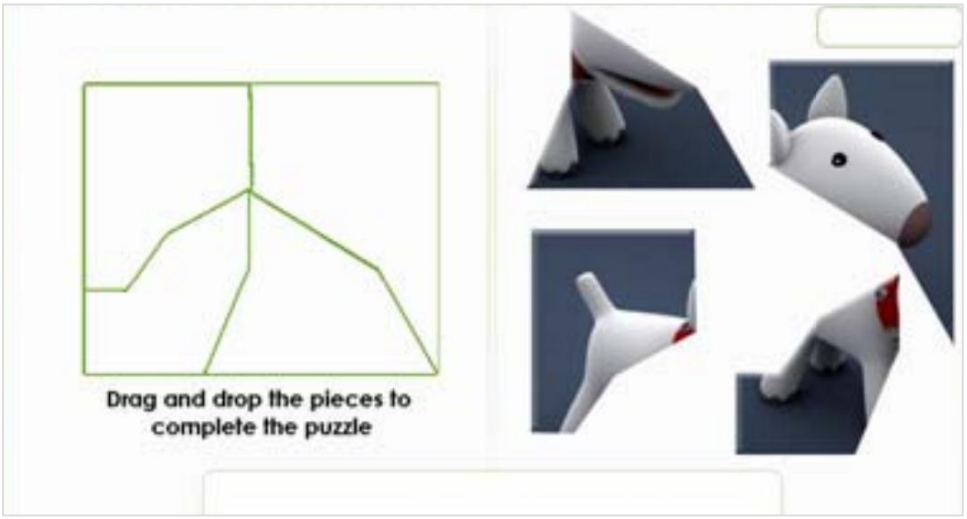


Figure 16: Sample of games using shapes

- Module 3: Getting to Know Words, Phrases and Simple Sentences.
  - In this module, user will learn about words, phrases and sentences. There are many activities that will be included in this module such as combining a vowel and consonant to make up a word and also spell a name of pictures.

- Module 4: Speak, Read and Write
  - In this module, user will learn on how to speak and pronounce those words in a proper way. The courseware will be provided with an audio system and user will listen on how to pronounce it. As the user pronounces it, Kinect will detect their pronunciations and indicate whether it is true or false. After that, there's also an activity where user will try to read and write a line of simple sentences in a books.

3.6.2 Features

Based on the research made from previous literatures and observations, the following features are essentials in the developments of the courseware.

- Multisensory Approach

This is the main features that should include in the courseware. At first when the courseware is launch, the courseware will required the user to stand in front of the Kinect to allow the Kinect to calibrate and lock the position of joint of user. After that, all movements of the user will be recognise and user able to control the courseware. The applications will be control by the body movement of user and it will trigger certain command in the courseware. The mock up design shown below is a sample where user needs to follow the movement on how to spell the alphabet by using hand. The courseware will recognise user's hand when move according to the lines and shapes requested by the courseware.

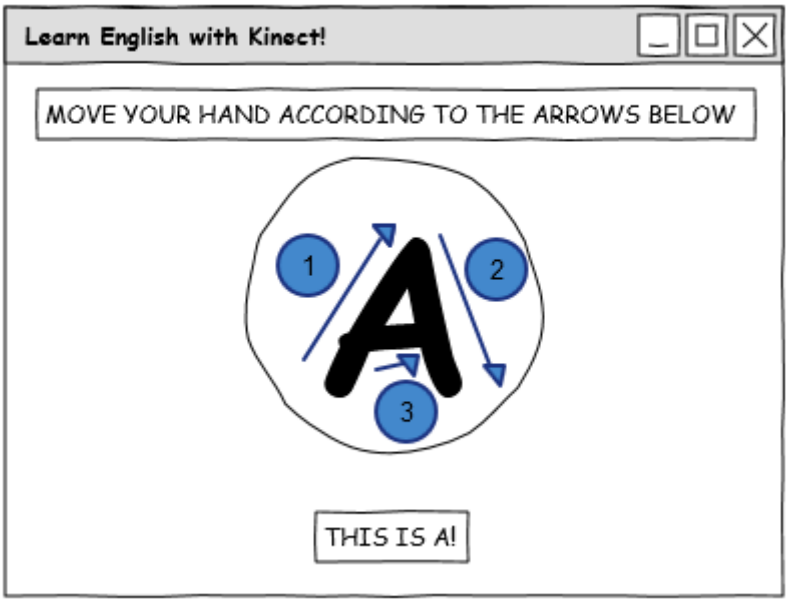


Figure 17: Mock Up design of an activity in the courseware

- Design

To assists a dyslexic children, the courseware must be design in full colours, used a strong colours that allow the user to really differentiate between characters, alphabet and instructions requested by the courseware. The courseware also must use a big font of text that will dyslexic children understand about certain instructions. Other than that according to study conducted by (Ismail & Jaafar, 2011) short paragraphs are preferred by dyslexic children. The colours used in the courseware also affecting dyslexic children towards understanding in the learning progress. Below is a good sample on how should be the interface and design of the courseware as taken from Kinect Games for Xbox 360 (Kinect, 2012).

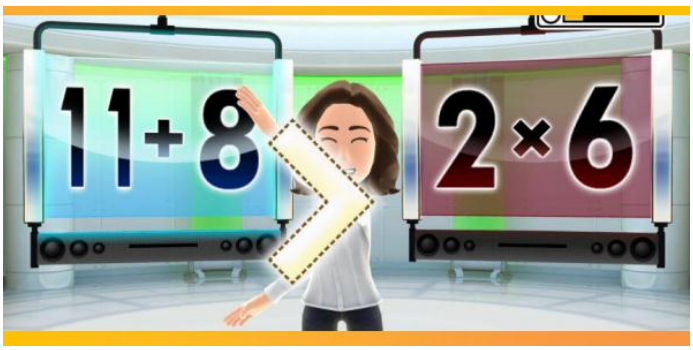


Figure 18: XBOX 360 sample games

- Instructions

All instruction used in the courseware must be much more intense. The courseware will keep remembering user on how to do activities in the courseware. At first each and every rule that governs the written words must be teach first to the user before they continue on doing all the activities in the courseware. After they progress to the next activities, the courseware will introduce a new rule on how to spell or read the new alphabet. All activities will include instructions at top of the screen as shown as the mock up sample above.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Survey data collection and findings

To continue the development of this project, a survey and interview had been conducted during the system development process. After the prototype of the application completed, a usability test had been conducted. The result helps to support the develop application for further improvement and alteration to the application. The survey data were conducted with selected 5 primary school children in Standard 1 around Kluang, Johor.

For the following analysis, Scale 1 represents the lowest score while Scale 5 represents the highest score.

