CERTIFICATION OF APPROVAL

Multilingual Children with Dyslexia: A Further Study of the Multi-sensory Approach using IT

by

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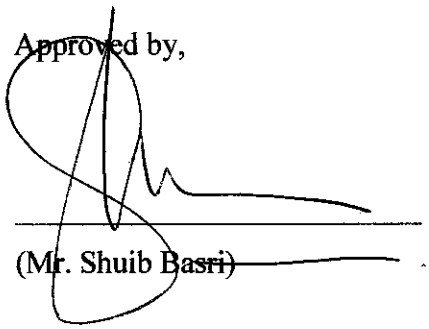
Approved by,



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CERTIFICATION OF ORIGINALITY

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

QAIRUNNISA MD ALIAS

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ABSTRACT

This study is about the difficulties that multilingual dyslexic children face and whether the enhancement of the multi-sensory teaching techniques using the Orton-Gillingham (O-G) Method could increase the effectiveness of Information Technology in helping these dyslexics children. This project was conducted to overcome this problem since most software is designed for monolingual children and to This done by conducting a study on improving on the multi-sensory level by further adding and manipulating the senses to the courseware which already uses the Orton-Gilingaham method as a baseline and testing it to dyslexic children. The result overall will shows that the O-G method does help a lot in teaching dyslexics, but prove to be less effective with dyslexics with auditory skills.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The word 'dyslexia' originates from Greek and when translated into modern English means 'difficulty with words or language'. Although it is a simplistic definition, it does gives an insight into the difficulties experienced by dyslexic people. Dyslexia for many is a difficulty in reading, writing, spelling and in particular expressing thoughts on paper. At its heart is a processing difficulty which can be auditory, visual or motor in nature, or indeed a combination of all of three, which frustrate the acquisition of many literacy skills which others take for granted.

The official World Federation of Neurology definition is

"[Developmental dyslexia is a] disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and socio-cultural opportunity".

The extent to which dyslexia is apparent in a particular language is affected by the quantity and quality of exposure to that language and other languages. Dyslexics are likely to have greater difficulty with languages that have more complicated orthographic, phonological and/or grammatical systems. The effects of dyslexia can be largely overcome by skilled specialist teaching and the use of compensatory strategies (Dyslexia Association of Singapore, 2003).

In this research we will mostly look mostly into the difficulty in reading for dyslexics with multilingual background and how a further approach with the multi-sensory learning techniques using IT can help them overcome their problems and study the pros and cons of current multi-sensory methods.

1.2 PROBLEM STATEMENT

In Malaysia Dyslexia has not been given much attention except by parents having Dyslexic children and special organizations. The main software tools for dyslexics in the market (speech recognition, dictionary pen) mostly are just to help in the short term without really helping in the long term (Sanderon, 2005). Research has shown that the brain can be trained, researchers have shown that the brains of dyslexic children can be rewired -- after undergoing intensive remediation training -- to function more like those found in normal readers (Trei, 2003). This can help dyslexics in the long term. Most software in the market are also UK and US based which maybe based on dissimilar environment with the Malaysia also can disrupt the learning reading. Plus the multilingual ness of most Malaysian children will prove be a problem. So it is suggested a Malaysian made software adapted to the local environment which incorporates most of the latest knowledge on effective reading for dyslexics.

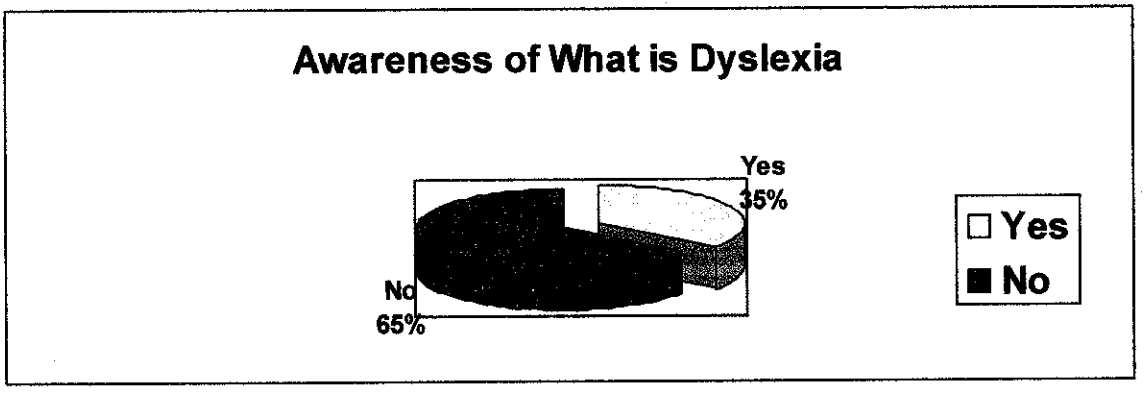

Figure 1.0: Awareness of What Dyslexia Is

1.3 OBJECTIVES

The objectives of this study are to:-

1.1.1 To have a broader knowledge on dyslexia and how it affects patients.

1.1.2 To implement IT and techniques that are simplified to help children with dyslexia

1.1.3 To integrate and improve multi sensory -learning techniques (Orton-Gillingham) that has been studied upon by experts plus author's own ideas and initiatives.

1.1.4 To help multilingual dyslexics overcome their literacy problems.

1.4 SCOPE OF STUDY

The main focus of this study is mainly in terms of literacy problems among multilingual speakers and whether multi-sensory (Orton-Gilligham) approach or do help or do not help multilingual dyslexic children in learning to read.

