Dyslexia Child Aide – a Mobile Application to Aid in Learning for Children with Dyslexia Utilizing the Orton-Gillingham Approach

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16132

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Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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Approved by,

_____

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TRONOH, PERAK

May 2015

CERTIFICATION OF ORIGINALITY

This was to certify that I am responsible for the work submitted in this project, that the original work was 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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(MOHD DHIYAURRAHMAN BIN MOHD SHAKIB)

ABSTRACT

The Dyslexia Child Aide is a mobile application that is developed in order to serve as a platform in which can help children with dyslexic condition in learning especially language learning. The children with dyslexic condition have learning disabilities in which they find it hard to distinguish between similar forms of letters. For example, they cannot differentiate the letter 'b' and 'd'. This condition occurs not because of sight impairment but because of genetic disorder. The Dyslexia Child Aide mobile application will be developed utilising the Orton-Gillingham approach. The approach is a very famous and successful approach and it has been practice by teachers around the world for almost 50 years. The approach is not a technique but merely act as a guideline for the teachers to develop their teaching plan. The Dyslexia Child Aide mobile application has been developed on iOS platform. This is because the iOS devices, issued by Apple Inc. are known for their quality in graphics display. The good and sharp images in the mobile app will help the student more. The testing has been done with the help from special education student and also from the special education teachers that specializes in teaching the dyslexic children. Their reactions and feedback has been recorded and the collected data has determined that the mobile app is a success in achieving its objectives.

ACKNOWLEDGEMENT

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1. INTRODUCTION

1.1. BACKGROUND OF STUDY

1.1.1. MOBILE APPLICATIONS

Mobile Applications are programs designed utilising the computational technology and liberated from the desktop computers and laptops to run on smartphones, tablet computers and other mobile devices. Mobile Applications or more famously referred to Mobile Apps are usually developed and are made available to be owned by public through application distribution platforms. In order to own the apps, the user will usually need to pay a sum of money to the platform provider and the money will be channelled to the developer. In a more simple way, the users usually need to buy the apps from developer through the platform provider.

The mobile apps platforms are like a marketplace in which the sale of mobile apps occurs. The platforms started to gain popularity after appearing in 2008 and are typically operated by the owner of the mobile operating system. The marketplace is an important feature that fully defines the whole smartphone and mobile devices idea because it helps the developer of the mobile phone to make sure that users of smartphones can fully utilises the features of a smartphone, through the installation and the usage of the mobile apps. There are various types of mobile apps available in the marketplace and by having the marketplace, users can pick and do mix and match of apps based on their preference. Some of the famous mobile operating systems and their correspondence mobile apps platform are described as follows:

Mobile Operating System	Mobile Apps Platform
iOS (Apple Inc.)	Apple App Store
Android (Google)	Google Play
Windows Phone (Microsoft Corporation)	Windows Phone Store
BlackBerry OS (BlackBerry Ltd.)	BlackBerry App World

Table 1 shows the Mobile Operating System and the correspondent Mobile Apps Platform.

In a usual way, the mobile apps will be downloaded from the above mobile apps platform and will be installed in the corresponding device in which the operating system is installed. But, these mobile apps can also sometimes be downloaded into laptops or desktop computers.

Originally, mobile apps are developed and offered to the user for the purpose of general productivity and information retrieval such as email, calendar, contacts, stock market and weather information. But, as the technology grows, and the addition of other factors such as the demand from general public that possesses the smartphone and mobile devices, and the availability of developer which have the access to the tools needed in the development process of the mobile apps, has really increase the range of purposes in which mobile apps can function. Some of the purposes or categories are word processing, social media, picture sharing, mobile games, factory automation, GPS mapping and location-based services, banking, networking and file transfer, education, video streaming, order tracking, ticket purchases and mobile medical apps.

The expansion of technology has resulted to the increasing of needs for smartphones and mobile devices. This situation has driven the popularity of mobile apps to shoot up and sky rocketing for the past 5 years. Other than that, the popularity of mobile apps shooting up is also due to their usage which has become increasingly prevalent across mobile phone users.

1.1.2. DYSLEXIA AND THEIR LEARNING DISABILITIES

Dyslexia is a general term used across the world in reference to the disorder which involves the difficulty in learning to interpret words, letters, and other symbols. Subsequently, the people with dyslexia will have a huge difficulty in order to do processing on language. The difficulties mentioned are typically manifested by the person with dyslexic condition through a lack of proficiency in reading, spelling, and writing. People with dyslexic condition also have a very hard time to converse with their peers. They are often described by their parents as a late talker because they are only able to talk at a later age in their life. After all of the above conditions

are taken into account, it does not mean that a person with dyslexic condition can be considered as a stupid or retarded person. The person may be dyslexic but the condition does not affect their general intelligence.

The main cause of dyslexia is genetics or in other words, we can say that dyslexia is a condition which can be passed on through families or generations. Scientific research have been done in the field of genetics and the result has shown that if a person suffers from dyslexia, a possibility for their child to also have the same condition is significantly high. The result also shows that if one identical twin is known to suffer the dyslexic condition, the possibilities are high and very likely that the other twin also have the same condition.

In order to create a point of view on the sheer quantities of people with dyslexic condition in the world, there is a survey conducted by experts and the subsequent results was published by the International Dyslexia Association. Some of the statistics from the survey states that 70% to 80% of people in the world which happens to have a poor reading skills, are most likely to have a dyslexic condition. Other than that, the result of the survey also shows that one in five students, or roughly 15% to 20% of the world population, has a language based learning disability. This statistic is relevant to the dyslexia because dyslexia is the most common cause of the language based learning disabilities. The survey also found out that the number of males and females in the world that suffer from the dyslexic condition has a nearly the same percentage. It is also the same case with the people from different ethnic and socioeconomic backgrounds.

1.1.3. THE ORTON-GILLINGHAM APPROACH

In order to help these unfortunate people to overcome their unavoidable condition, some of the world's most talented, passionate and high intellectual people have worked together to invent ways or approaches to be adapted by teachers and parents to train their child from early age. One of the most famous approaches is the Orton-Gillingham approach. The Orton-Gillingham approach can be described as an instructional approach that is intended primarily for the use of people who have

difficulty with reading, spelling and writing skills or generally for the use of people with dyslexic condition. The approach is described in such manner because it is not understood and practiced by the well-trained and experienced instructor as a method, program, system or technique. It is merely an approach in which the instructor adapted flexibly according to the suitability of the instructor and the trainee or child.

The Orton-Gillingham Approach has been used in the education for the dyslexic children around the world since the 1930s. The approach has been introduced by Samuel Torrey Orton (1879–1948), a neuropsychiatrist and pathologist at Columbia University and his research has been helped by Anna Gillingham (1878–1963), an educator and psychologist at Teachers College, Columbia University. Since 1920s, Orton had extensively studied the behaviour of children with the kind of language processing difficulties now commonly associated with dyslexia. He later formulated a set of teaching principles and practices for such children based on the study that he has done. Working with Orton, Gillingham helps in the study conducted by Orton by training selected teachers and compiling along with publishing the instructional materials for the usage of public.

1.2. PROBLEM STATEMENT

Currently there is a lot of mobile app developed for the use of normal children in their daily learning activities. The obvious problem is that those mobile apps do not suitable for the use of children with learning disabilities, especially the children with dyslexic condition. This is due to the nature of the children which makes them different from other normal children.

1.3. OBJECTIVES

The objective of this research are:

I. To understand, learn and do research about the Orton-Gillingham approach and its practices in the Malaysian education system. Since the Orton-Gillingham approach is known to be implemented worldwide in the period of 50 years, there will be a need to explore the implementation of the approach in the Malaysian context.

II. To develop a mobile app that caters the need of education for children with dyslexic condition utilising the principles of Orton-Gillingham Approach. Since the Orton-Gillingham Approach has been proven to be the most effective techniques in training the children with dyslexic condition, a mobile app that utilises the approach will be a good platform for the children to learn and for the parent to help their children to do so without the need to spend a lot of money.

III. To do testing on whether the children can accept and use the mobile app in their learning process. The testing is the most crucial part in this mobile app project because it will hugely determine the success of the mobile app that has been developed.

1.4.   SCOPE OF STUDY

In the process of conducting this paper and research, there are scope of study that I need to consider depending on the environment, users and the system requirement that the mobile app need in order for it to be operated in full capacity. Basically, the main function of the mobile app that I will develop is to be used as a language learning tool, specifically English, which will help children with dyslexic condition, their parents and the teachers. So, the mobile app will need to be able to be used by children that suffer from dyslexic conditions. The mobile app also must be able to be operated by the parents or teachers because they will use it in order to monitors the progress of the children.

For this study, the targeted user of this mobile app is for the primary school student, aged 7 to 10 years old. The reason for this age group chosen is because they are still early in learning process in the school and some of them can only be diagnosed with dyslexic condition when they reach the age group. Depending on their progress, dyslexic children have different age in which dyslexia can be diagnosed in them.

For monitoring purposes, the instruction in the mobile app, which is in English, must adhere to a certain English language levels because not all of Malaysian parents can understand a high level English instruction. For this mobile app to be easily accepted, an intermediate level English is a feature which is the most important in designing and developing the instruction within the app.

The mobile app will be developed to comply with the Orton-Gillingham approach of teaching language to dyslexic children. To achieve that, the app must consist of some features that are tally with the Orton-Gillingham attributes which can be seen in the Orton-Gillingham attributes. To ensure the mobile app actually developed and adhere to the Orton-Gillingham approach, a checklist will be needed in the development phase.

The mobile app will be basically operated without the assistant of any other outer applications. So, the device in which the mobile app will be operating only needs to have an operating system and database or memory for the mobile app to store some data.

2. LITERATURE REVIEW

2.1. LEARNING WITH ASSIST FROM MOBILE TECHNOLOGY

In her paper, Utilization of Mobile Apps among Student with Learning Disability from Islamic Perspective, Zain (2013) state that mobile technology can offer appropriate educational environment to assist learning activities outside the classroom. There is a very crucial need for student to learn outside of the classroom because in the current world situation, a holistic in knowledge and a well-rounded student are crucial characteristics that is needed in a student. This is because the world nowadays is in a state whereby there are virtually no boundaries between countries. So, in order to make sure that the child will be able to survive in the future, the lessons in the classroom are simply not enough.

Learning through mobiles has extended the scope of learning anytime and anywhere (Mishra). This is true based on a platform in which mobile devices can be carried anytime and anywhere. Once the appropriate and useful mobile apps that helps in learning has been installed, the mobile device can become the tool for learning in anytime and at anywhere. Mishra also state that the concept of mobile learning has gained serious strength and influence in describing the future of education. As the technology evolves and slowly dictates our daily lives, the need is there for a mobile learning application that works on the mobile devices. It is just normal nowadays that every possible action in the reality being imitated and recreated to be virtual and mobile,

Revelle (2007) meanwhile state in her study that educational media and technology have been widely used to promote literacy learning among children in both formal and informal environments when effective teaching techniques are applied. The most obvious example that can be mention here is how television shows for children that use simple and understandable language have been used to teach language to children. Although there is no syllabus drafted when it comes to

television shows, children that watched the show shows a remarkable progress in language learning, compared to other children.

2.2. MOBILE APPLICATION FOR DYSLEXIC CHILDREN

In the previous explanation, we have seen how three researchers found that the mobile apps really help children to learn outside of classroom, whereby it is important for a children to learn other things than in the classroom; learning with mobile apps has extended the scope of learning anytime and anywhere; and educational media and technology have been widely used to promote literacy learning among children in both formal and informal environments. But all these statements has been made on the account that the children in the context does not suffering from any learning disabilities. The main concern now is whether the children with learning disabilities will embrace learning using mobile devices through the mobile apps.