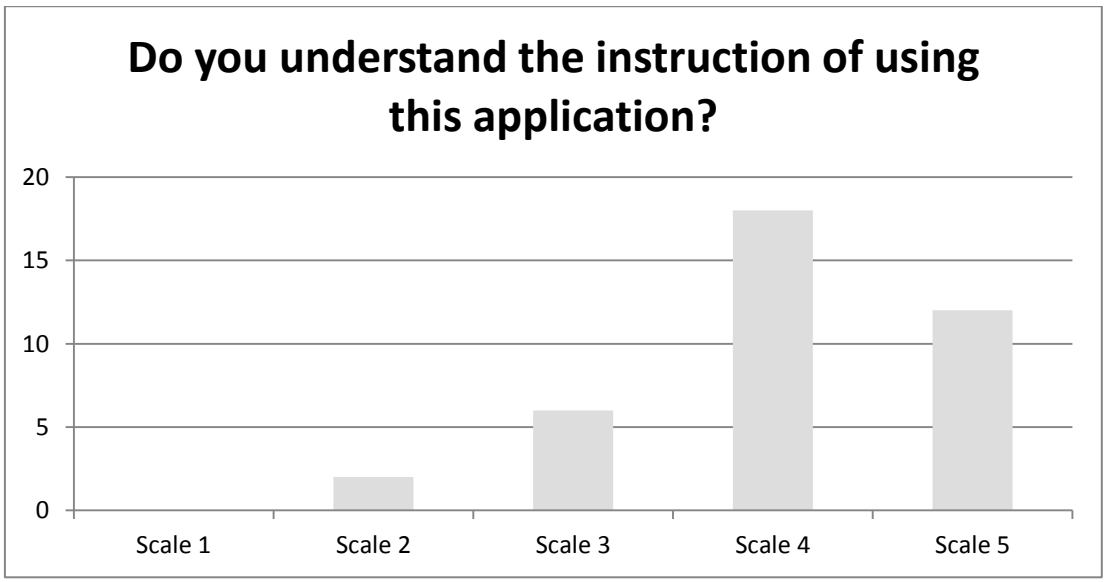


Figure 19 : Understanding of the application's instructions.

Figure 19 shows the graph conducted for the first question. The users were asked regarding their understanding on the instruction on how to play with this game. Result shows 18 students rated with Scale 4 and 12 students rated Scale 5. This shows that majority of the users understand on how the game works and know how to play with it. Minority with of the students have difficulty in understanding it for the first time which result 4 student on Scale 2 and 6 students on Scale 3.

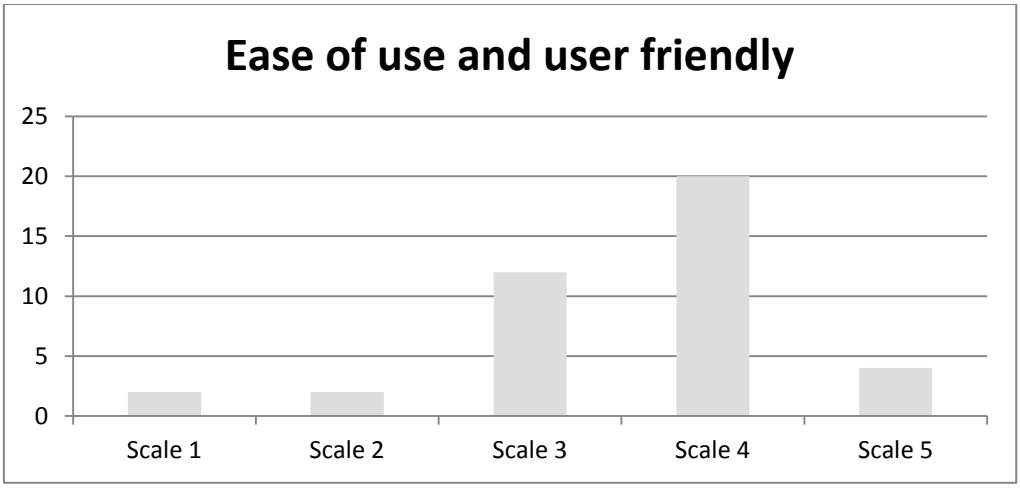


Figure 20 : Ease of use an user friendly

Figure 20 shows that there are 20 of the students who rated for ease of use and user friendly at the Scale of 4. There are another 4 students rated it at Scale 5. This shows that over half of the users found the application is user friendly and easy for them to use even for the first time. Apart from that, around 12 students found the applicaiton moderately easy to use at the Scale of 3 and remaining 4 students find it difficult to use at first by scaling at Scale 1 and Scale 2 respectively.

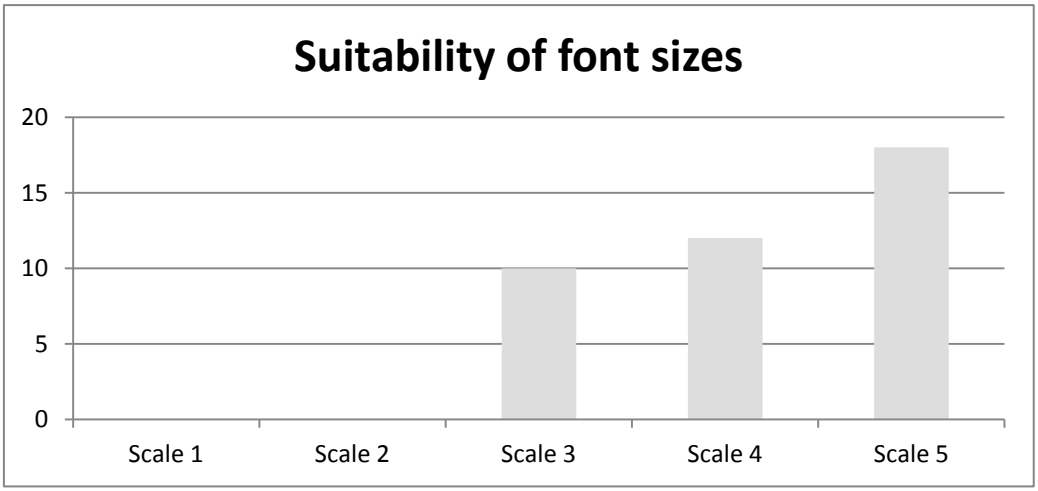


Figure 21: Suitability of font sizes

Figure 21 shows that there are 18 students feel the font size used in this game are suitable and comfortable for them. Another 12 students rate it on the Scale of 4 and the remaining of the students rated on Scale 3. Overall, students find that sizes of the fonts used are suitable and acceptable enough for them. But, there is still room for improvement in future.

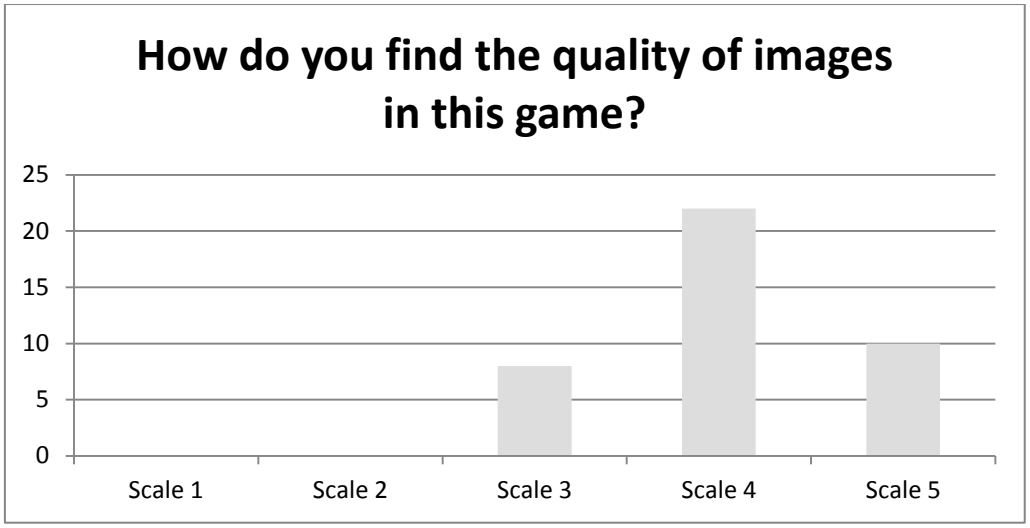


Figure 22: Feedback about the quality images used

Figure 22 shows on how the students rate the quality of images used in making this applications. 11 students rated on Scale 4 for the quality of the images used and 10 of the students rated on Scale 5. The remaining of them rated it at the Scale of 3. Although majority of the students feel the quality of image used are satisfying, there is still improvement in future can be made in designing a more high quality applications.