1.4.1 Whether IT can be incorporated with multi-sensory approach (Orton-Gillingham) helps multilingual dyslexic children

Multi-sensory methods of teaching are usually advocated for teaching dyslexic students. These integrate visual, aural, tactile and kinaesthetic modalities to consolidate the learning experience. Lessons must be very well structured, sequential and cumulative (Orton-Gillingham based), and all skills and concepts must be thoroughly practised (overlearned) in order to counteract the memory problems of the dyslexic. Content generally needs to concentrate on phonic skills, as these are usually the weakest aspect in dyslexia.

1.4.2 E-Content Accessibility for Dyslexics

The steps to an effective accessibility for dyslexics are studied, and how this design guidelines will be used.

CHAPTER 2

LITERATURE REVIEW

In this section what is discussed mainly is how technology and approaches are used to overcome dyslexia, multilingual dyslexic's problems and the selection of accessibility guidelines pertinent to students with dyslexia.

2.1 MULTILINGUALISM – DYSLEXIC CHILDREN

The case in Malaysia is similar to the case in Singapore where due to colonization, the language has become 'rojak' or mixed creating "Manglish" or simply the combination of English and Malay similar to Singapore's 'Singlish'. The literature review below will be based up studies conducted in Singapore due to the lack of studies done in Malaysia, we take Singapore's scenario as a comparison since the race and culture between these two countries are almost the same.

2.1.1 Chinese Speaking Dyslexics

Chinese children in Singapore follow a twisted linguistic path. They may grow up speaking Hokkien or Cantonese at home. At school they're educated in English and Mandarin – are confused, especially when they start at primary school... They've just left kindergarten, and in pre-school they probably learned phonics for the English language. And then when they go to Primary 1 there's a new set of phonics they learn: hanyu pinyin. An article in Teach! (2002).

The introduction of a Romanized phonic script to teach Chinese children is believed to cause confusion to children with dyslexia. (Lim and Gunn-Toe (2003) and Chia (2002))

It has been suggested that Chinese dyslexic children are using compensatory logographic reading approaches. (Campbell & Butterworth (1985) and Rickard Liow (1999)).The above researchers suggest that it is important to use a phonic based teaching system to teach Chinese-speaking children who are learning English.

2.1.2 Malay Speaking Dyslexics

"English words that begin with q will always be followed by the letter u"; whilst in the Malay language, there is a rule that "no Malay word has two consonants together". However, in exceptions such as "tropika"(tropical), "krim"(cream) and "proses"(process), it helps the learner to identify that these words are not original Malay words, but borrowed words from the English vocabulary and have been changed to fit the Malay context. It has been argued that the Malay language is more regular then either English or Chinese and therefore the dyslexic Malay child have a better phonemic awareness then either the Chinese or English speaker. Rickard Liow and Poon (1998).

However recent research reported at the Malaysian Dyslexia Association conference suggests that there is a similar number of Malay children with dyslexia as in Chinese or English children. There are similar phonological difficulties regardless of the regularity of the mother tongue. (Abdullah (2003)).

The majority of research on multilingualism and how it affects the child with dyslexia in Singapore has been conducted by university academics, as opposed to only one published work by practioners (Lim and Gunn-Teo 2003). This study was a small-scale research project that tested seven Chinese Singaporean children, using the Burt Reading Test and Schonell Spelling Test. It showed a 187 per cent improvement in spelling, on average, over a 22-month period and a 158 per cent improvement in reading English during the same period (Lim and Gunn-Teo 2003).

2.2 APPROACHES

There is no generally accepted classification system for the approaches and programmes, but they are presented here in six broad groupings:

- Structured cumulative approaches
- Person-centered approaches
- Physiological approaches
- Approaches using technology
- Approaches used in mathematics
- Approaches used in higher education

But since we are focusing on the use of technology and senses in overcoming dyslexia, we will mainly talk about

i. Approaches using technology
ii. Structured cumulative approaches (Orton-Gillingham Method)

2.2.1 The Orton–Gillingham Approach

This is a multi-sensory approach with auditory, visual and kinesthetic elements reinforcing each other. The Orton–Gillingham approach involves using simultaneous multi-sensory instruction. A dyslexic learner is taught to see the letter A, say its name and sound and write it in the air – all at the same time. The approach requires intense instruction with ample practice.

The method is structured, sequential and cumulative. A teacher trained in this method introduces the elements of the language systematically. Learners begin by reading and writing sounds in isolation. Then they blend the sounds into syllables and words. They learn the elements of language – consonants, vowels, digraphs, blends and diphthongs. They then proceed to advanced structural elements such as syllable types, roots and affixes. As learners learn new material, they continue to review material that has been covered to ensure that the learning is secure. The teacher addresses vocabulary, sentence structure, composition and reading comprehension in a similar manner.

Teachers start at the very beginning, with the aim of creating a solid foundation and presenting one rule at a time. Each rule is practiced until the learner can apply it automatically and fluently when both reading and spelling.

Teachers try to ensure the learner is not simply recognizing a pattern and applying it without understanding. When confusion of a previously taught rule is discovered, it is re-taught from the beginning.