In order to investigate the acceptance of dyslexic children towards the mobile apps that helps in learning, Daud (2013) has developed a mobile apps called the "Dyslexia Baca". The mobile app has been developed and configured to be operated in Malay language. The mobile app has been developed with the following objectives to be met:

I.   To assist alphabet recognition for dyslexic children.

II.   To motivate dyslexic children learn to read.

III.   To help dyslexic children in recalling the information that they read and learn.

The prototype version of the mobile app introduced five confusing letters, which are 'P', 'p', 'b', 'd' and 'm' for dyslexic learners at early reading level. After finish playing at each level, the dyslexic children will get rewards in the form of a

congratulation page and clapping sound. This mobile application, although it is good; does not developed to utilise the Orton-Gillingham approach, which is the tried-and-tested approach used to help the dyslexic children.

According to (Purkayastha (2012)), the Orton-Gillingham Approach has been used in education for the last 50 years can be further described as a language-based, multisensory, structured, sequential, cumulative, cognitive, and flexible. The described characteristics can be easily related to from the following attributes of the approach:

I. Personalized.
Different person have a different needs and requirements to be met. In order to successfully implement this approach, each person's difference must be recognized. Although people with dyslexia sometimes have their similarities, they have differences in some aspects such as their language needs. People around the world converse with different language and these different languages have their own difficulty level that is perceived by dyslexic person.

II. Multisensory.
The approach was design to meet a criteria whereby the all learning pathways; seeing, hearing, feeling, and awareness of motion, brought together in a series of tasks. The tasks are design and tailored by the teacher according to the needs of the student. The teacher also explains on how the student, by using these multiple pathways, can engage in multisensory learning that will result in a great success towards learning.

III. Diagnostic and Prescriptive.
The approach is diagnostic in the sense that the instructor continuously monitors the verbal, nonverbal, and written responses of the student to identify and analyse both the student's problems and progress. The information on the student's problems and progress will

be the basis of planning for the next lesson. Meanwhile, the approach is prescriptive in the sense that it will contain instructional elements that is based on the student's progress noted from previous lesson.

IV. Direct Instruction.

The teacher's lessons follows a format that will help to ensure that the student approaches the learning experience in a manner that they understand what is to be learned, why is it to be learned, and how it is to be learned.

V. Systematic Phonics.

The approach utilises the systematic phonics by stressing the alphabetic principle in the initial stages of reading development. The best way to implement the approach so that it fulfils the systematic phonics is by taking advantage of the sound/symbol relationships inherent in the alphabetic system of writing. It can be done because spoken words are made up of individual speech sounds, and the letters of written words graphically represent those speech sounds.

VI. Applied Linguistics.

The applied linguistics are not only embraced during the initial decoding and encoding stages of reading and writing, but also during the more advanced stages dealing with syllabic, morphemic, syntactic, semantic, and grammatical structures of language and our writing system. In other words, the approach involves the student in integrative practices that require reading, spelling, and writing together at all time.

VII. Linguistic Competence.

The approach helps to increase the linguistic competence by stressing the language patterns that determine word order and sentence structure and the meaning of words and phrases.

VIII. Systematic and Structured.

In the approach, the teacher will present information in an ordered way so that there will be enough indication towards the relationship between the current material taught and past material taught.

IX. Sequential, Incremental and Cumulative.

For the student that only begin their training, they need to go into a step by step learning, starting from the simple, well-learned material towards the more and more complex material. They will move from one step to the other one shortly after they master the level of language skills before.

X. Continuous Feedback and Positive Reinforcement.

The approach recommends that a close teacher-student relationship needs to be built in order to boost the self-confidence of students based on their success.
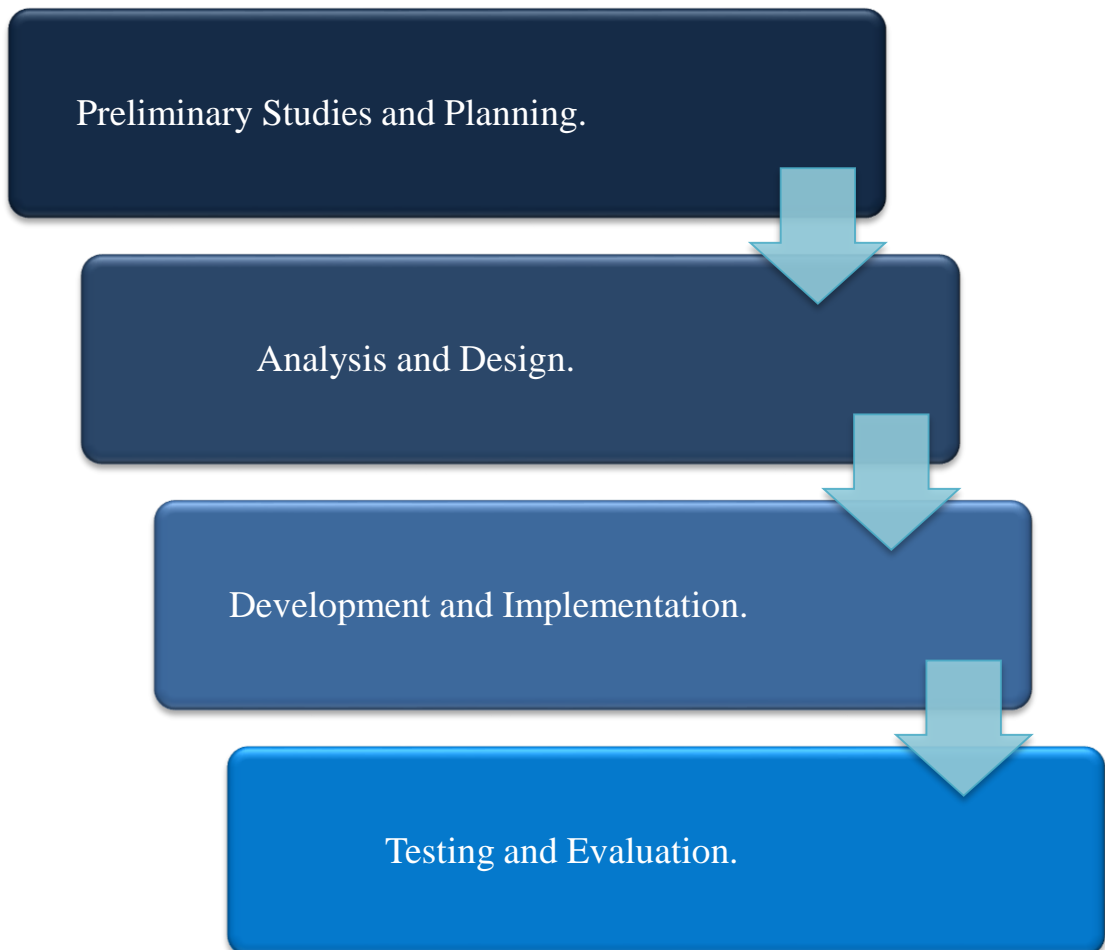
XI. Cognitive Approach.

The approach strives to make sure that student can really understand the reasons for what they learned. The approach also helps student to understand the learning strategies that they employed. Students can only then gain more confidence once they gain their ability to apply newly explored knowledge and subsequently increase their knowledge on how to develop their skills with reading, spelling, and writing.

XII. Emotionally Sound.

Self-confidence and motivation are important in dealing with student emotion. In order to ensure that all students have stable emotional state, it is vital to make them feels good about themselves and about their learning. To accomplish that, teaching must be directed towards providing the experience of success.

3.   METHODOLOGIES

During the early stage of the studies, by referring to various sources, I have made a decision to develop the mobile app in phases. After done some serious studies, I have found out that the method that can be feasibly implemented is by following the Software Development Life Cycle (SDLC) technique because by implementing SDLC, the development process will be systematic, neat and it will be easier make sure that every base and details of the project is completely covered. So, to implement the SDLC method, I have laid out the phases that will be done which can be seen as follows:

Preliminary Studies and Planning.

Analysis and Design.

Development and Implementation.
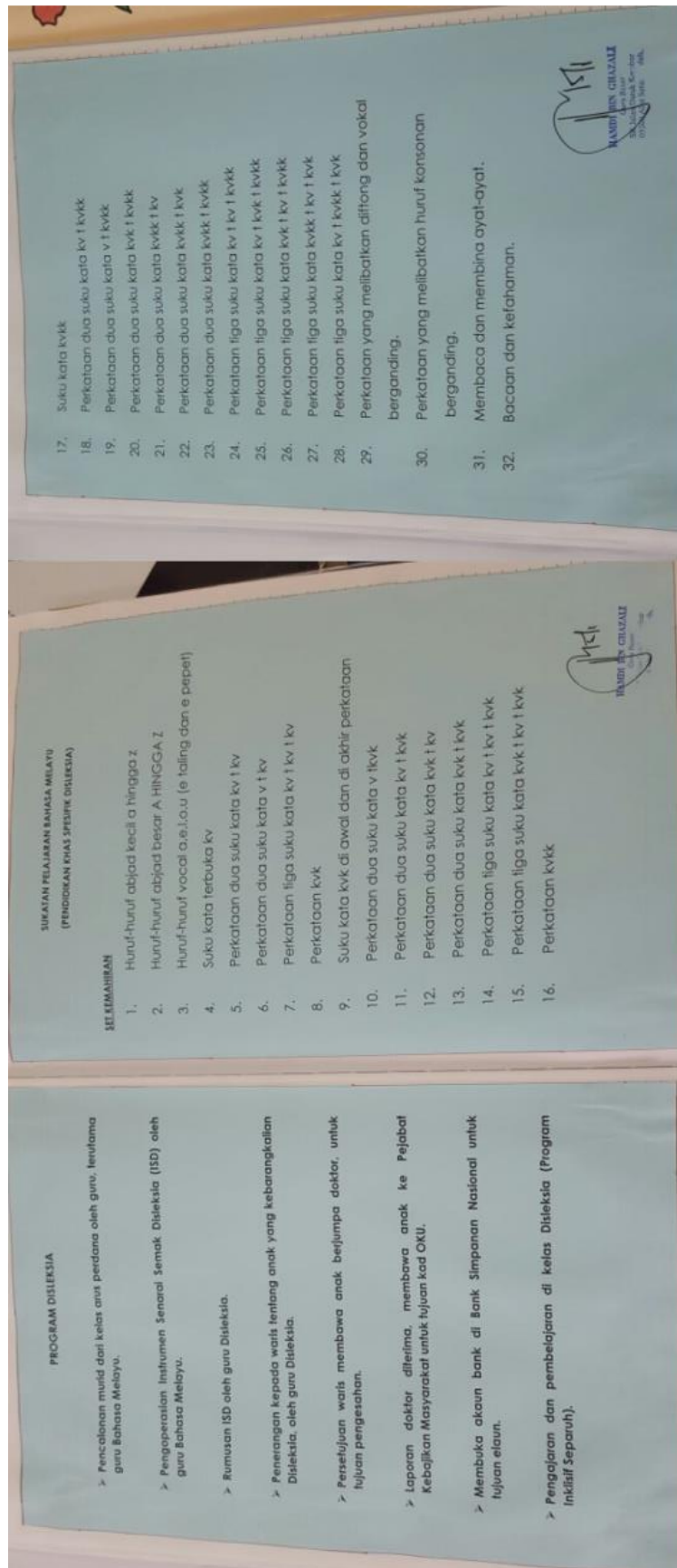
Testing and Evaluation.

3.1.   PRELIMINARY STUDIES AND PLANNING

In order to understand the implementation and utilisation of the Orton-Gillingham approach in the education sector in Malaysia, especially involving the dyslexic kids, the most suitable and reasonable step to be taken is to do an interview with the teacher who handles the dyslexic students in Malaysia.