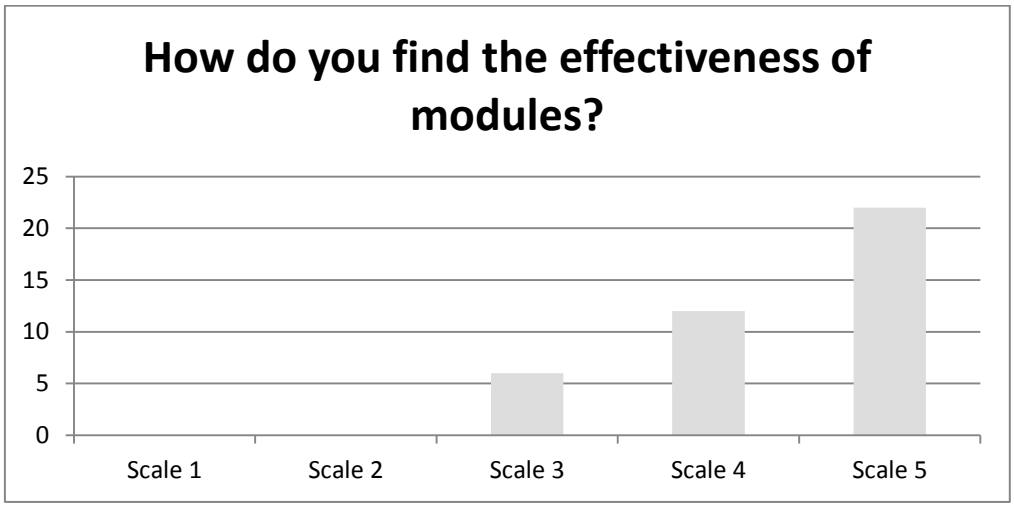


Figure 23: Feedback about the effectiveness of the modules

Above Figure 23 shows that the overall modules that been used in the application are acceptable and suitable for them to learn. Although the target group are not focusing on dyslexic children, but they still in learning process and they believe that this application still suitable for normal students.

4.2 System and Software Architecture

In order to start using 'ABCDyslexic', user needs to install 'Kinect Cursor Control' which is a program that allows you to use Kinect to control Windows cursor as mouse replacement. First, user may have to install all the necessary drivers in order for the Kinect to work. After that, user need set up the Kinect itself by plug in it to the computer. Below are the installation procedures:

1. Download and install Kinect SDK Version 1.5
   http://www.microsoft.com/en-us/kinectforwindows/develop/developer-downloads.aspx
2. Plug in Kinect
3. Install 'Kinect Cursor Control'
4. Run 'ABCDyslexic'

After finish setting up the Kinect, user may now install the application itself by using the installation disc. After done with the installation, user is now able to start the application by simply clicking the application icon on the desktop. The splash screen will be shown to the user. User may want to wait for 10sec for the application to fully load. The main screen will be shown after the application fully loaded. The application will show the home page of the application.

Basically, the application consists of 4 modules which are:

a) Module 1: Get to know letters

b) Module 2: Spell a word

c) Module 3: Communicate with friends!

d) Module 4: Shapes, Let's play!

Further explanation about the system will be explained later in next chapter. Kindly refer Figure 24 for the brief flowchart of the system architecture.

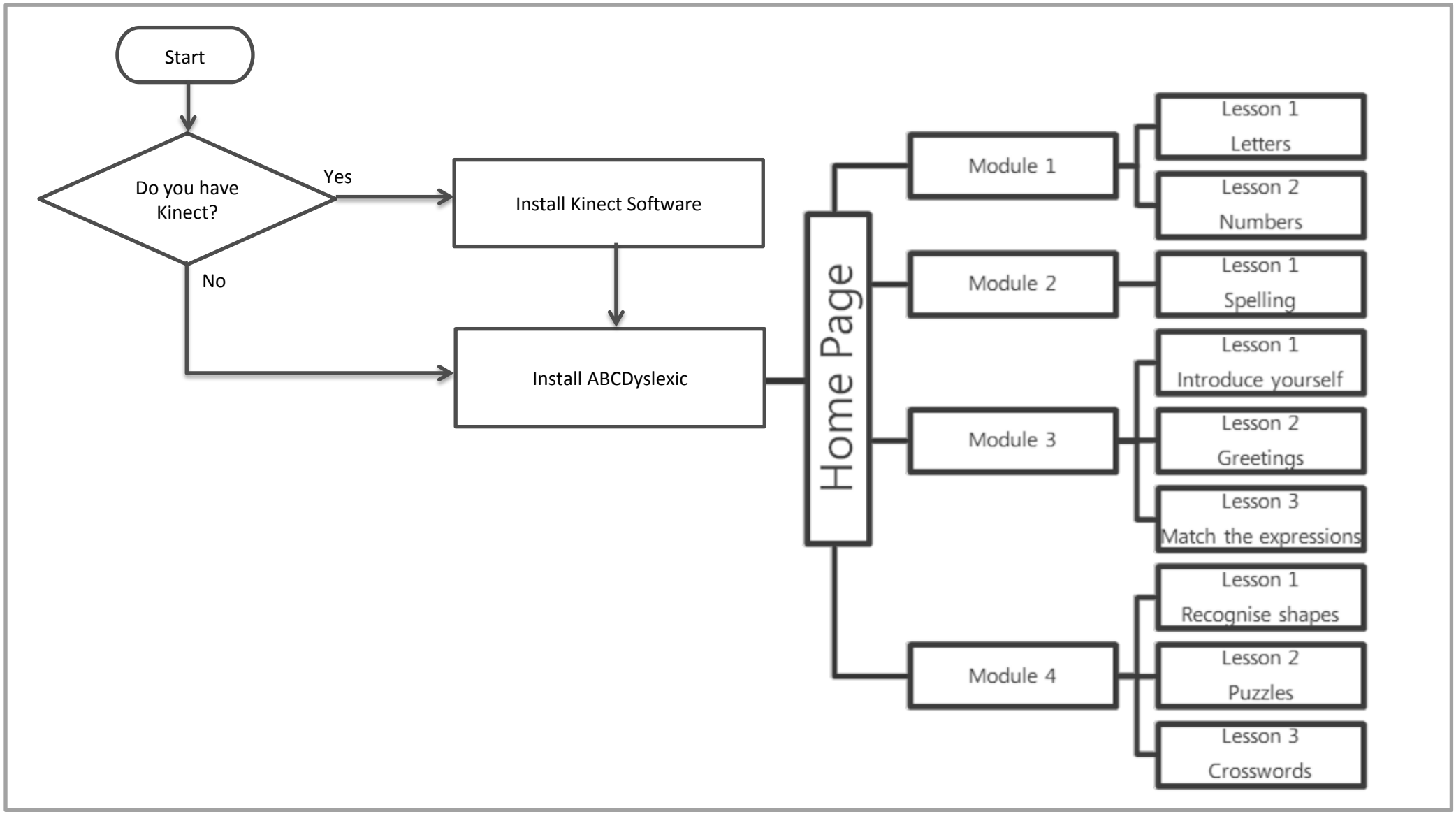


Figure 24: Flowchart of the application

4.3 System Prototype

After finish setting up the Kinect environment, users have to install the application 'ABCDyslexic' by using the installation disc. After done with the installation, user is now able to start the application by simply clicking the application icon on the desktop. The splash screen will be shown to the user. User may want to wait for 10sec for the application to fully load. The main screen will be shown after the application fully loaded. The application will show the home page of the application.