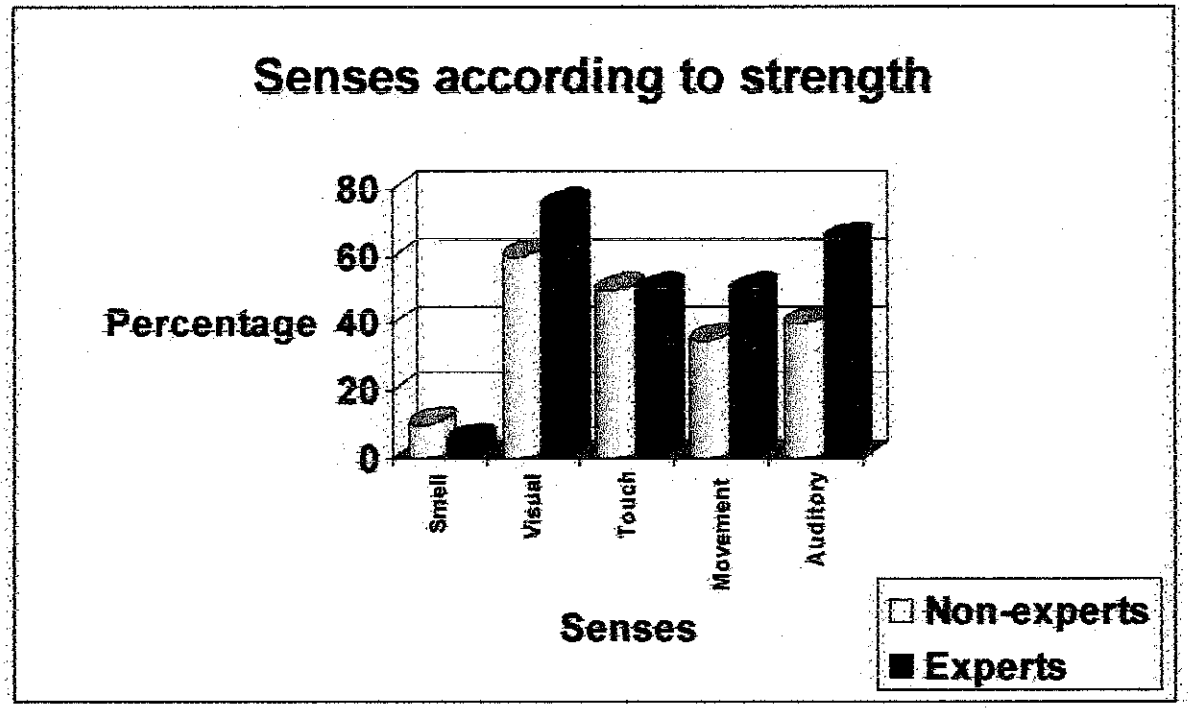

Figure 2.0 Sense according to Strength

i) Current usage of the Orton–Gillingham approach

Nearly all alphabetic programmes designed to remediate dyslexic type literacy difficulties are based on this programme. The Orton–Gillingham approach underpins many current approaches; any programme which starts by teaching I, t, p, n, s, d (though not necessarily in that order) is Orton–Gillingham-based. It was designed mainly for children, but has been adapted for use with adults.

Most dyslexia specialist teachers of children use the multi-sensory methods pioneered by this method. Many structured, cumulative multi-sensory programmes, such as Alpha to Omega, that are used to teach decoding and phonics are based on the original Orton–Gillingham programme.

This is the reason why the author has decided to use this method as a base platform in developing her courseware and further enhancing the multi-sensory technique to develop a more effective solution to discover the effectiveness of the multi-sensory method for multilingual children with Dyslexia.

2.2.2 Technology Integrated Approach

i) The integrated approach to using technology to support dyslexics

The most sophisticated approach to using technology to support dyslexic learners is an integrated approach, where all the above facilities are harnessed to create an individualized learning medium. The advantage of an integrated approach is that it enables the learner to be successful in doing what they want to do. It enables them to work on what is meaningful for them. It removes the need to focus on areas of weakness things they cannot do or can do only with difficulty, which for some learners can result in boredom, apathy, or disaffection.

ii) History and current usage of technological approaches

Multimedia approaches for learning with learning difficulties and disabilities has a history as long as that of educational multimedia. The development of specialist assistive technology appropriate for a post-16 context has grown most noticeably during the last 15 years. The existence of additional learning support funding in further education has undoubtedly stimulated demand and may have acted as a catalyst for change.

iii) Using specialized assistive technology

The following table lists appropriate specialized assistive technology.

Table 2.0: Specialized Assistive Technology

DragonDictate	Voice recognition software that operates at word level. It is often used with:
Keystone	Speech output software
Kurtsweil	Optical character recognition (OCR) program, used with a scanner to scan or read text and produce voice output
TextHELP!	Adds speech output, word prediction and spell check facilities to most Windows programs
Dragon Naturally Speaking	Voice recognition software that recognizes continuous speech
INSPIRATION	Mind-mapping software
Mind Manager	Mind-mapping software that can be used with speech recognition

The technology can have high status with other learners, it is up to date, interactive and can be empowering. But it is expensive and there are considerable training requirements to be taken into account. Organizing these can create more barriers, such as when learners are not allowed to embark on a course until they have been trained in the use of the assistive technology. Therefore, the author has come out with a solution to create software that helps dyslexic children not to be fully dependent on assistive technology.

iv) Is There A Cure?

Assistive and adaptive technology does not "cure" a specific learning disability. These tools compensate rather than remedy, allowing a person with an LD can demonstrate his intelligence and knowledge. Adaptive technology for the person with an LD is a made-to-fit implementation. Trial and error may be required to find a set of appropriate tools and

techniques for a specific individual. Ideally, a person with an LD plays a key role in selecting her technology. She should help to determine what works and what does not. Once basic tools and strategies are selected, they can be "test driven," discarded, adapted, and or refined.

Following are descriptions of some computing tools that have been used effectively by individuals with specific learning disabilities. This list is not exhaustive and should not limit the person with an LD or the adaptive technology practitioner from trying something new. Today's experimental tinkering could lead to tomorrow's commonly used tool.