Implementation and utilisation of Orton-Gillingham approach is still limited in Malaysian education context. Puan Hanifa Bibi binti Shafi Mohamad, a teacher taught specifically the dyslexic student at Sekolah Kebangsaan Jalan Datuk Kumbar, in her interview with me says that before this, she never knows what Orton-Gillingham approach are. Despite her more than ten years' experience dealing with the dyslexic students, she does not have any clue in what is Orton-Gillingham approach and I have to explained it to her. The main reason behind it is that Orton-Gillingham approach is not suitable for the teaching of Bahasa Melayu. Orton-Gillingham approach is phonics based teaching technique and it may suitable with English, but not for Bahasa Melayu, she says. Bahasa Melayu is easier taught using syllables based teaching technique. To compensate the listening part, the students then need to reread their work, in the workbook.

Besides that, the teachers training module does not specified whether she is a specific and exclusively trained to teach the dyslexic children. Their training is general, formulated to deal with all kinds of learning difficulties and that proves to be a problem because they are not exposed to the technique specific for teaching dyslexic children. Even the world famous and proven techniques are neglected in the teachers training module. To adapt in teaching the dyslexic students, Puan Hanifa Bibi said that teachers chose to develop the techniques, based on their preferences and qualifications and then get it approved by the Ministry of Education Malaysia. For Puan Hanifa Bibi, she chose to teach using syllable technique, as per technique that has been used by Bahasa Melayu teacher that teaches normal Standard 1 pupils. This technique emphasizes on the togetherness of writing and reading for the students, and it usually takes from 6 months to 1 year for the student to be able to fully overcome his or her difficulty, depending on the student's motivation.

PROGRAM DISLEKSIA

> Pencalonan murid dari kelas arus perdana oleh guru, terutama guru Bahasa Melayu.

> Pengoperasian Instrumen Senarai Semak Disleksia (ISD) oleh guru Bahasa Melayu.

> Rumusan ISD oleh guru Disleksia.

> Penerangan kepada waris tentang anak yang kebarangkalian Disleksia, oleh guru Disleksia.

> Persetujuan waris membawa anak berjumpa doktor, untuk tujuan pengesahan.

> Laporan doktor diterima, membawa anak ke Pejabat Kebajikan Masyarakat untuk tujuan kad OKU.

> Membuka akaun bank di Bank Simpanan Nasional untuk tujuan elaun.

> Pengajaran dan pembelajaran di kelas Disleksia (Program Inklisif Separuh).

SUKATAN PELAJARAN BAHASA MELAYU
(PENDIDIKAN KHAS SPESIFIK DISLEKSIA)

SET KEMAHIRAN

1. Huruf-huruf abjad kecil a hingga z
2. Huruf-huruf abjad besar A HINGGA Z
3. Huruf-huruf vocal a,e,i,o,u (e taling dan e pepet)
4. Suku kata terbuka kv
5. Perkataan dua suku kata kv + kv
6. Perkataan dua suku kata v + kv
7. Perkataan tiga suku kata kv + kv + kv
8. Perkataan kvk
9. Suku kata kvk di awal dan di akhir perkataan
10. Perkataan dua suku kata v + kvk
11. Perkataan dua suku kata kv + kvk
12. Perkataan dua suku kata kvk + kv
13. Perkataan dua suku kata kvk + kvk
14. Perkataan tiga suku kata kv + kv + kvk
15. Perkataan tiga suku kata kvk + kv + kvk
16. Perkataan kvkk

17. Suku kata kvkk
18. Perkataan dua suku kata kv + kvkk
19. Perkataan dua suku kata v + kvkk
20. Perkataan dua suku kata kvk + kvkk
21. Perkataan dua suku kata kvkk + kv
22. Perkataan dua suku kata kvkk + kvk
23. Perkataan dua suku kata kvkk + kvkk
24. Perkataan tiga suku kata kv + kv + kvkk
25. Perkataan tiga suku kata kvk + kv + kvkk
26. Perkataan tiga suku kata kvk + kv + kvkk
27. Perkataan tiga suku kata kvkk + kv + kvk
28. Perkataan tiga suku kata kv + kvkk + kvk
29. Perkataan yang melibatkan diftong dan vokal berganding.
30. Perkataan yang melibatkan huruf konsonan berganding.
31. Membaca dan membina ayat-ayat.
32. Bacaan dan kefahaman.

Picture 1 shows the teaching syllabus that Puan Hanifa Bibi drafted with approval from the Headmaster of the school.

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Besides different technique required for their learning, the dyslexic student also needs specific workbook and textbook in their learning. According to Puan Hanifa Bibi, there are no such things in Malaysia. She said that dyslexic is only fully recognised as a learning disability in the 1990s. It is still considered a new field because there is not much experts in the field working with the ministry of educations now. That is why no specific workbook and textbook are available and distributed by the ministry. So, the teachers are the one who need to find an alternative by mixing and matching different materials to suit them.
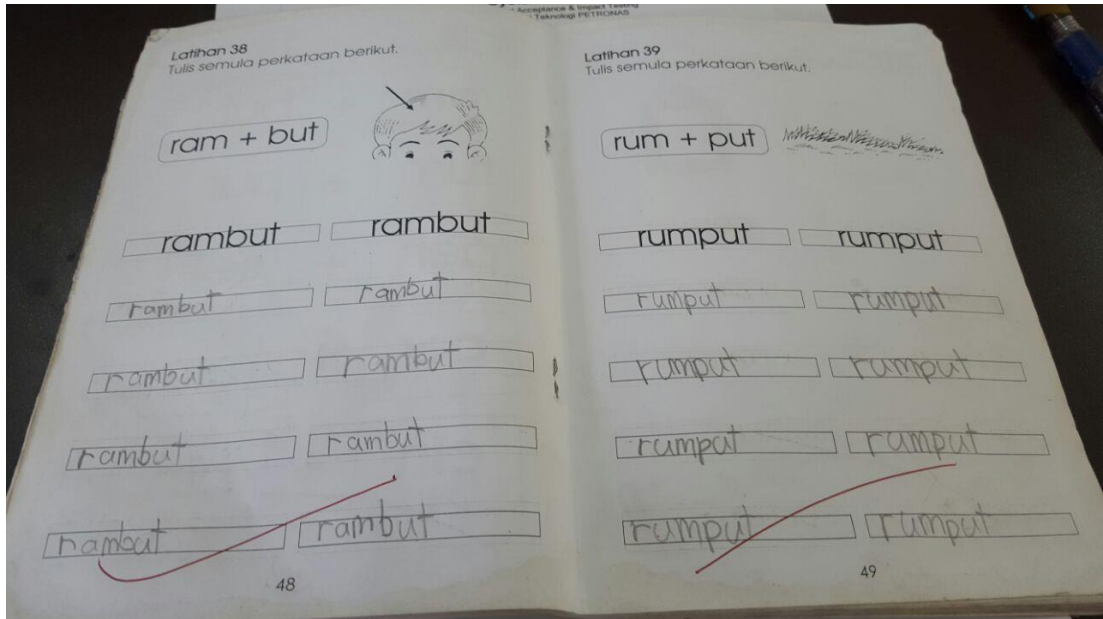
Picture 2
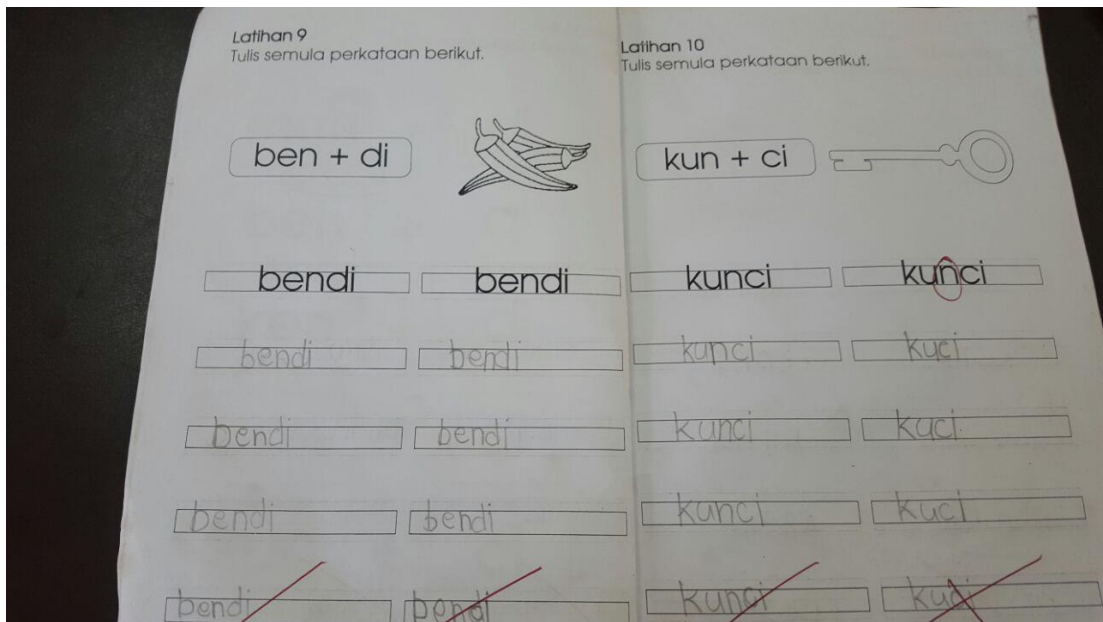
Picture 3