Figure 25: Splash screen

This application is divided into 4 main modules which are:

a) Module 1: Get to know letters

b) Module 2: Spell a word

c) Module 3: Communicate with friends!

d) Module 4: Shapes, Let's play!

At the main screen, user will have the freedom to choose desire modules.

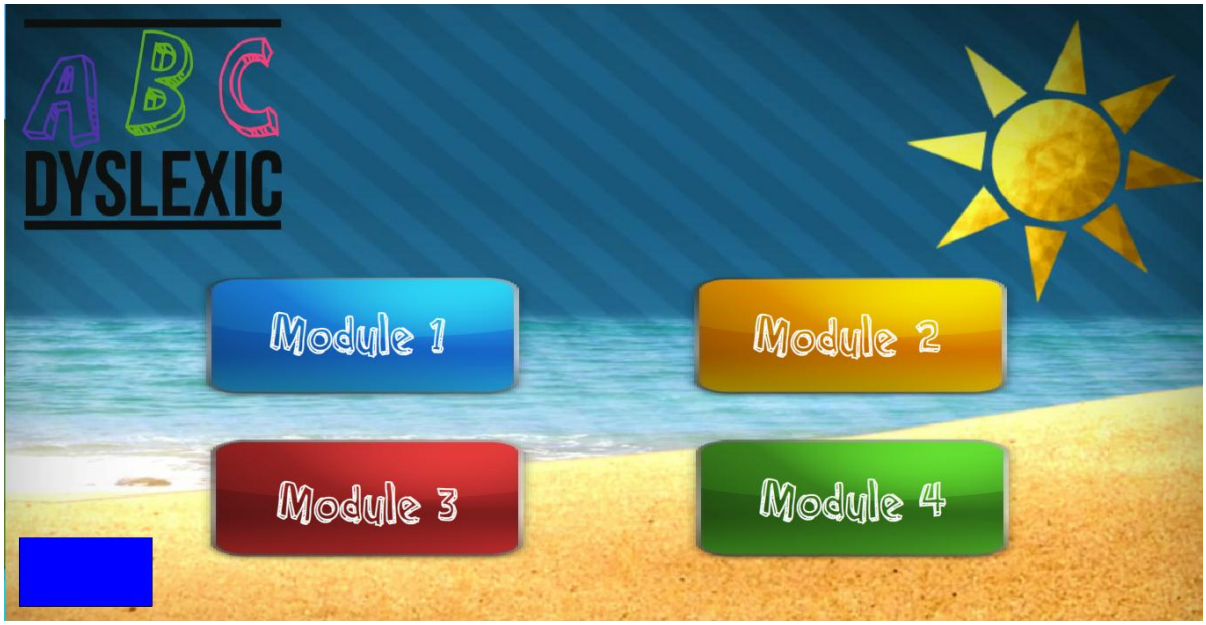


Figure 26: Main screen

Figure 27: Module 1 Main Screen

The first module which is Module 1: Get to know letters, is a module where user will listens to the sound of the letter follow by following the lines of the letter and confirmation on how to spell and write the letter. Those elements combine into Lessons 1 under Module 1. Figure 15 is the sample screen shoots of the application which referring to the Lesson 1 under Module 1. First user needs to get to know on how the letter pronounced. Figure 15 show the example of letter 'A' being demonstrated. A video of a person pronouncing the letter 'A' will also display at this stage. This will help dyslexic children to really understand on how the letter 'A' being pronounced by looking at the video of demonstrator in the application. After understand with the pronunciations, user may continue with this stage by simple moving their right hand to the right away from their body.

This stage continues on how to write the letter 'A'. User will need to follow the arrow by hover their right palm according to the lines. It is shown on Figure 16 below. After completing all the lines, user can continue to next stage where the application will confirm again with the user on how to pronounce and write the letter as shown in Figure 17. This process continues from the letter 'A' until letter 'Z'.