- Word Processors
- Reading Systems
- Concept Mapping
- Phonetic Spelling
- Word Prediction
- Speech Recognition
- Organizational Software/Personal Information Managers (PIMs)
- Talking Calculators

Information technology has been described by some by many dyslexics as little short of a miracle for it releases the student from many of the specific struggles associated with dyslexia. There is a temptation therefore to acquire all that is on offer in the belief that each piece of hardware/software will be in some way beneficial. However, this is not the case, for each piece of software/hardware will be more suitable in supporting particular difficulties but by no means all. Expressed crudely, visual processing difficulties may be lessened by using one or a range of software or hardware working to auditory strengths, whilst those with auditory difficulties will require different software. It is important to match the difficulty of each user to the properties of particular software/hardware. Put simply it is a case of 'horses for courses' and thus to purchase an inappropriate piece of software/hardware may double the difficulties experienced and lead to more frustration. Stacey (1998) describes the difficulties caused by inappropriate resources as follows:-

'..a mismatch can hamper the students ability to use coping strategies to manage their dyslexia'

It is therefore vital to select appropriately to meet individual needs. In order to exemplify this point some of the more popular Information Technology available, some of which is specifically for dyslexics.

Thus in assisting the dyslexic student computers have, in some respects, leveled the 'playing field' in academic terms with their non dyslexic peers. For as Singleton (1994) states:-

' .... because word processing enables the separation of highly complex activities in writing which are normally carried out simultaneously. It reduces the information load on the brain and facilitates a systematic approach to detection and correction of errors, and editing and improvement of the text.' (p91)

In the light of all these advantages it would appear that Information Technology in the form of the computer, would seem to meet the needs of dyslexic students and assist in competing with their non dyslexic counterparts in the academic world of higher education. However, this is not the case, as for some dyslexic students (Sanderson, 1999) acquiring the skills of word processing can be as confusing as learning to read, write and spell. Thus, for the dyslexic with sequencing difficulties the QWERTY keyboard may represent not only a sequence of letters their order to be learnt, but two sequences to be use with two hands simultaneously. This may result in some being unable to acquire the necessary skills to access the keyboard. For the dyslexic who can acquire the skills of using the QWERTY keyboard, they may face the additional difficulty and frustration of not being able to type as proficiently and quickly as his mind is able to think. This seriously disrupts the creative process not assists it.

Difficulties may also be experienced in using the spell checker, a tool designed by non dyslexics for non dyslexics. For example, some packages may only indicate a word has been incorrectly spelt, offering a list of alternatives. Unfortunately, words suggested are usually spelt in very much the same way (or 'look' the same). It may therefore be

impossible for the dyslexic, with visual discrimination difficulties to correctly identify the word they require. There may also be confusion with regard to homophones, which, if initially spelt correctly, will not be identified by the computer as inappropriate, and if spelt incorrectly the student may not be able to differentiate between homophone alternatives suggested. Difficulties are obviously experienced when the dyslexic student has attempted to spell a word phonetically but which bears no resemblance to the word spelling, (try at-moss-fear for atmosphere) and in consequence is not identified by the spell checker. There is also the nightmare of spelling a word correctly and the spell checker indicating it incorrect!

Despite these limitations of computers, it is nonetheless beyond debate that computers have liberated many dyslexics who have previously been locked inside a circle of failure. Indeed in this regard there are some software packages available that works with, and also enhances, strengths so lessening the affects of processing deficits. Two such software packages are TextHelp and Inspiration. TextHelp works with auditory and visual strengths, thus overcoming many auditory and visual difficulties. Inspiration supports random thinking, use of color and pictures, and in general non word representations, which can be later organized and translated into linear text escaping the need for linear thinking which some dyslexics find so restrictive.

2.3 SELECTING ACESSIBILITY GUIDELINES PERTINENT TO STUDENTS WITH DYSLEXIA

We are interested in focusing on guidelines that may be particularly beneficial to students with dyslexia. These guidelines were selected from among both the generic accessibility guidelines (CITA, 1998;W3C, 1999;TechDis, 2002) , which matched against known problems associated with dyslexia, and also those that the guideline provider particularly recommended for people with dyslexia or special learning difficulties (IMS, 2002;Rainger, 2003) . Twelve germane, recurrent themes that emerged from the standards and guidelines described above are:

1. Allow the user to control the font sizes and styles, and colors of the background and text (IMS, 2002). This is important since for example, Serif fonts can be problematic for dyslexic users (Parker, 2001) whereas some combinations of contrasting colours can aid the reading of text (Draffan, 2002;Rainger, 2003) . Such preferences are individual and hence cannot easily be catered for by the author of the material, although it may be possible to cater for them to some extent at least by allowing the end user to configure the default interface. In a Web context the use of Cascading Style Sheets may be used to facilitate the user customisation of the Webpage's appearance (W3C, 1999;Rainger, 2003) .
2. Avoid strongly coloured or patterned backgrounds, as these can effectively obscure the text (IMS, 2002;Rainger, 2003) .
3. Clear structuring of the text into left justified paragraphs (TechDis, 2002;Rainger, 2003) .
4. Use clear and concise language and easy to understand graphical cues (TechDis, 2002;Rainger, 2003) .
5. Design pages so that they can be read by assistive technology, including text readers and screen readers (CITA, 1998;IMS, 2002) . A person with dyslexia may use a screen reader in order to hear elements or large bodies of text. This circumvents the requirement of reading and provides the same information in a more accessible channel (Beachham, 2002;Rainger, 2003) .

6. Allow the user to turn off any animated or timed elements (W3C, 1999;IMS, 2002) . Blinking or scrolling text could be difficult to read and any assumed timing in presented text could be inaccurate for someone having difficulty reading the text or who is taking longer than anticipated by the designer to digest the information (Rainger, 2003). Animated elements that are not textual may simply be distracting, making reading any text difficult (W3C, 1999).
7. Use consistent layouts and formats. This reduces cognitive overload and allows the content to be the focus of attention (W3C, 1999;IMS, 2002) .
8. Provide context and orientation information (W3C, 1999).
9. Front-load the information (W3C, 1999), since giving as much orientation and content information as possible at the beginning of any section can be helpful. This enables the user to understand what they are reading and why without committing themselves to reading a lengthy text and the danger of losing the thread.
10. Use judicious white space so the text does not appear cluttered (TechDis, 2002;Rainger, 2003) .
11. Place hyperlinks at the end of a piece of text rather than scattered throughout. (IMS, 2002).
12. Use front-loaded hyperlink sentences, which provide a brief description of where a link will lead and why it is there (IMS, 2002;Rainger, 2003) .