The pictures above show the sample of the workbook that is repurposed by Puan Hanifa Bibi so that the dyslexic children can use it in their learning at school. This book is for the beginners book in which the students started to learn the words and syllables. The workbook is not a specific dyslexia workbook so there are a lot of limitations in using the book in daily learning.
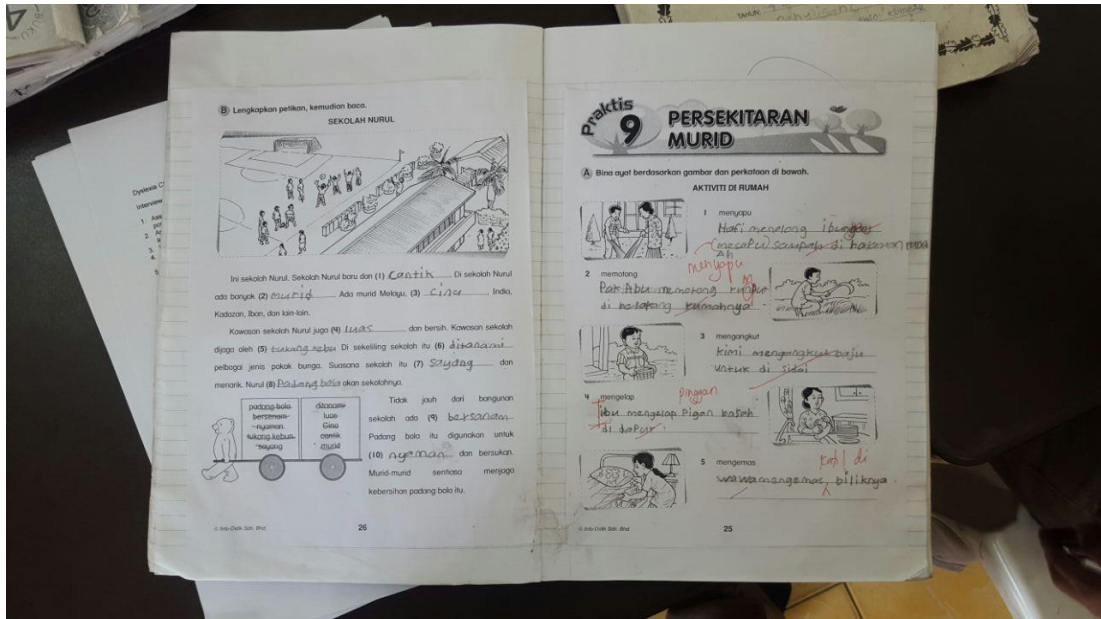
Picture 4
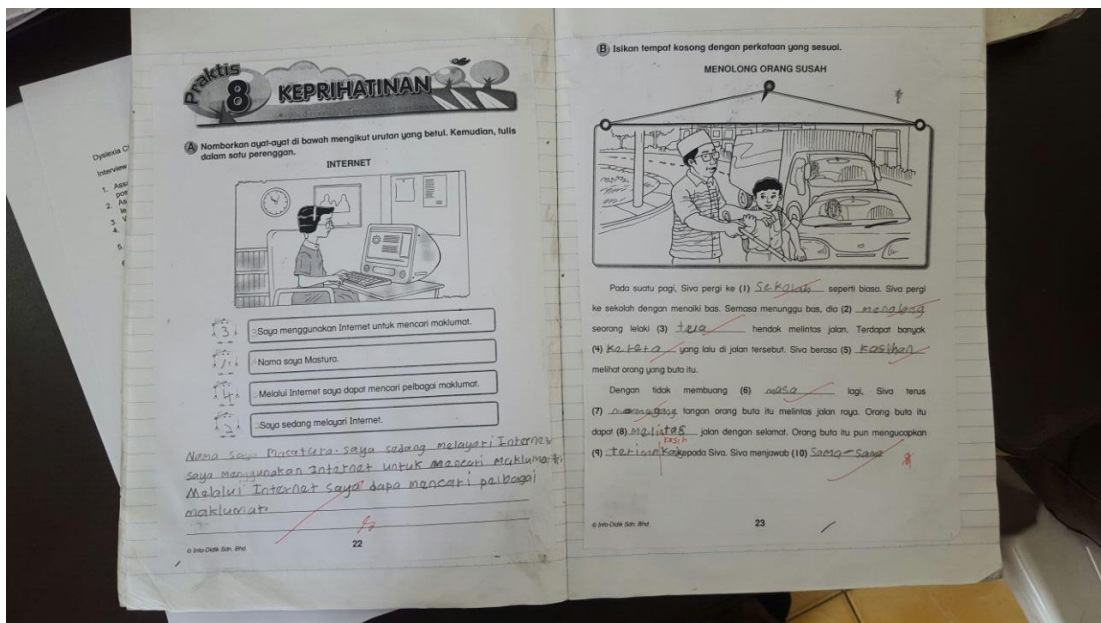
Picture 5

The pictures above meanwhile show the different level of workbook for the students. In this workbook, the student started to make their sentence, albeit from copying the existing sentence in the book. This trains them to write while reading.
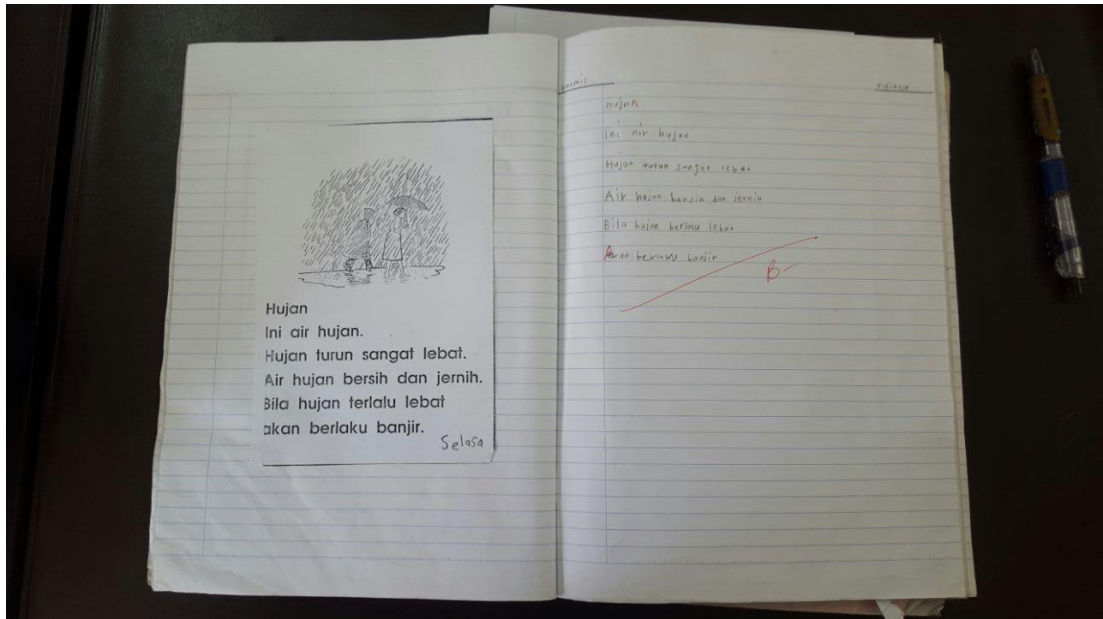
Picture 6
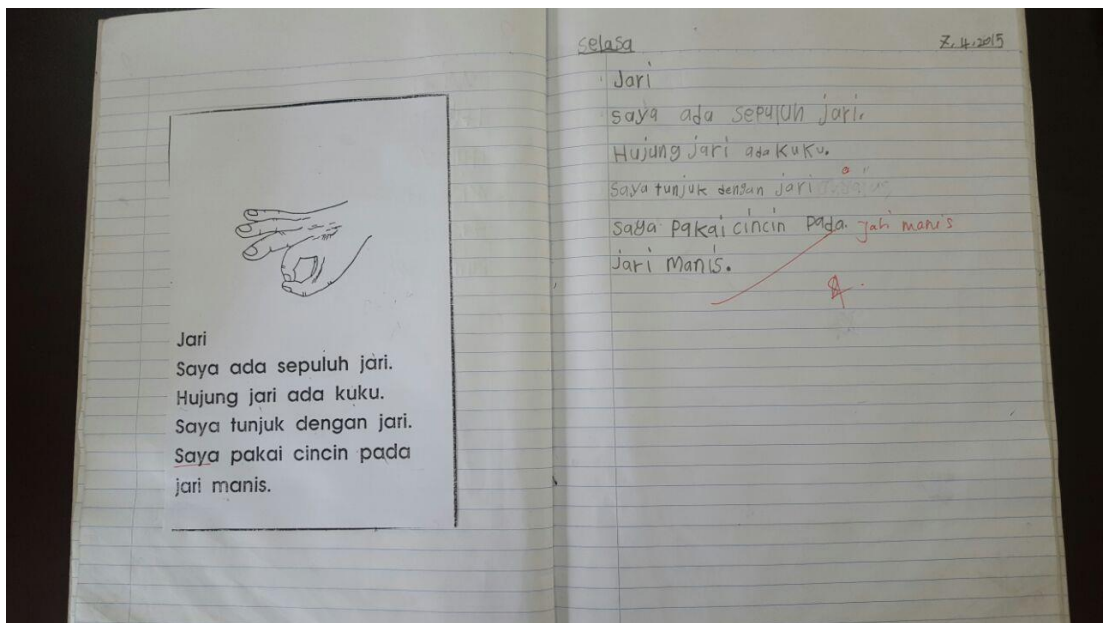
Picture 7

The above workbook shows attributes in pictures and the accompanying sentence describe the pictures for them. While them learning to read and write, they also learn to describe things by reading the materials.
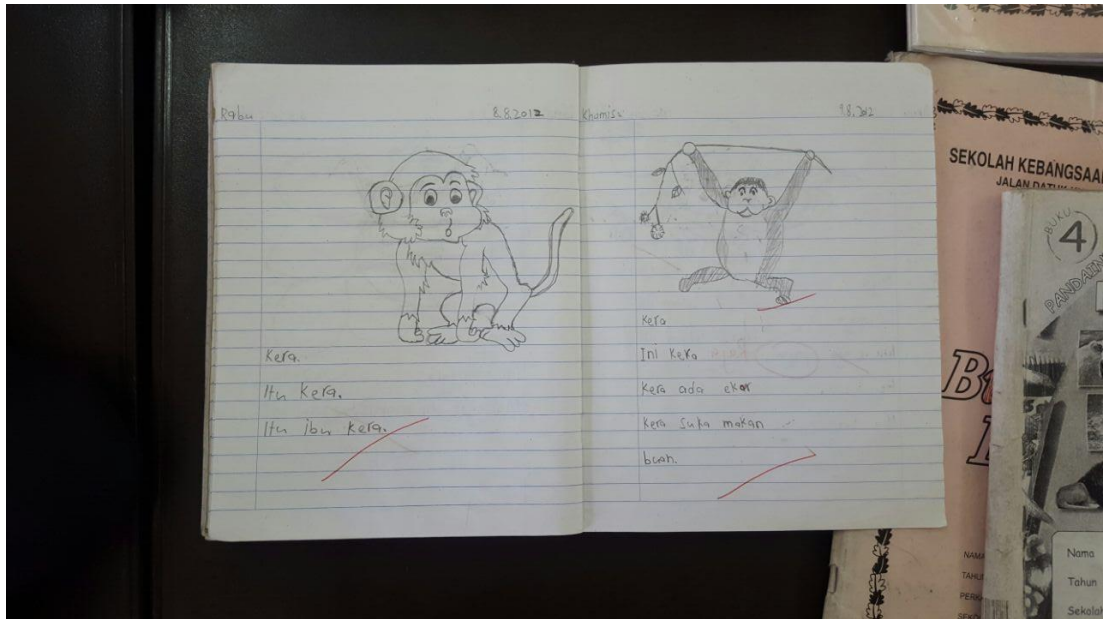
Picture 8
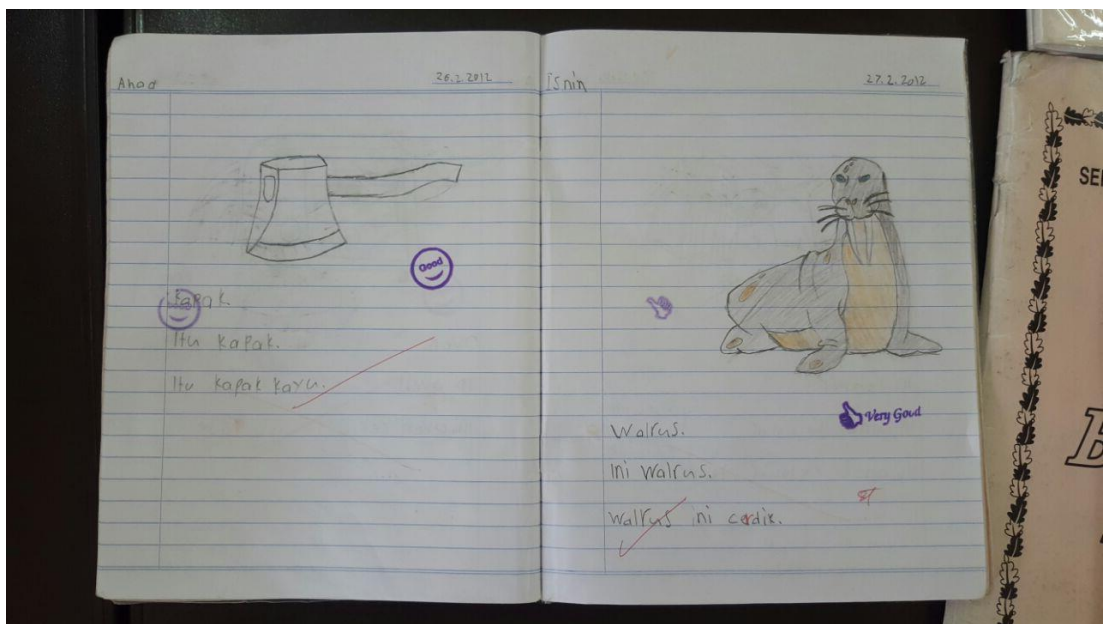
Picture 9

In the above picture, the student started to make their own sentence and some of them are creative enough to draw the pictures. This showcase their abilities to do things that even normal people can do.