Figure 28: Module 1 Lesson 1

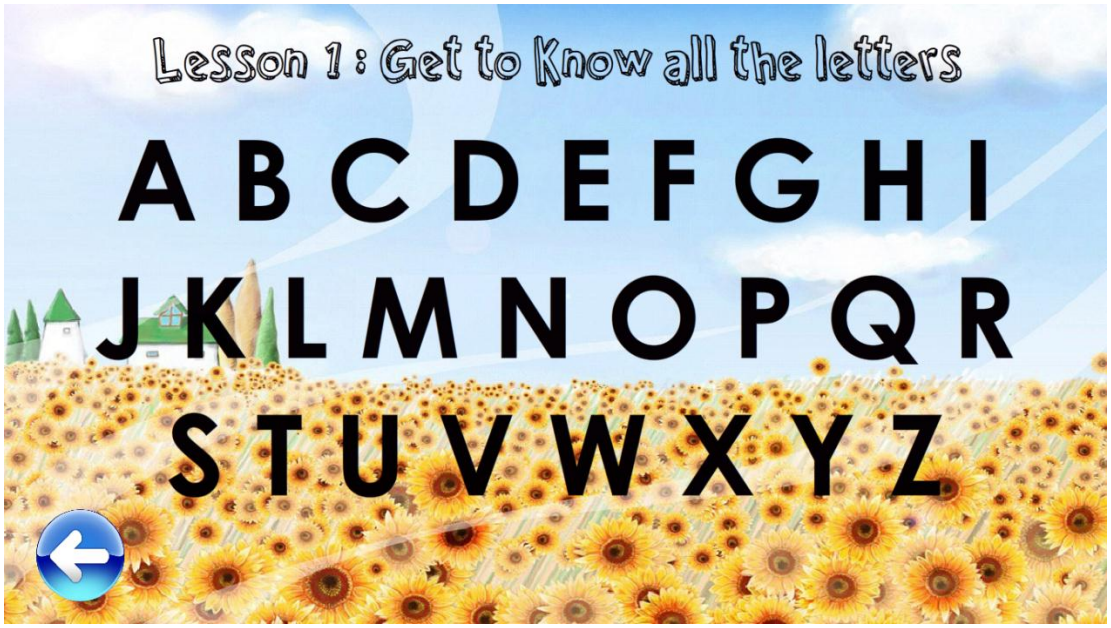


Figure 29: Module 1 Lesson 1 Selection

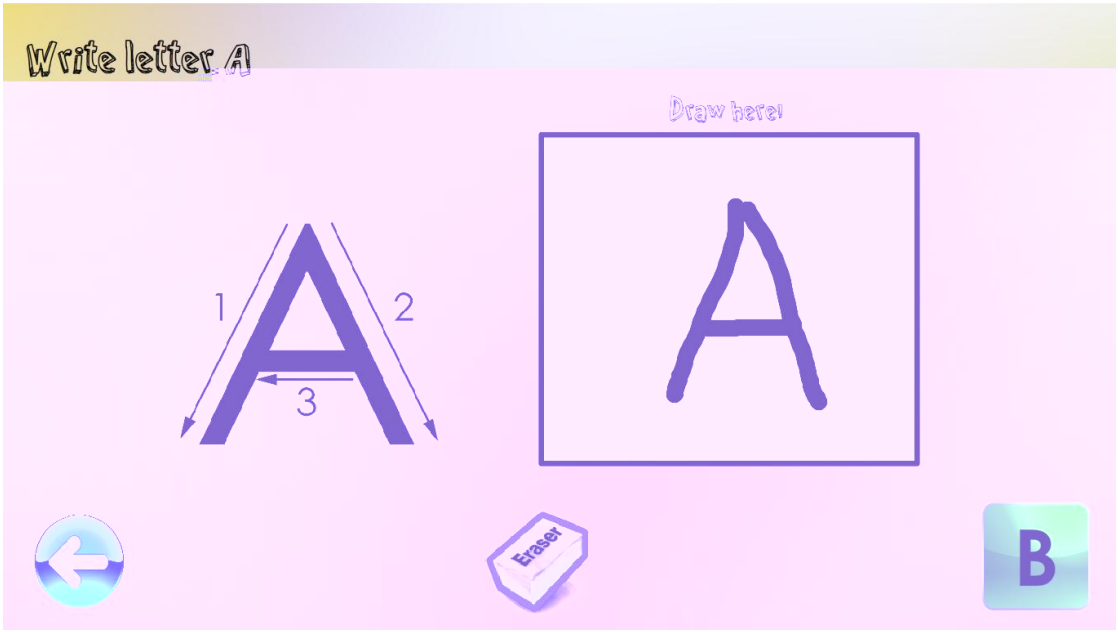


Figure 30: Module 1 Lesson 1 Write

After completing Module 1 Lessons 1, the application will continue to Lesson 2 which is to get to know the numbers from number 0 till number 9. Lessons two are pretty much the same concept and steps as Lesson 1 as it teach the user to pronounce the number (Figure 18) , write the number (Figure 19) and also check again on how to successfully pronounce and write the number (Figure 20).