These guidelines will help develop transportable and accessible Web pages with improved clarity, allowing the user to focus on the content. Further, following the off-shoot argument, that is lessons from the use of the technology in extraordinary human computer interaction might lead to helpful development of the technology for "general" use (Edwards, 1995), by catering for dyslexic students, non-dyslexic students may also benefit from these measures.

However in developing this courseware, not all the techniques will be implemented as the software is of web-based and designed only for children ages 4-7 which are at the early stages of learning to read.

CHAPTER 3:

METHODOLOGY

3.1 PROCEDURE IDENTIFICATION

As far as design methodology is concerned, the author has designed her own model to use as system procedure methodology. There phases are as below:

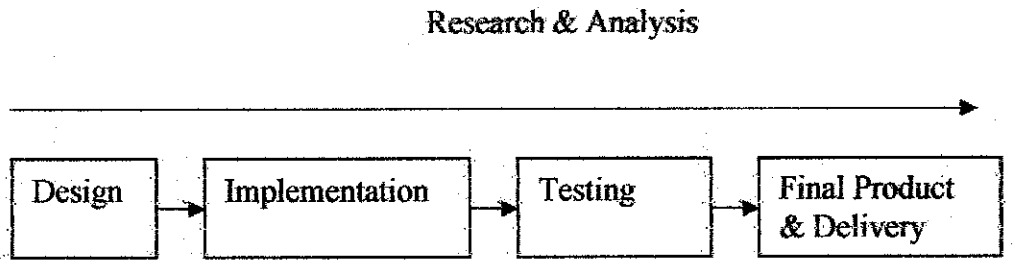

Figure 3.1: Methodology Used

Hypothesis

Ho = Increased number of multi-sensory techniques in multimedia for dyslexics will not increase its effectiveness

*H*A = Increased number of multi-sensory techniques in multimedia for dyslexics will increase its effectiveness

3.1.1 Requirements Definition

The requirements of study will be analyzed as in depth as possible. The research begins when the main problem is identified, emphasizing on educational issues among dyslexic

children. A research process is carried out as the next step in narrowing the scope of problem. It involves observations, research findings and analysis activities.

As a need to require more information, research finding is carried out on various material including journals, professionalism speeches and seminars, internet, newspaper and magazine articles and reports. From the information collected, analysis is taken out.

As the narrowed problem statement is identified, the system goals, objective, constraints and requirements will be established together with system's users. They are then defined in detail and serve as a system specification.

3.1.2 Design

In system design phase, the first step is to establish the architecture of the system. It will show the flow of system as shown in Figure 3.1.2, from the beginning till end processes. Storyboard is used to demonstrate the system's flow in more meaningful style, where each system interfaces will be designed effectively. Besides, tools required for the implementation phase are also need to be determined. It includes software, hardware or equipments and programming languages.