The main obstacle for dyslexic children to be successful in their learning is their self-motivation and surrounding support. According to Puan Hanifa Bibi, a hardworking student and that lives in a conducive and supportive environment have higher chances to be successful. So, for learning to happen at home, the students need an effective way to learn to ensure their progress will be significantly faster. The parents also must be involved with their learning as a show of support to increase their morale. Puan Hanifa Bibi then states that by having a mobile app to help learning at home, it will be a significant booster for the child and their parents. That is one of the reason that I have encountered in order to further continue my project.

Besides conducting the interview with the teacher who handles the dyslexic students in Malaysia, to complete the research in order to understand the implementation and utilisation of the Orton-Gillingham approach, I have to review previous research papers that have been done in the topics that related to this study. There must be a certain amount of connection and relation from those research papers for them to be relevant as a resource needed in my research. Although most of the research has been made to be available for public access and can be downloaded easily from the online platform, some of the papers have lots of medical jargon which makes it a very difficult task for me to go through the papers. Despite all of that, I have managed to find and understand some of the research papers related to the topics of this study. After done with the research part, I finally managed to understand the approach highlighted in the Orton-Gillingham approach. The essence of the approach is basically for the tutor or teacher to follow these attributes in their teaching plan:

I.   Personalized

II.   Multisensory

III.   Diagnostic and Prescriptive

IV.   Direct Instruction

V.   Systematic Phonics

VI.   Applied Linguistics

VII.   Linguistic Competence

VIII.   Systematic and Structured

IX.   Sequential, Incremental and Cumulative

X.   Continuous Feedback and Positive Reinforcement

XI.   Cognitive Approach

XII.   Emotionally Sound

The reason behind the approach is mainly to make sure that the child with dyslexic condition can cope and slowly adapting to the teaching plan. The approach also stresses on utilising the entire important sense of the child in their learning process to ensure that they can fully understand the teaching easily. The most important thing of all, in the approach, the founder of the approach really wanted to make learning, especially language learning to be a simple and fun activity for the dyslexic children. This is mainly because by teaching using normal methods, the children found themselves struggling to cope and understand the teaching. This makes them frustrated and causing them to be left behind and hinder them from achieving their full potential.

3.2. ANALYSIS AND DESIGN

In order to make sure that the Dyslexia Child Aide apps comply with the Orton-Gillingham approach attributes, the exercises and activities in the mobile apps are broken down into four different modules and each module will focusing on different sense of the child. The modules can be referred in the diagram below:
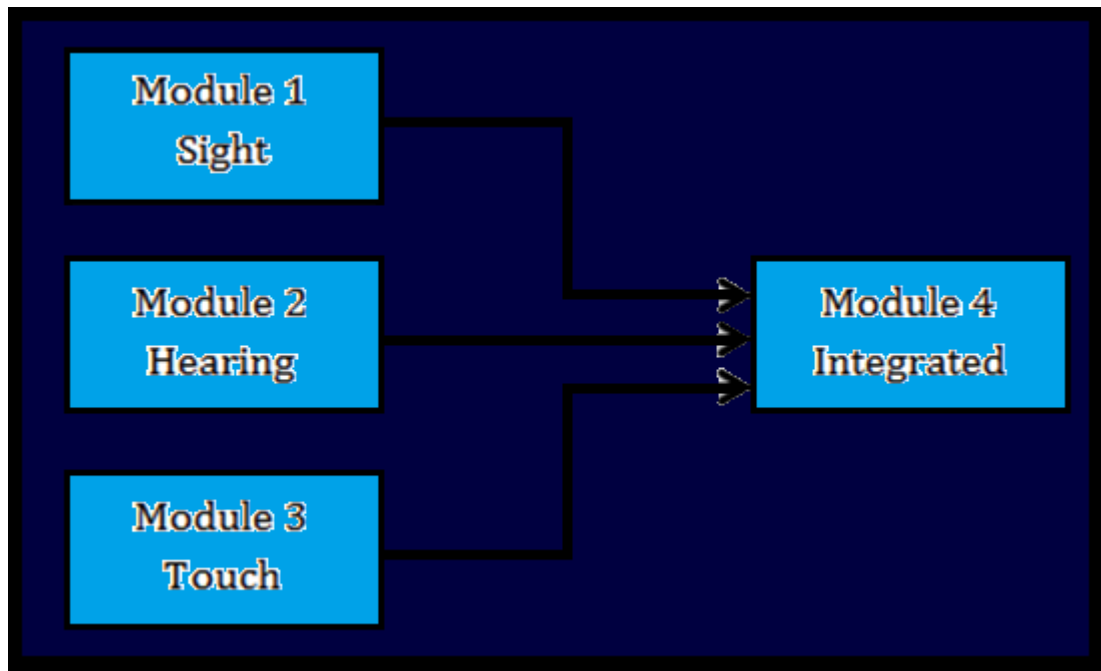
Figure 1 shows the modules of activities in the Dyslexia Child Aide mobile app.

The main reason behind the decision to divide the mobile apps into different module is because it will be easier to know in which area or senses that the child are more likely to receive the maximum amount of knowledge from the activities. All in all, the purpose of the mobile app development is to help the dyslexic child in their learning, not to hone their senses. So the module than will be tailored based on the guide that which module will the student are likely to absorb more knowledge.

By separating the mobile apps into several modules also, I can give more attention towards finishing each module. Besides the four modules in the diagram above, there will also be modules in which the main menu page is located and the

module for appreciation page. There will also be a small and local database in the device, which the data and progress of the child will be stored. These data will act as baseline in which the child's learning activities will be tailored. Each child has their own progress and when they log on into the mobile apps, they can enter their name and then the mobile apps will determine which module that the child needs to give more focus. The flow of the software from the user point of view can be seen in the following diagram:
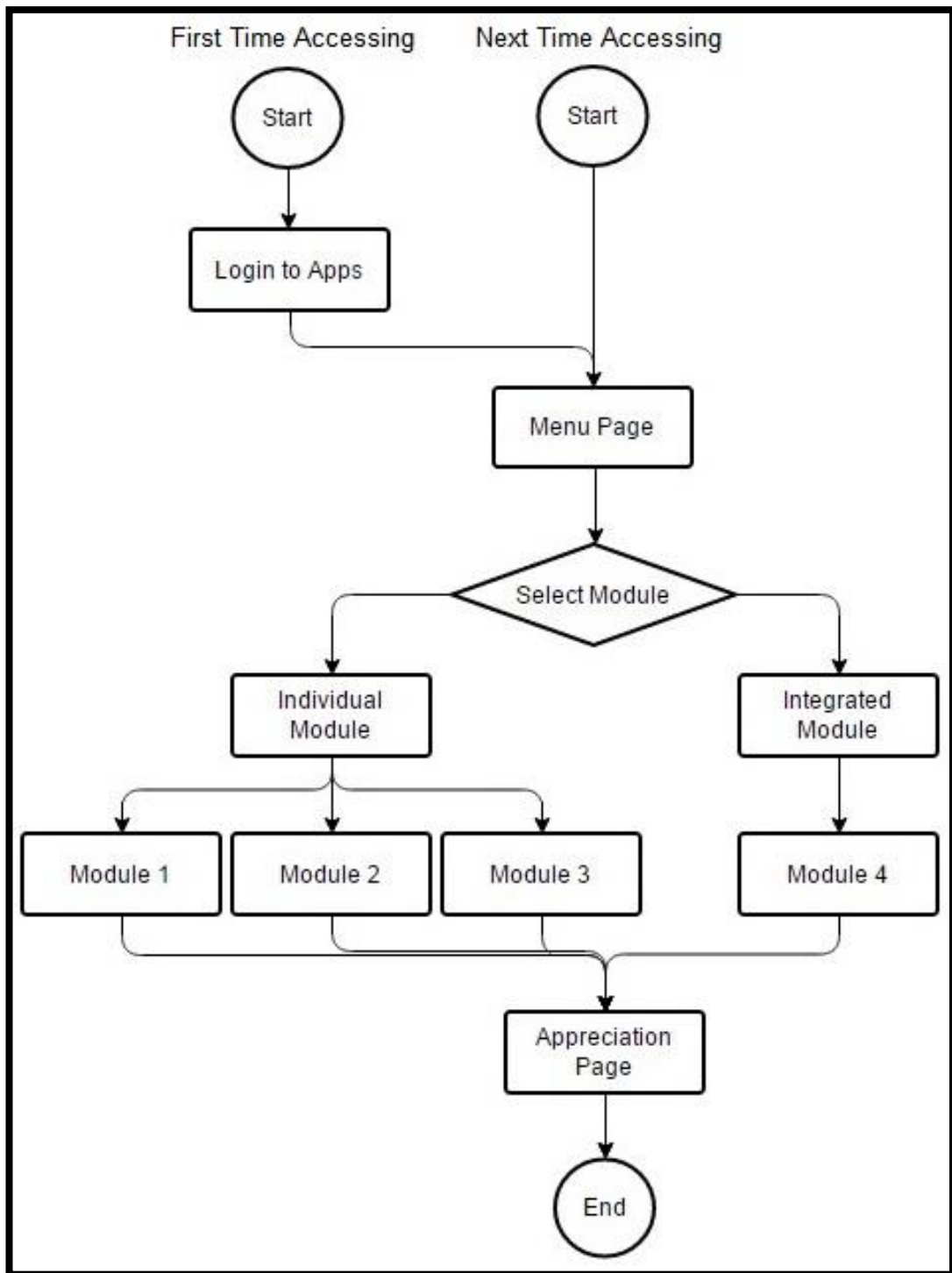
Figure 2 shows the flow of activities in the mobile app, from user point of view.

Besides the flow chart, there are also other diagrams that I have developed in order for us to further understand the workings, flow and activities of the mobile app. The diagrams are as follows:
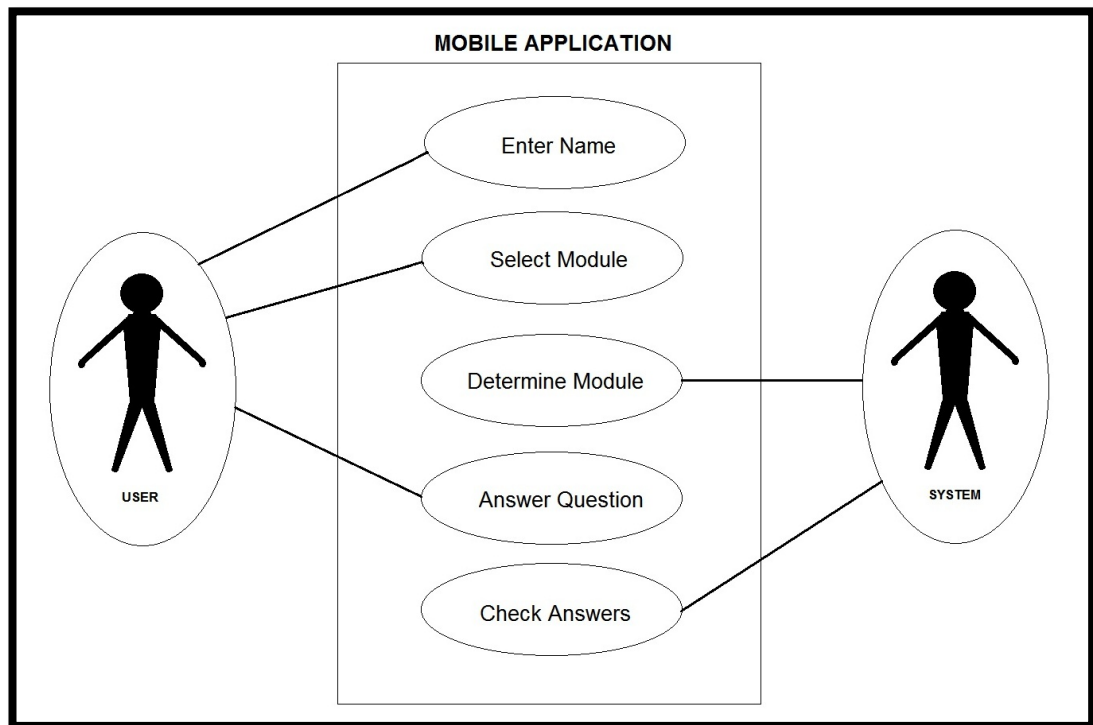
Figure 3 shows the use case diagram for the mobile app.