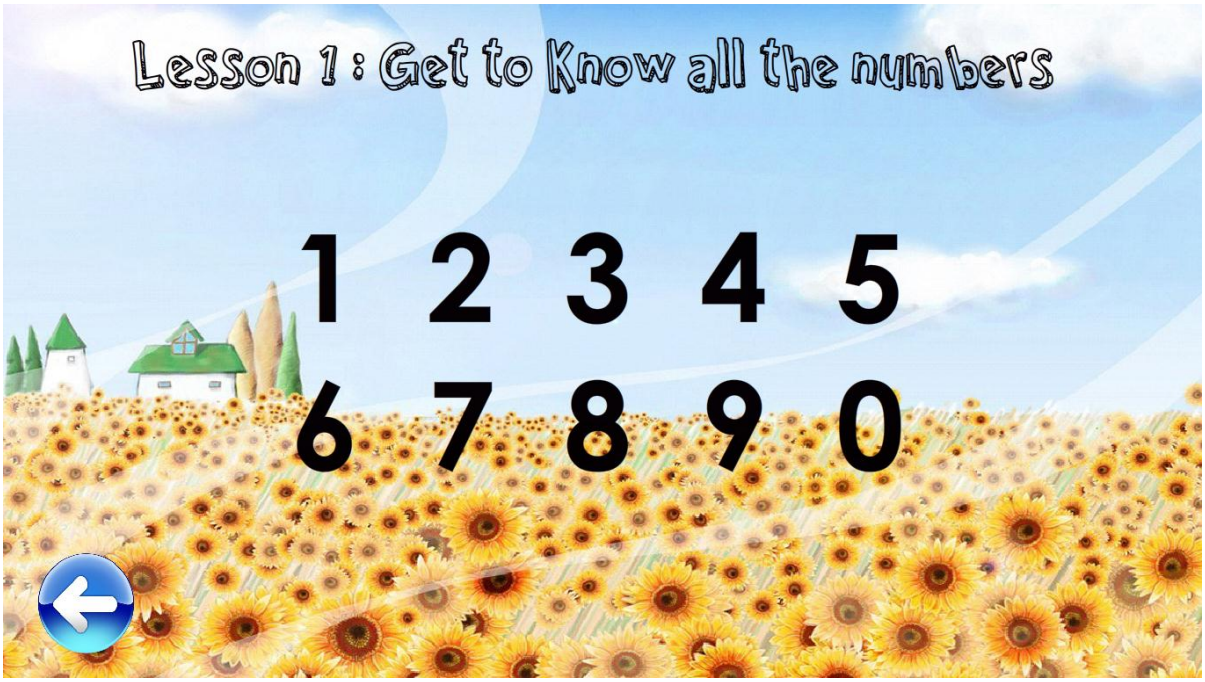


Figure 31: Lesson 1 Number Selection

Figure 32: Lesson 1 Numbers

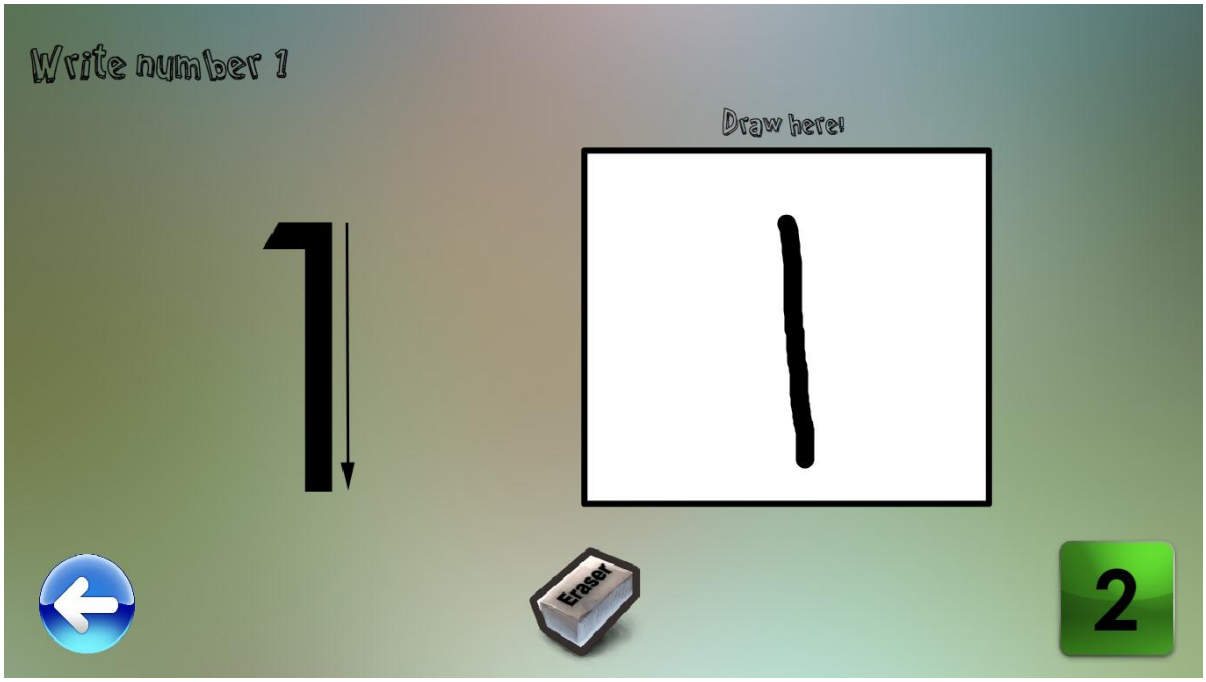


Figure 33: Lesson 1 Write Number

After finish recognizing and get to know the letters and numbers, user will head over to Lesson 1 under Module 2 to get to know their self. As shown as Figure 21 below, user have to pick the correct letter and put the letter to the space give to complete the word "my name is…". This is simply done by hovering their palm to the correct letter and put up their left hand to pick up the word. User have to put down their left hand in order for the letter to be drop onto the space given. After completing the words, user may continue to Lesson 2: Greetings.

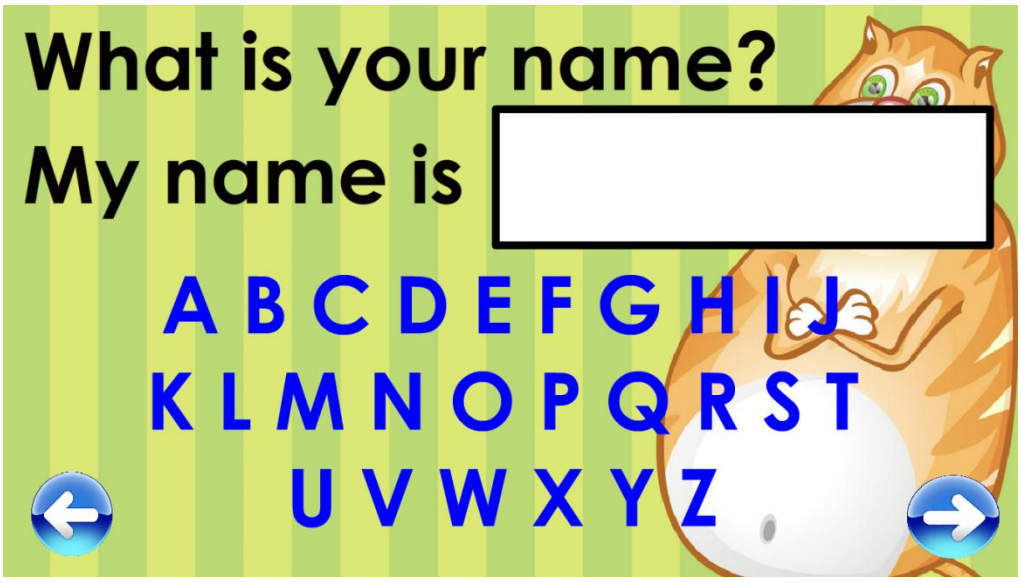


Figure 34: What is your name?

In Module 2 (Figure 35), an animal's picture will be display together with the letter that will make up the name of the animal. However, the letters are not in order thus it required user to identify on how to spell the animal's names. User just has to select the word and adjust it in good order. To help user identifies what kind of animal shown in that picture, they can move their hand to the animal's photo and bring up their left hand. It will trigger the applications, to make the sound of the animals. After completing adjusting the animal's names, user may continue to the next animals. The application has 10 animals to be tested to the users.

Figure 35: Module 2 Main screen

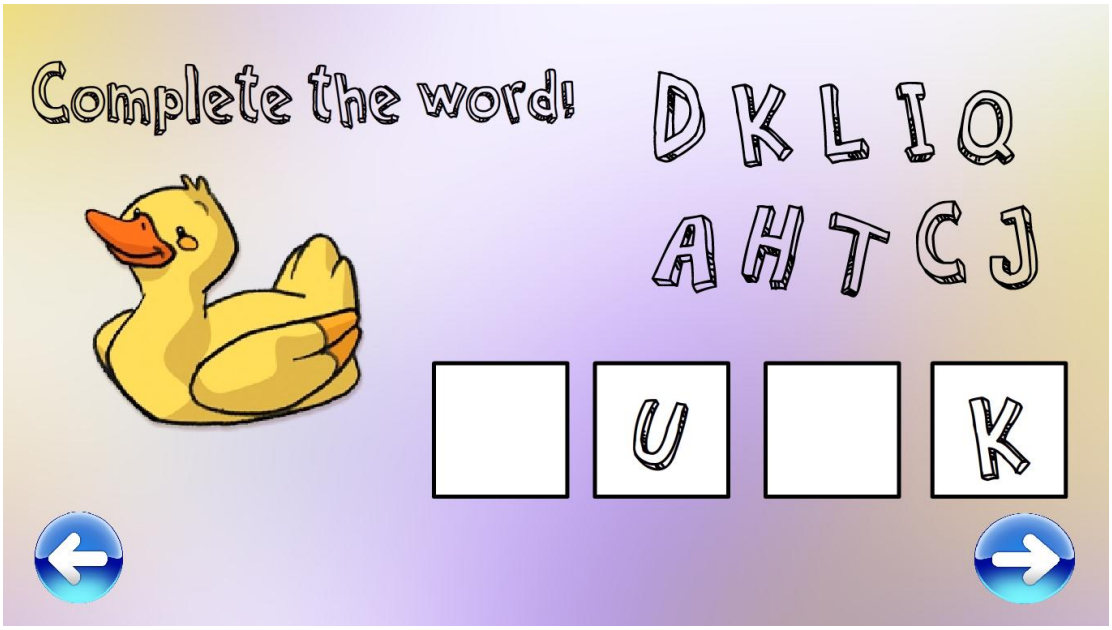


Figure 36: Arrange letters

Figure 37: Module 3 Main Screen

This module is two lessons which are "Lessons 1: Express yourself" (Figure 37) and "Lessons 2: Match the Expressions" (Figure 37). After finish recognizing and get to know the letters and numbers, user will head over to Lesson 1 under Module 2 to get to know their self. As shown as Figure 38 below, user have to pick the correct letter and put the letter to the space give to complete the word "my name is…". This is simply done by hovering their palm to the correct letter and put up their left hand to pick up the word. User have to put down their left hand in order for the letter to be drop onto the space given. After completing the words, user may continue to Lesson 2: Greetings.