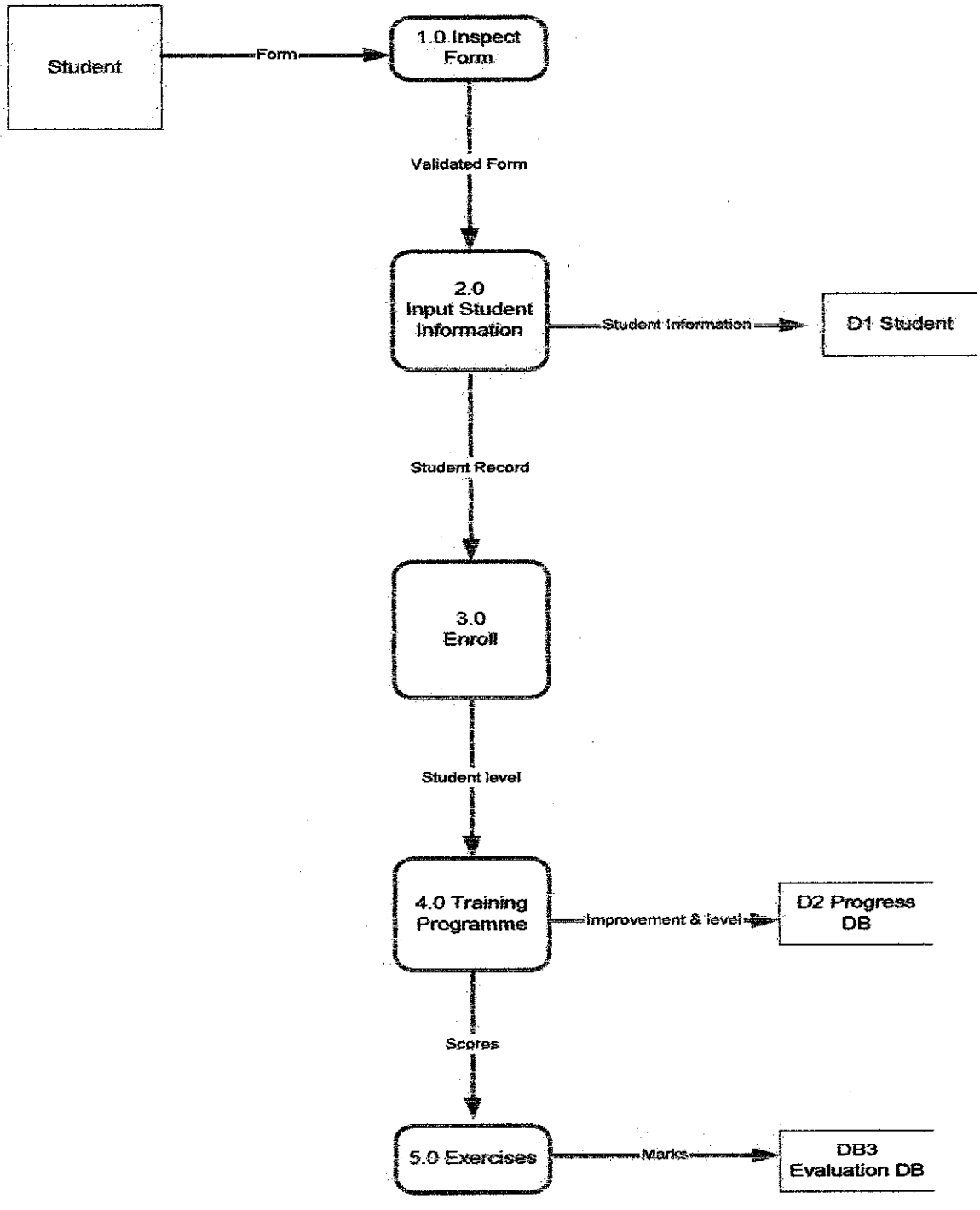

Figure 3.0: System Work Flow

3.1.3 Implementation

This is the most critical phase in system development process. The reasons are, it is time consuming and involves a lot of technical activities. Instead of designing the system as a whole, it will be divided into separate subsystems. Subsystems are determined based on different functions in the system and will be designed according to storyboard. On each subsystems implementation, testing is required in order to ensure the subsystems are well functioning.

3.1.4 Integration and Testing

In this phase, the individual subsystems are integrated and tested as a complete system. It's purposely to ensure that the system and user requirements have been met. There are two different parties will involve in testing phase. First, testing by people who involve in system development includes supervisor and project coordinator. The next testing will carried out by target user includes dyslexics from the center. If any problems or errors found during testing, then it will resolve until the system is definitely functioning. At the end of this phase, the system is ready to be presented to target user again and system is close-out by preparing final documentation and lesson learned.

i) Final Testing Approach

The approach to final testing of the system software involves the following steps:

1. The developer will deliver the module executable, source code, test plan, and testing results documentation to an external independent test group.
2. The external independent test group critically reviews the developer's test plan for completeness.
3. The external independent test group documents additional tests to be conducted (if necessary).

4. The external independent test group (re)executes all tests and any additional tests using the delivered program executables.
5. Working iteratively, the external independent test group documents any errors found and communicates with the software developer. The software developer corrects code and redelivers the executable and source code to the external independent test group to continue testing.
6. The external independent test group recompiles source code(s) and rebuilds the executable files.
7. The external independent test group (re)executes the tests conducted under Step 4 using the new executable files. The iteration with the module developer, as described in Step 5, is repeated until all test results are acceptable, or it is decided that the remaining problems do not require fixing.

Figure 3.0 User Testing

3.1.5 Operation and Maintenance

This is an optional phase which normally takes place when the system is installed and put into practical use. It involves correcting error which not discovered in earlier phases of development, improving the implementation of the system and enhancing the system according to new requirements.

3.2 Tools and Equipments Required

As the system is a product based on cd-rom , various software are used in order to assist and facilitate the development process this is to incorporate the multi-sensory teaching aspects and strategies.

In addition, compatible hardware is used purposely to ensure the system is integrated and runs smoothly.

3.2.1 Software

1. Windows XP, Professional Edition with service pack 2
2. Macromedia Flash
3. Microsoft Access 2003
4. Microsoft Internet Explorer 6.0
5. Microsoft Office 2003 (for documentation purposes)

Macromedia Flash is proposed as the main software because of its functionalities and multimedia approach that will incorporate the 3D modeling, sound, colors. Other speech recognition software will also be used to incorporate the multi-sensory approach of study.

3.2.2 Hardware

Personal computer with following requirements:

- Processor: Intel(R) Pentium® 4, CPU 2.40GHz
- Memory: 512 MB RAM
- Storage: 80GB
- Display Card: S3 Graphics ProSavage DDR
- Operating System: Microsoft Windows XP Professional Service Pack 2
- Monitor: 15" with 1024 x 768 resolutions
- Media Device: 1.44 MB Floppy Disk Drive, Samsung DVD-ROM SD-616Q

3.2.3 Programming Languages

The programming languages will only take little part in the development of this software tool. Mostly the author had to explore the use of flash scripts and manipulate them to adapt to the use of the dyslexic user.

CHAPTER 4:

RESULTS AND DISCUSSION

4.1 FINDINGS

4.1.1 Over-learning

The overwhelming strength of the O-G system of tuition according, to 87.5 per cent of the teachers interviewed – regardless of whether they were dyslexic trained teachers or non-dyslexic trained teachers - is that it provides over-learning for a dyslexic learner through reviewing previous learning.