From the above use case diagram, we can see that there are only two actors involved during the runtime of the Dyslexia Child Aide mobile app. The user and the system interact in the mobile app and the interactions cause the mobile app to achieve its intended purposes, which is to help children in language learning. The system, in this context, act as the enforcer or authorities that determine which module to be done by the children; that is if the child chooses Module 4 or the integrated module. The system also acts as an examiner that will check the answer given by the children and give credits to the child if they answer correctly.
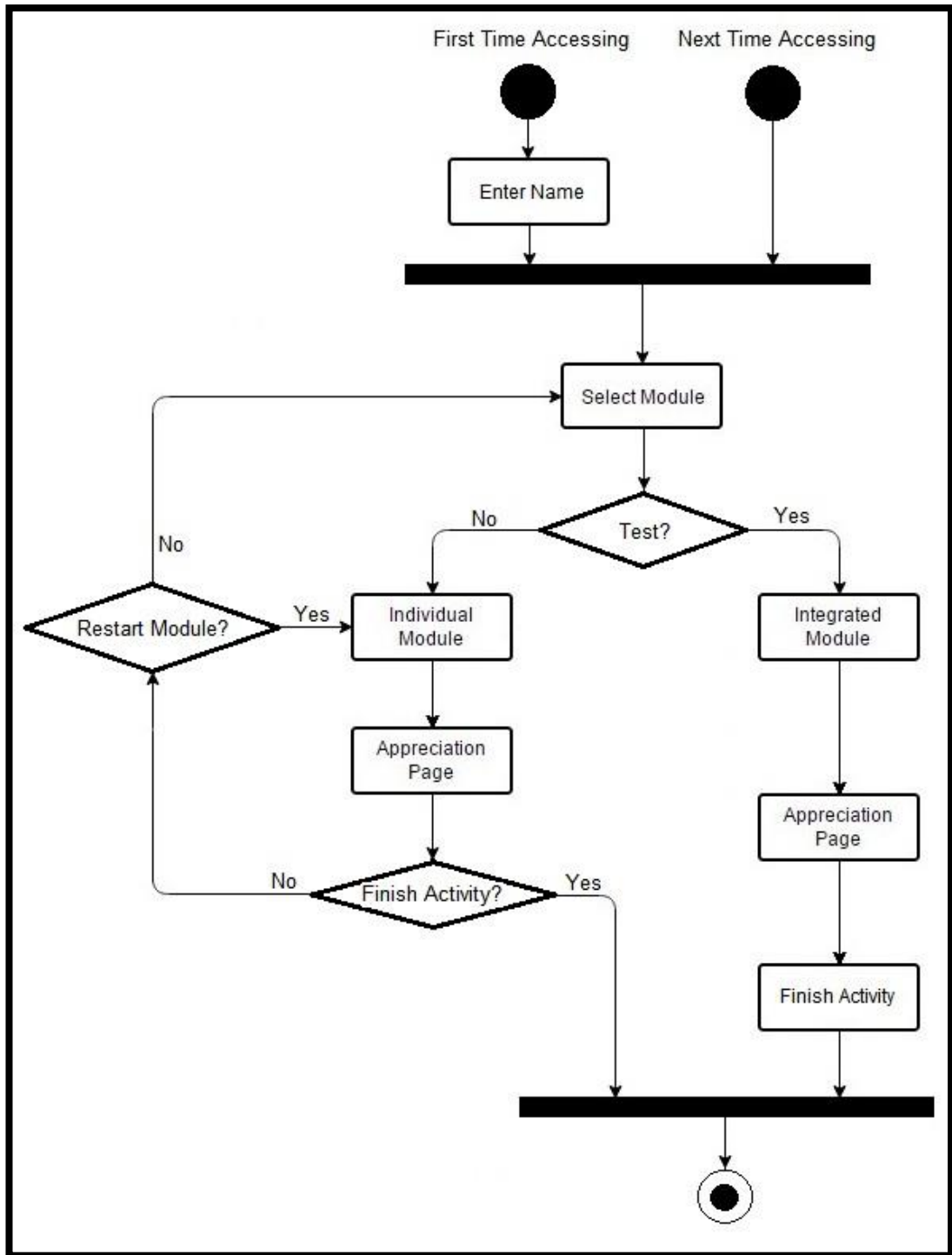
Figure 4 shows the activity diagram for the mobile app.

After finishing and finalising the flow, workings and activities in the mobile app, I follow up the process with designing the app by sketching the layout of every page in the app. The sketching also includes the detailed explanation of every aspect
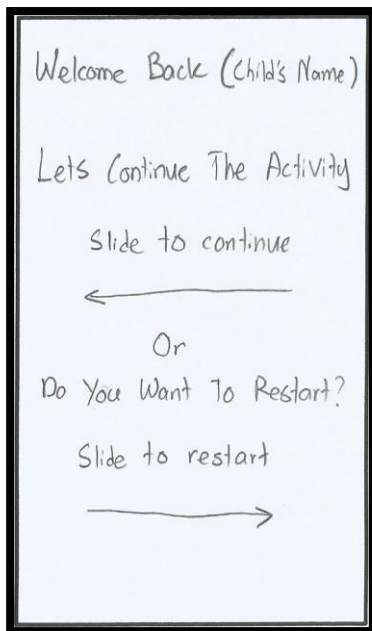
in the design. All of the buttons and gestures are labelled and the action performed by each of the buttons and gestures are highlighted. The sketches are as follows:
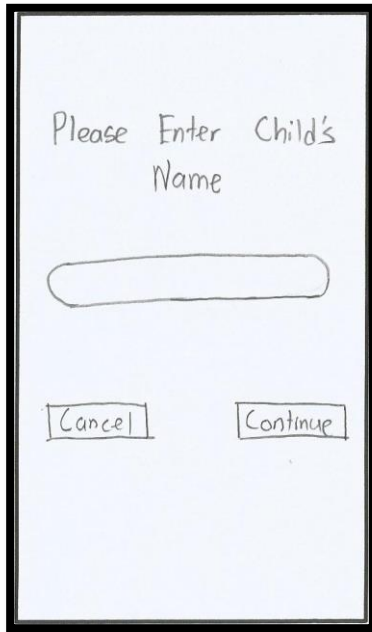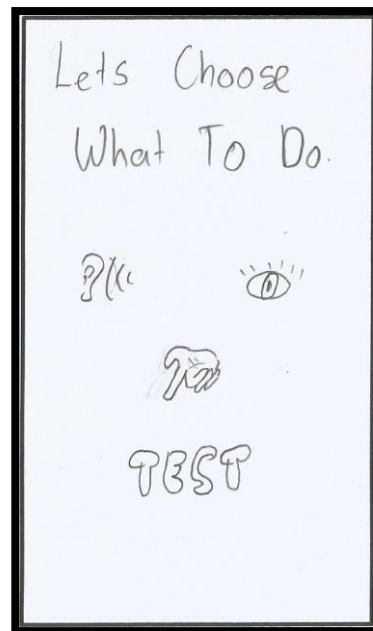

Picture 10 shows the name entering page.

Picture 11 shows the first page (First time accessing).

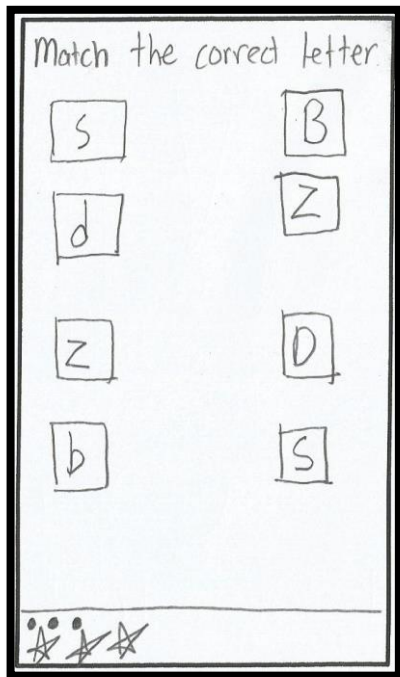*Picture 12 shows the first page (Next time accessing).*

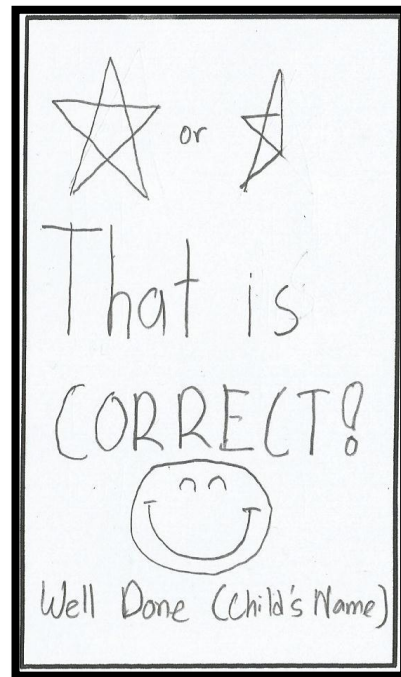*Picture 13 shows the main menu page.*
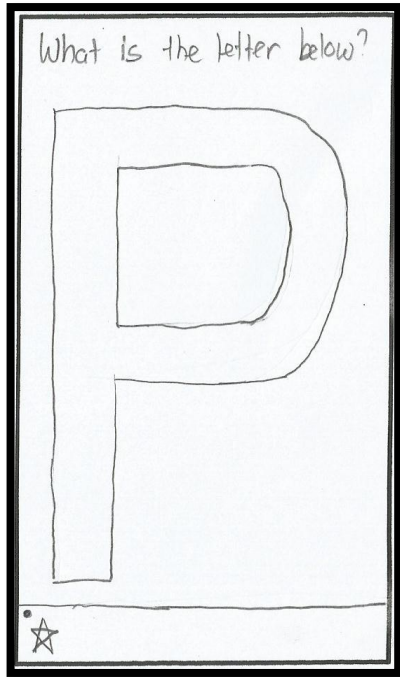
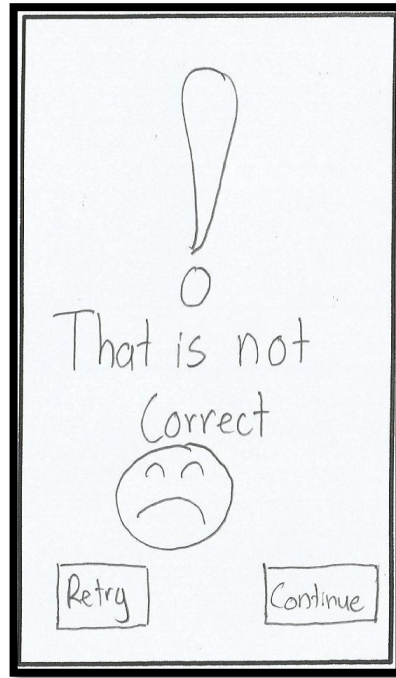*Picture 14 shows the first module*
(Sight).
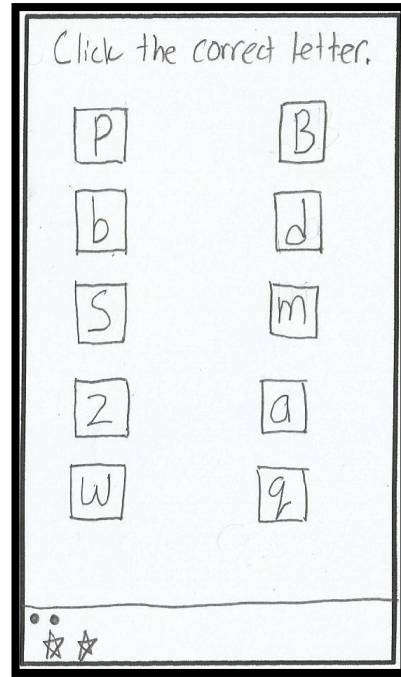
Picture 15 shows the second module
(Hearing).