Lesson 2 will focus on how to express yourself according to situations whether it be sad, funny, laugh, crying, angry, or even greetings and sorry for other peoples. A simple video will be shown on how to react according to situations. User just has to watch the videos and remember the reactions. User will be requested to arrange the letter according to orders. It consists of nearly 10 emotions and greetings as below:

- Hello
- Good morning!
- Good Evening!
- I'm sorry
- Thank you

Figure 38: Module 3 Lesson 2 Selection

Figure 39: Module 3 HELLO

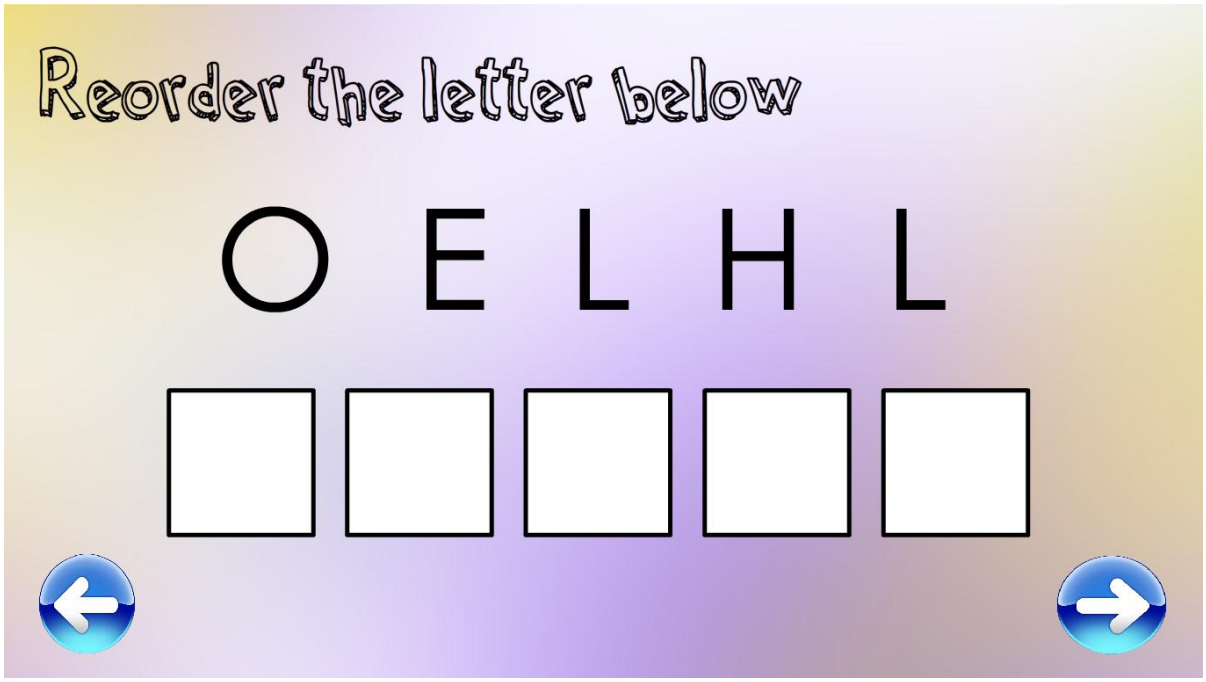


Figure 40: Arrange HELLO

The last module that provided in this application is “Module 4: Shapes, Let’s play!”. As we know, dyslexic children sometime have problems with recognizing shapes. So this activity mainly to help dyslexic children to recognize and differentiate between shapes. There are two lesson in this activity which are “Lesson 1: Recognize the shapes” (Figure 40) and “Lesson 2: Complete the puzzle” (Figure 40).

In lesson 1, the application will provide a set of shapes that relate to certain things such as tree, snails, bicycle, fish and others. So, user just has to recognize the shapes of the picture and identified it names. There are few alphabets, at the right side of the application, user will need to grab a letter that referring to the first letter on its names and drop it into the box besides the shapes.

In the last lesson in this application, it will test the user ability to recognize shapes and to think carefully on how to complete the puzzle that makes up a picture.