4.1.2 Dangers of Orton-Gillingham Method (O-G)

Ms. Faridah from Dyslexic Association of Singapore (DAS) pointed out two dangers that teachers of O-G may bring to the child's learning:

"Students who are hyperactive or younger, find the predictability monotonous and too rigid after a while so the teacher has to come up with a variety of activities to keep students interested . . . teachers may place their security on the structure that they have memorised and simply go through the 'motion' of teaching without making any attempts to observe or teach in a dynamic way", and *". . . in the hands of an ineffective teacher who gives too much help by providing answers, little learning takes place, for example, when the teacher spoon feeds a child by readily reading or spelling words for children"*

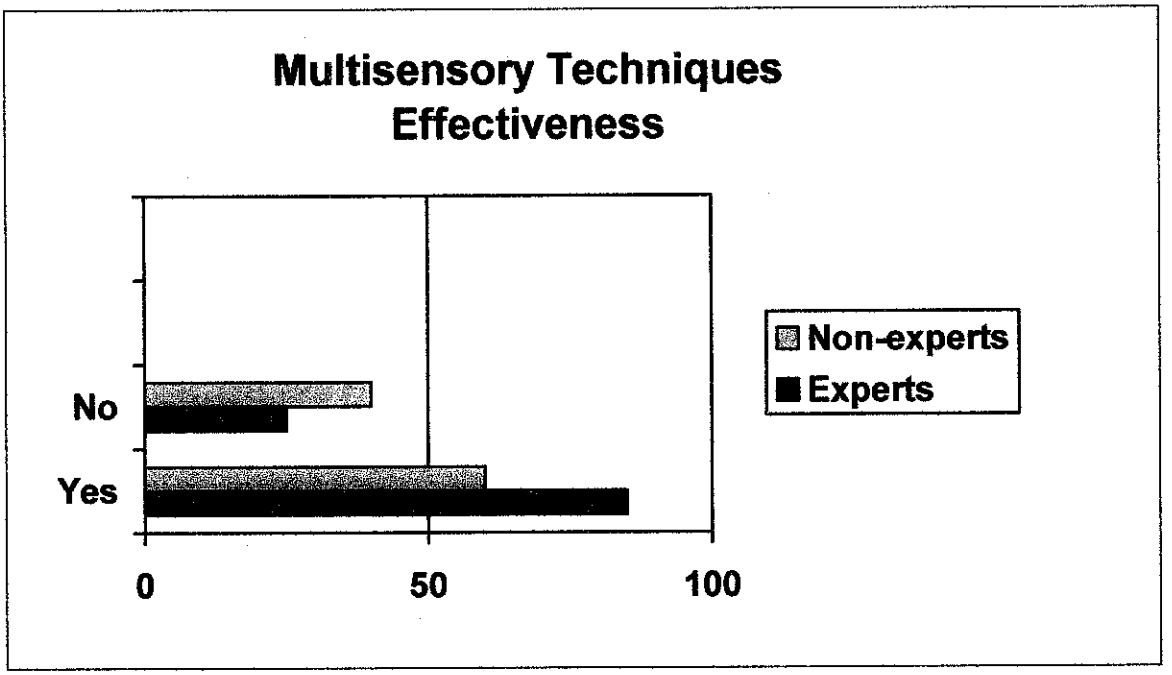

Figure 4.1: Multi-sensory Techniques Effectiveness

Seventy-five per cent of the teachers interviewed identified multi-sensory learning as important for the children.

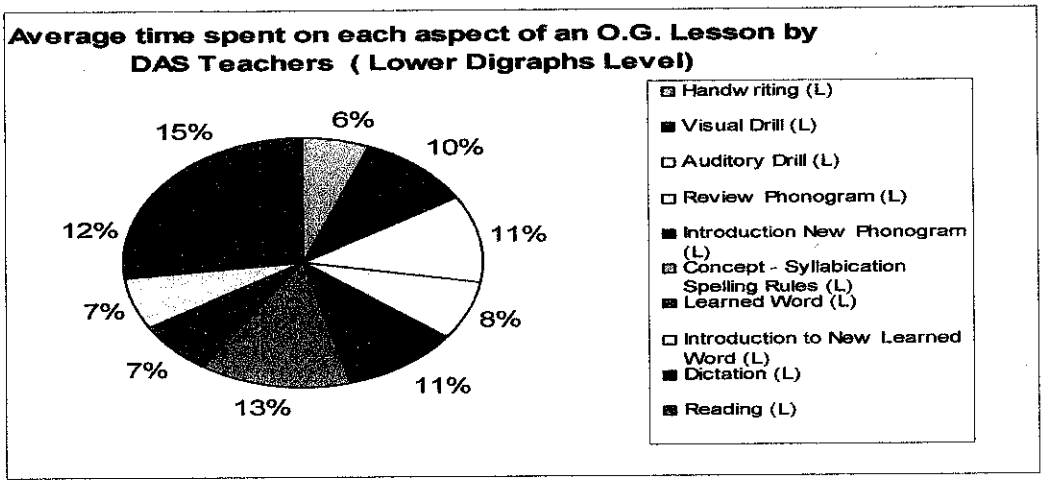

Figure 4.2: Average Time spent on each of and O.G Lesson by DAS Teachers

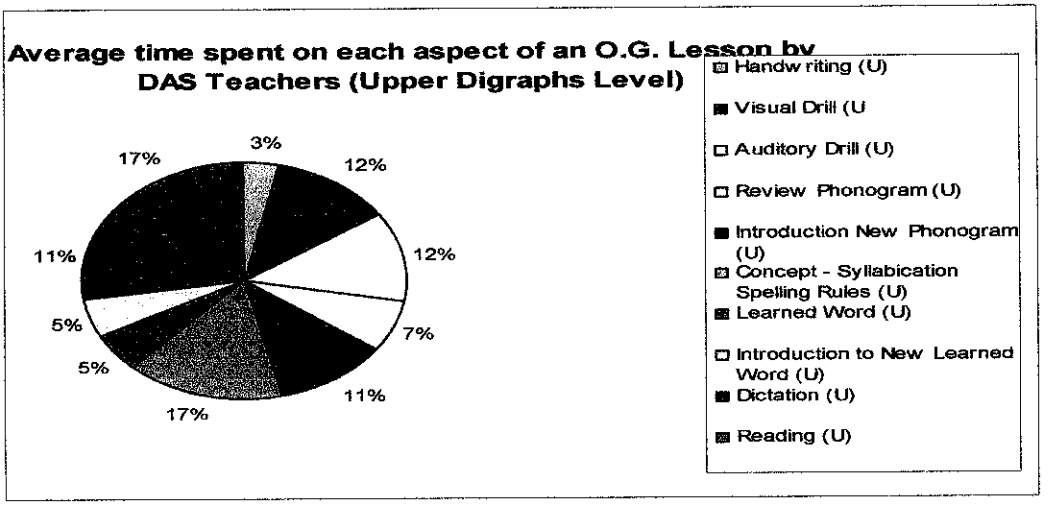

Figure 4.3: Average time spent on each aspect of an O.G. Lesson by DAS Teachers

The rationale behind multi-sensory teaching?