Picture 16 shows the third module
*(Touch).*

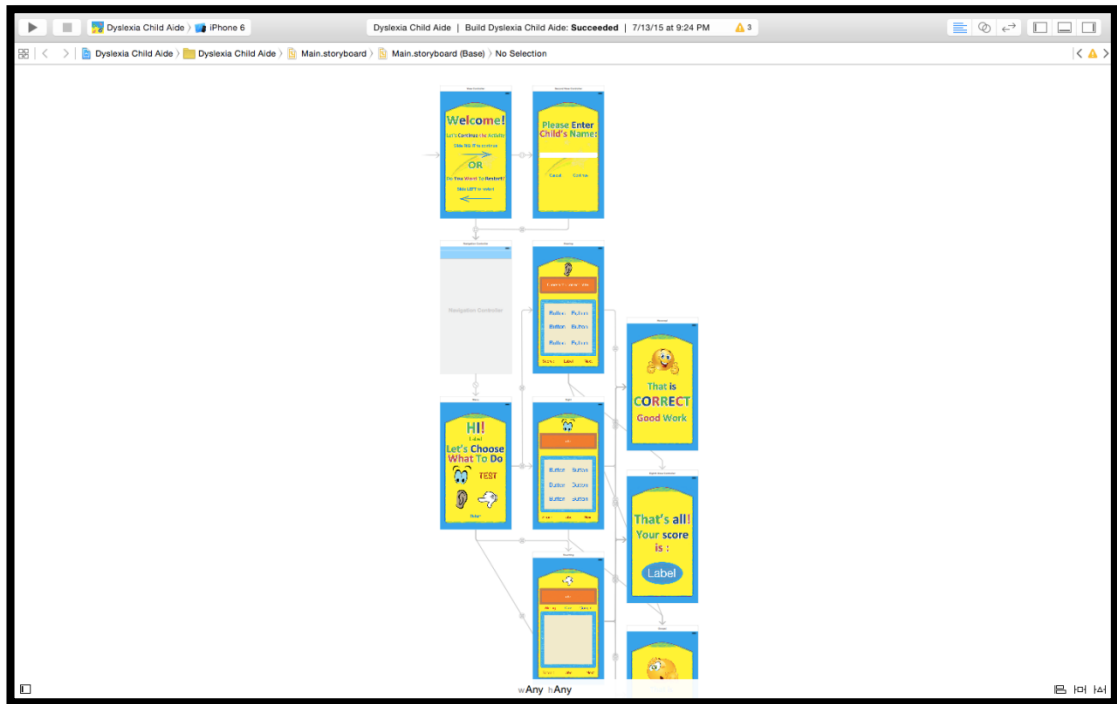*Picture 17 shows the correct answer*
appreciation page.

Picture 18 shows the wrong answer appreciation page.

3.3. DEVELOPMENT AND IMPLEMENTATION

The development of this mobile app is done by using the tool that is specified to develop iOS mobile app. The reason of using the tool is because I have familiarized myself with the tool enough to make me feel confident of developing my mobile app using the specified tool. The other reason for developing the mobile app using the iOS platform is because the iOS devices provides a really good graphics and this will help the student to responds towards the mobile app. The tool in question is the Xcode version 6.2 and version 6.4. The tool can be downloaded for free at Mac App Store and the usage of it is exclusively permitted for Apple's Mac OS devices. The tool utilises the SWIFT programming language version 1.2. SWIFT is a multi-paradigm, compiled programming language created by Apple for iOS and OS X development.
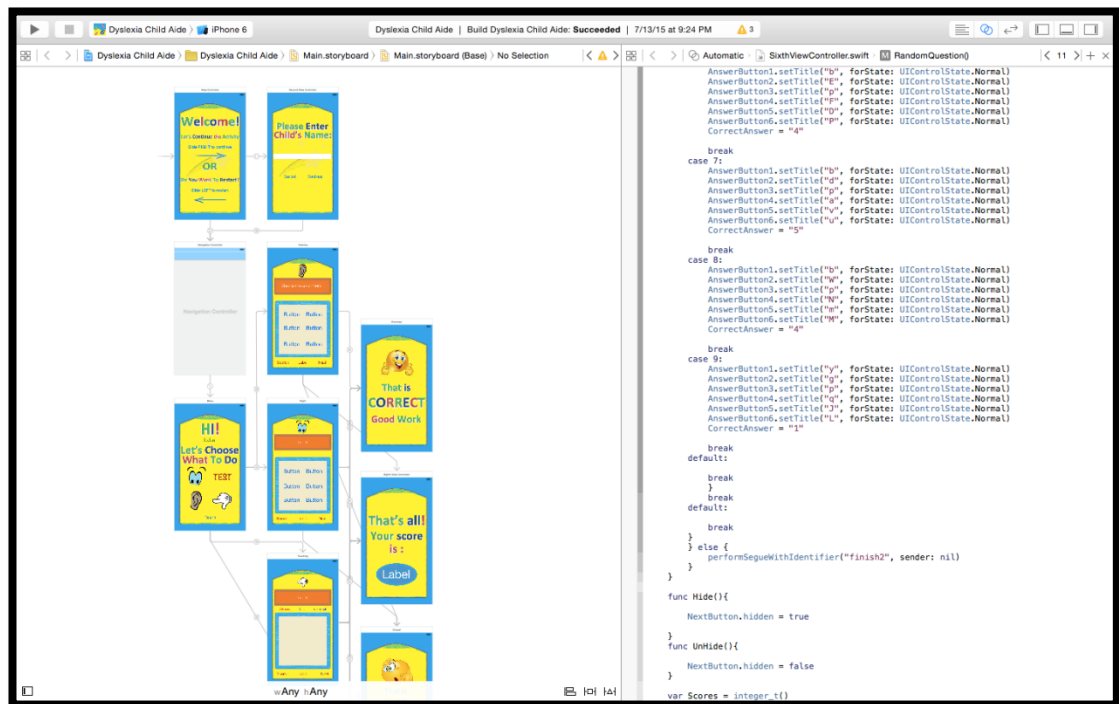
Picture 19 shows the development page using Xcode version 6.4.

Picture 20 shows the flow of the mobile app inside the development tool.

Picture 21 shows the coding page and code snippet inside the development tool.

After decided on the tool that I need in order to develop my mobile app, I have proceeded with the development of the app itself. During the development process, I have outlined several key milestones in order to measure the progress of my development process. The key milestones are as follows:

1. Key Tasks:	1. Researching about the implementation of Orton-Gillingham approach. 2. Designing the flow of the mobile apps. 3. Designing the layout of the apps. 4. Creating functional features of the apps. 5. Integrating and testing. 6. Acceptance testing. 7. Completing the reports.
2. Key deliverables:	1. The project report. 2. The interim report. 3. The mobile application.
3. Achievements:	1. Finish the interview. 2. Finish designing. 3. Finish developing modules. 4. Finish integrating. 5. Finish testing.

Table 2 shows the Key Milestones in the development project.

To further oversee the milestones and the timeline of the development process, I also have come out with a Gantt chart. The simple Gantt that is, was developed so that the process of developing the mobile app can be seen in its timeline.

3.4.   TESTING AND EVALUATION

After done with the development of the mobile app and the finished mobile app can be used and tested on the required device, a user acceptance test has been done in order to assess whether the mobile app developed met the required criteria in the objectives. The testing also has been done because the mobile app main purpose is to see the human and computer interaction between the dyslexic children and the mobile app.

In doing the acceptance testing, I have been in touch with Sekolah Kebangsaan Jalan Datuk Kumbar, Alor Setar. The reason behind the choosing of the school is because the school has dedicated classes for students with various learning disabilities and physical disabilities. The students that are diagnosed with dyslexia are still allowed in the class the same as the normal students. But, at certain period, they will need to attend special class whereby the learning process specific for their disabilities are carried out. Besides that, the teachers who teach at the school are family friends due to my father's involvement with their special education setup before his departure from the school.

The test has been carried out by asking them to use the mobile app. Along with the difficulties in learning the contents of the mobile app, observation done shows that the students also has problem in learning on how to use the apps, despite the directness of the instruction given accompanying each questions. This is due to the language used in the mobile app which is the English language. In Malaysia, language learning for students with learning disabilities focuses on Bahasa Melayu. The reading materials shared with me by their teacher are all in Bahasa Melayu. The reasons stipulated by the teacher for that issue are that Bahasa Melayu is easier to be taught since the teacher has been trained in Bahasa Melayu. They simply do not have the expertise to teach the child in English.

Once they familiarize themselves with the usage of the mobile app, they started to enjoy using it. I have been given 4 students to be used as a test subject. I

decided to let them test the mobile app by pair. In using the mobile app, one student operates the app and another student becomes the observer. The reason to have one student to operate and another as the observer is because I want them to feel comfortable around me as I am a stranger to them. After done operating and go through every nooks and cranny the mobile app, the student will interchange roles. This interchange is done throughout the thirty minutes session they have with me. Due to the need of the student to be in their classes, my sessions with them are restricted to only 30 minutes by the teacher.

The sessions have been recorded for references and valuable inputs have been taken from both the teacher and the students. It is important to acquire both inputs because the usage of this mobile app by the student must be supervised by either the teacher or the parents. This is to ensure that the student is actually doing the activity in the mobile app rather than they play games on the device. To get the teacher approval, the mobile app also has been handed to her to be used. The data, which is the reactions and feedback from users, which are the teacher and students, are very important in the testing process because it will determine whether the mobile app is a success or a failure.

Other than going to the special education class, the mobile app also has been tested by general public user. These testers have not been given any instruction to operate the app and they must find their way across the app pages. The reason of conducting this testing is to measure the user friendliness of the app if it is downloaded by a general public user. As always, their reactions and feedback also has been recorded as a data for further improving the mobile app presentation.

An evaluation form has been prepared and the testers can give their opinions on the mobile app. For the dyslexic child, their experience on using the mobile app has been recorded in an interview because there is a big chance that these dyslexic children is still cannot write on their own.

4.   RESULT AND DISCUSSION

Based on the interview with Puan Hanifa Bibi, I have determined that it is important to design and develop the mobile app in the most acceptable way by the students and parents. So, the design of the layout and user interface of the mobile app is done base on the Orton-Gillingham approach suggestions. The module that is created is based on the multisensory approach. There are modules that focus on the sight, hearing and touching senses of the children. This module, other than serves as the diverse stimulation on the children sense, also serves as a boring blocker. It makes the experience of using the mobile app not as dull as other mobile app. They can choose to undergone activities that are different all along from the previous activity. This makes sure that their attention is not run away from the learning process during the activities. The results of the designs are as follows:
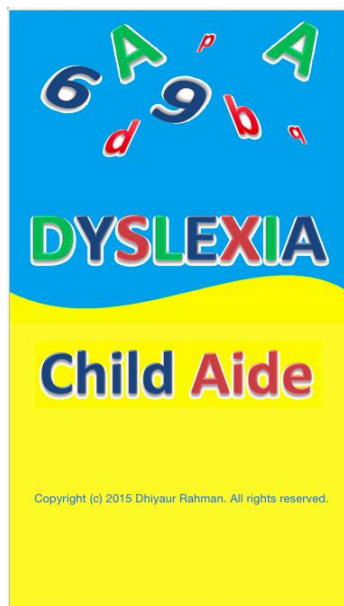
Picture 22 shows the splash screen of the mobile app.