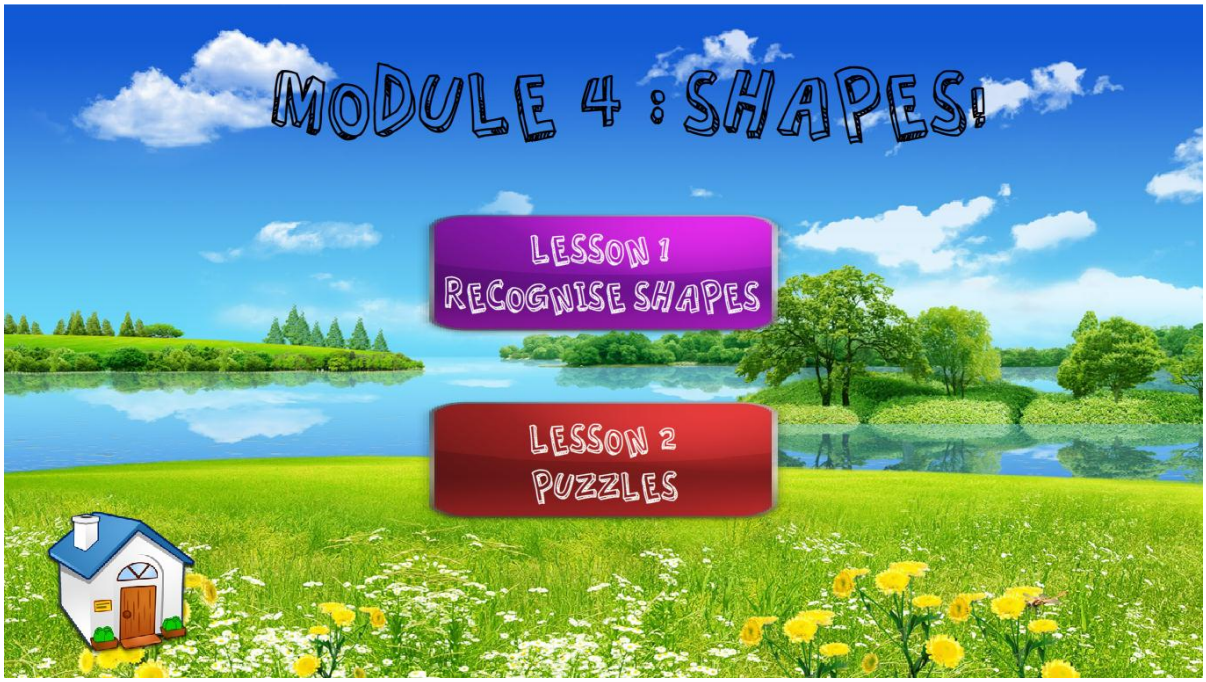


Figure 41: Module 4 Main Screen

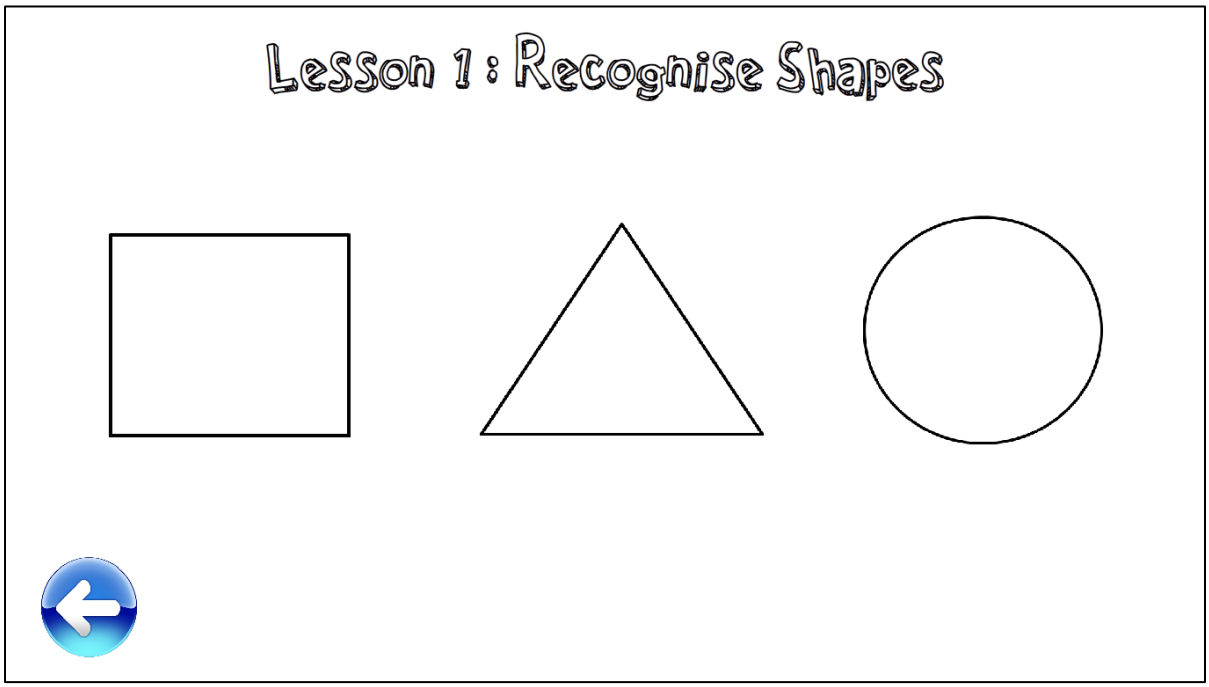


Figure 42: Module 4 Shapes

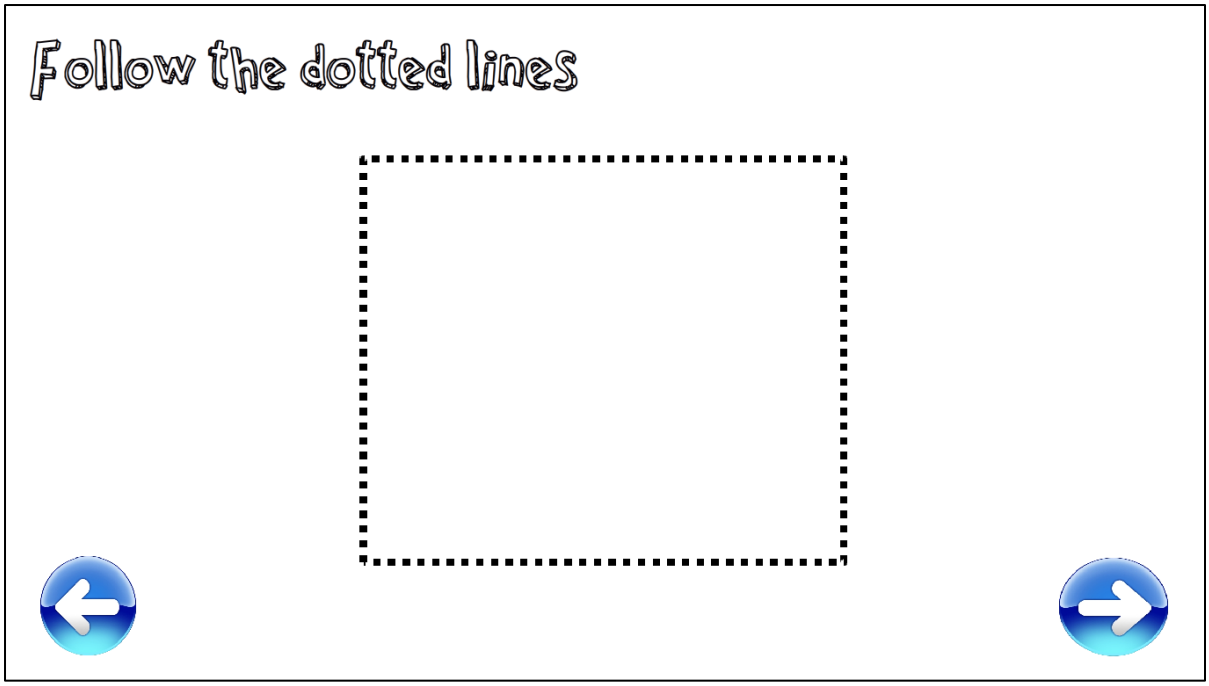


Figure 43: Module 4 follow the dotted lines

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

ABCDyslexic has the abilities to help Dyslexic children to improve their learning abilities thus improving their learning in other aspect. The development of this application will surely contribute to them and also at the same time provide guidance for teacher in assisting Dyslexic children in today learning environment. ABCDyslexic also provides a new platform for teachers and children that have problems in dyslexic to try out the new technology that based on Kinect. It creates a much more fun ways of learning and grasps the children attention to really focus in the learning process. Thus, this research is another contribution on the Kinect technology itself to be usable and acceptable by the community and contributes in improving level of education in Malaysia.

For future works, this application can be made to be compatible in other platform, not just limited to PC but also in smartphone and online usage. Operating system such as iOS, Android and Blackberry will create portability to this application. Further studies also needs to done to improve the current modules to really cater and help dyslexic children to improve their learning abilities.

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APPENDICES

Appendix 1 : Planned Gantt Chart

No	Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	[FYPI]Selection of the project topics									
2	[FYPI]Preliminary research									
3	[FYPI]Submission of preliminary research									
4	[FYPI]Seminar 1: Preliminary report									
5	[FYPI]Project work on progress 1: 5.1 Literature review 5.2 Identify project requirements									
7	[FYPI]Submission of progress report 1									
8	[FYPI]Seminar 2: Progress report 1 Project work on interim report 8.1 Literature review 8.2 Design 8.2.1 Plan system 8.2.2 System design 8.2.3 Interface design									
9	[]FYPI] Oral presentation									
9	System development									
10	[FYPII]Seminar 1: Submission of progress report 1									
11	[FYPII]Testing 9.1.1 System testing 9.1.2 User testing									
12	[FYPII]Poster exhibition & pre- edx									
13	[FYPII]Submission of dissertation - softbound									
14	[FYPII]Oral presentation									
15	[FYPII]Submission of dissertation - hardbound									

Appendix 2 : Actual Gantt Chart

No	Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	[FYPI]Selection of the project topics									
2	[FYPI]Preliminary research									
3	[FYPI]Submission of preliminary research									
4	[FYPI]Seminar 1: Preliminary report									
5	[FYPI]Project work on progress 1:									
	5.1 Literature review									
	5.2 Identify project requirements									
7	[FYPI]Submission of progress report 1									
8	[FYPI]Seminar 2: Progress report 1									
	Project work on interim report									
	8.1 Literature review									
	8.2 Design									
	8.2.1 Plan system									
	8.2.2 System design									
	8.2.3 Interface design									
9	[]FYPI] Oral presentation									
10	System development									
11	[FYPII]Seminar 1: Submission of progress report 1									
12	[FYPII]Testing 9.1.1 System testing 9.1.2 User testing									
13	[FYPII]Poster exhibition & pre- edx									
14	Changing of requirement									

15	[FYPII]Submission of dissertation - softbound									
16	System Development									
17	System Testing									
18	[FYPII]Oral presentation									
19	[FYPII]Submission of dissertation - hardbound									