Picture 23 shows the initial page of the mobile app.

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Picture 24 shows the Child's enter name page.

Picture 25 shows the main menu page.
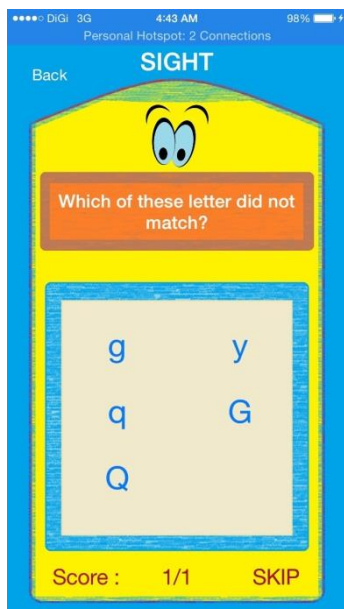
Picture 26 shows the question page.
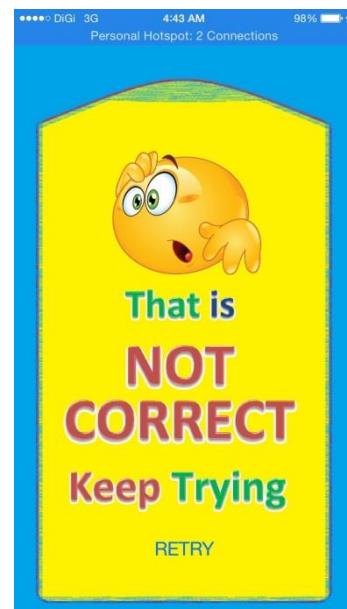
Picture 27 shows the correct appreciation page
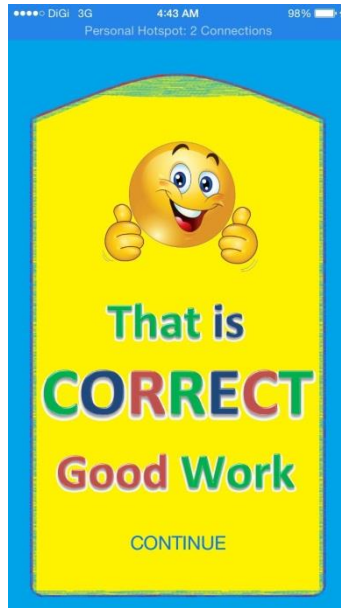
Picture 28 shows the wrong
appreciation page.

The basis for the above designs is to satisfy the attributes of the Orton-Gillingham approach which is the essential thing in this study. The pages-to-attribute table is as follows:

Orton-Gillingham attribute	Picture 13	Picture 14	Picture 15	Picture 16	Picture 17	Picture 18	Picture 19	Total
Personalized			X					X
Multisensory		X		X	X			X
Diagnostic and Prescriptive					X	X	X	X
Direct Instruction		X	X	X	X	X	X	X
Systematic Phonics					X	X	X	X
Applied Linguistics					X			X
Linguistic Competence					X			X
Systematic and Structured				X	X			X
Sequential, Incremental and Cumulative			X	X	X			X
Continuous Feedback and Positive Reinforcement					X	X	X	X
Cognitive Approach					X	X	X	X
Emotionally Sound					X	X	X	X

Table 3 shows the Page-To-Attribute for the mobile app.

The page-to-attribute table above shows the pages that each of Orton-Gillingham approach attribute is present. By having the above table, we can clearly see which pages represent the attributes of the Orton-Gillingham approach.

Besides that, the mobile app is also can be personalised based on the child's progress. At the start or the first time assessing, there will be a page in where the name of the child will be inserted. This name will be used throughout the app in order to make the child feels that they belong with the app. They will continuously using the app and it will, in the long run help them in language learning because consciously or not, they are learning in each step of using the mobile app.

The continuous usage of the mobile app will eventually create the pattern of data that can be analysed to determine the progress of the child. This will help either the teacher or parents, to monitor the child's progress and the system to determine the best possible question combination for the child.

In the user acceptance testing, the user, both the students and the teacher, Puan Hanifa Bibi express a good feedback and expressions. The students seem to really enjoy using the mobile apps. The pairs that the teacher chooses are both from different end of achievement ranking in their class. The first pair, Muhammad Adam Haikal and Mohd Amiruddin is on the high end of their class ranking. They have a little problem to answer each of the questions. The problems that they face are only for the first time usage of the mobile app. they giggles around in using the apps and they seem happy and satisfied with the mobile app. Although full of excitement, they still pays a good attention on the questions appears on the screen and sometimes, they do the questions together. At the end of the session, I asked them about how they feel on the learning experience, the say that it is better than learning using their traditional way. I also asked them is the mobile app good for them and both of them says yes.

The second pairs meanwhile are twin girls, Nur Ainna and Nur Aliyya. The girls, according to their teacher have a problem to pays attention during classroom

period because they like to plays around and have a chat with each other. When I gave them the device to test, both of them suddenly pays very good attention to the device. They listen carefully as I explain to them on how to use the mobile app. both of them catch up fast and in no time, they are able to use the mobile app on their own. By now, it can be clearly seen the reason why both of them are at the opposite end of class ranking compare to the other. Both of them have a big problem to differentiate the letter "p", "b" and "d". Eventually, at the near end of the session, both of them started to pick up and can easily distinct between the letters given. Both the pair's reactions are recorded in the table below:

Criteria of Assessment / Students Name	Learning Experience	Attention during learning	Content absorption	Ease of monitoring for guide
Muhammad Adam Haikal	Very Good 10/10	Very Good 9/10	Very Good 9/10	Very Good 10/10
Mohd Amiruddin	Good 7/10	Good 6/10	Good 6/10	Very Good 10/10
Nur Aliyya	Very Good 10/10	Very Good 9/10	Very Good 10/10	Very Good 10/10
Nur Ainna	Good 7/10	Very Good 10/10	Very Good 10/10	Very Good 10/10

Table 4 records the reactions and observation for the test subjects towards the mobile app.

After finish with the testing for the students, I gave the device to the teacher for her to give a verdict. I taught her how to use the mobile app and she straight away uses the mobile app. After done the testing, she says that the mobile app is very good and very suitable for the use of the students at home. She also stated that the mobile app is not very suitable to be used in school due to:

1. Lack of devices and infrastructure to implement the mobile app.

2. The mobile app require a one-by-one attention to guide whereas there are only a handful of teacher to teach 11 dyslexic students overall.

Other than the issues above, Puan Hanifa Bibi seems impressed and stated that the implementation of the mobile app will be a huge catalyst to the dyslexic children to be successful in primary school. Puan Hanifa Bibi's reactions and inputs are as follows:

Criteria of Assesment Name	Learning Experience	Attention during learning	Content absorption	Ease of monitoring for guide
Puan Hanifa Bibi	Very Good 10/10	Very Good 10/10	Very Good 10/10	Very Good 10/10

Table 5 records the reactions and observation for Puan Hanifa Bibi towards the mobile app.

Puan Hanifa Bibi's inputs:

1. Make it in level format, if the child performs, there will be levelling up occurs.
2. Add other levels to learn syllables, move to words and eventually making sentences.
3. Insert more picture as stimulants to the students.
4. Add more questions variations to make it less repetitive.
5. Add another function for comparing score with peers.
6. Make it more universal and can be played across multiple platforms.
7. Add Bahasa Melayu parts because in Malaysia, learning language focuses on Bahasa Melayu.

Before doing the testing to the students and teacher, a test have been done by me to see whether general public can use the mobile app. I asked few of my friends who have no idea how to operate my mobile app to try and use the mobile app. Their response are good and encouraging. They did not have any problem at all to operate the mobile app.

At the beginning of the test, I honestly expecting that some of them will have some problem to operate and navigate the mobile app but in the end, out of 5 friends that I engage with, not even one has any problem to use the mobile app. Some of them also said that the mobile app is easy to use and the graphics and the colour are a good choice. The colours are good to the eye and attractive to them. The oral feedback and improvement suggestions for the mobile app has been noted and along the development phase, I added some features that is useful, based on my friend's suggestions. By referring from the reaction that they give back, I can confidently say that the mobile apps that I developed from scratch is good enough to be used by general public. I also asked them what will be their reaction if they need to teach people how to use the mobile app after this and all of them said that it is easy to use and they can teach them to anyone.

5.   CONCLUSION

To start the conclusion, let me once again state that the Dyslexia Child Aide mobile application which has been developed by Mohd Dhiyaurrahman bin Mohd Shakib is a successful project. The successfulness of the project is measured by comparing the results with the objectives and problem statement, and the project has successfully met each of the objectives and solve the problem in the problem statement.

Looking back at the data collected from the testing of the mobile apps, all of the test subject shows a great acceptance towards the mobile app. The dyslexic children who has been chosen to be the test subject really seems to enjoying the experience mainly due to the interactive features of the app. The response that they give to the app were repaid by the appreciation page in the app. This initiate a stream of interest which subsequently resulting to a continuous usage of the app. Other than enjoying themselves, they were also seems to picked up many new thing and revised the thing that they have learned in classroom. Although I intentionally wanted the usage of the app to covers learning in classroom and at home, I finally surrenders and obliged to the facts that learning using the app in classroom is not suitable. But, it is still the best tool to help dyslexic children to learn at home, as stated by Puan Hanifa Bibi to me after she oversaw the testing of the app with the students.

Some of the test subject, other than the dyslexic students gave some very important suggestions for future improvement of the mobile app. Improvement such as making the game in level format, whereby if the child performs, there will be levelling up occurs; adding another level for the student to learn from syllables, move to words and eventually making sentences; incorporate more picture as stimulants to the students and many more. For future developments, these inputs must be considered along with other inputs given by Puan Hanifa Bibi and it will be worth the effort because the mobile app will be so much better afterwards.

Developing a mobile apps is not an easy task. A proper planning and good knowledge and insights are important part in which can guide a project towards a

success or failure. To develop the mobile app, the first thing that I done was to research and find any papers or mobile apps from numerous sources. This is so that I can really understand the topic in depth and actually knows what I am doing and what will I need to do.

To develop the mobile app, I have to learn and familiarize myself with the SWIFT programming language other than learn on how to use the Xcode programming tool. It is most certainly not an easy task since I have a knack of confusion in learning a new programming language. I always remember the flow but the syntax of each language has always been my Achilles' heel as a programmer.

Testing of the mobile app is also a challenge because I need to meet with unknown peoples and interact with them. It is not a norm for me to meet new people but for the sake of completing the mobile app, I have soldiered on and managed to meet and ask for new people's favour. The collection of data that must be done also presents its own challenge. I need to interview the dyslexic child and it is not easy.

In doing the testing, a lot of unexpected and good experience have I undergone in order to complete the testing the first plan which is the preferred test needed to be scraped as the conditions and time does not permitted. I eventually need to redo my testing plan from the scratch and all those experience have made me a better person.

All in all, I can honestly say that the experience in doing the Final Year Project has helped me to develop many things in my life. The successfulness of the Dyslexia Child Aide mobile app shows how much effort that I have put down to the project and hopefully it will be repaid with a good grade for this project.

6. REFERENCES

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7. APPENDICES