Children with dyslexia often exhibit weaknesses in auditory and/or visual processing. They may have weak phonemic awareness, meaning they are unaware of the role sounds play in words. They have difficulty rhyming words, blending sounds to make words, or segmenting words into sounds. They may also have difficulty acquiring a sight vocabulary. That is, dyslexic children do not learn the sight words expected in the primary grades. In general, they do not pick up the alphabetic code or system. When taught by a multi-sensory approach, children have the advantage of learning alphabetic patterns and words by utilizing all three pathways. Orton suggested that teaching the "fundamentals of phonic association with letterforms both visually presented and reproduced in writing, until the correct associations were built up" would benefit students of all ages.

Is there solid evidence that multi-sensory teaching is effective for children with dyslexia?

There is a growing body of evidence supporting multi-sensory teaching. Current research, much of it supported by the National Institute of Child Health and Human Development (NICHD), converges on the efficacy of explicit structured language teaching for children with dyslexia. Young children in structured, sequential, multi-sensory intervention programs, who were also trained in phonemic awareness, made significant gains in decoding skills. These multi-sensory approaches used direct, explicit teaching of letter-sound relationships, syllable patterns, and meaning word parts. Studies in clinical settings showed similar results for a wide range of ages and abilities. *The International Dyslexia Association(IDA).*

4.1.3 Phonics

The teaching of phonics, through the clear and ordered presentation of scope and sequence, given by the USA trainer, was identified by 71.4 per cent of the people interviewed as effective in helping the children. The

> Faridah: *"The scope and sequence gives teachers a very clear overview of what is to be taught so planning is simpler."*

The commonest weakness of phonics in the O-G system, recognised by 87.5 per cent of the teachers, was that it was especially weak at helping Singaporean dyslexic children, who also have auditory processing difficulties, in hearing the sounds. ***The phonic base of O-G can be a real challenge to dyslexics with auditory processing difficulties." "O-G is not suitable for kids with auditory discrimination difficulties"*** and when asked what she meant by 'auditory discrimination difficulties', she stated ***"kids can't hear vowel sounds clearly."*** Faridah: *"This approach may not suit all children, for example, those who aren't able to blend."*

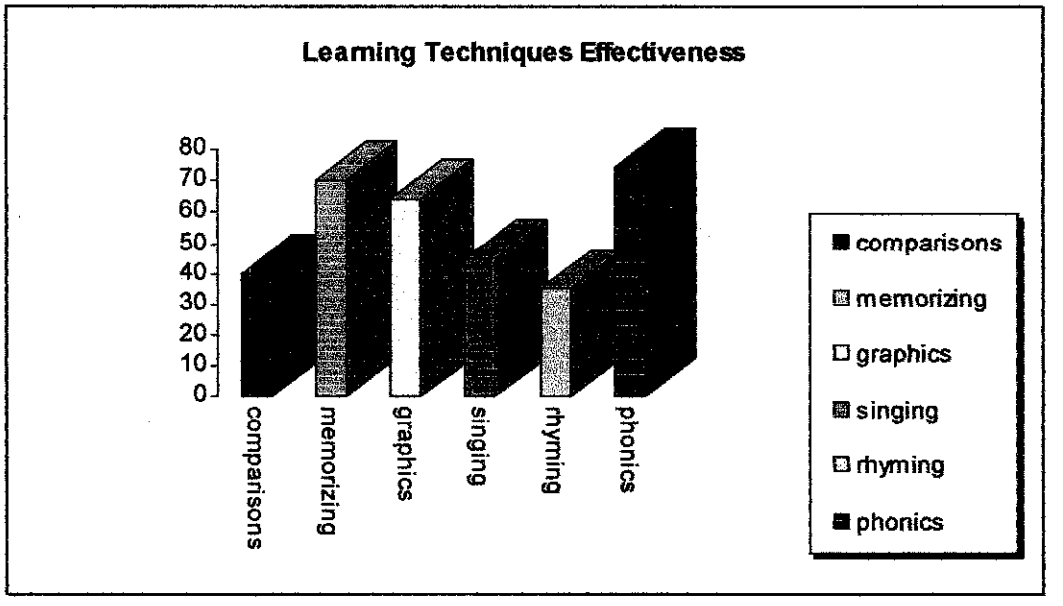

Figure 4.4: Learning Techniques Effectiveness

4.1.4 English as an additional Language (EAL)

Low language, in a Singaporean context, means English as an Additional Language and 87.5 per cent of the teachers believe that the children from an English as an Additional Language background derive less benefit from the O-G programme than children who came from a predominantly English-speaking home. Thus, the O-G programme itself was not seen to be at fault, rather the fact of the children's lack of exposure to the English language.

4.1.5 Analysis- multi-sensory teaching

The experience of the teachers interviewed, that multi-sensory teaching and over-learning is effective in helping dyslexic.-The qualitative data in this study, along with current research, mirrors the work of pioneers such as Montessori (1912), Fernald (1943), Gillingham and Stillman (1960, cited by Birsh 1999); and Hornsby and Shear (1974), and Hickey (1977, cited by Reid 2003). They concluded that the multi-sensory method was effective in supporting children with dyslexia; as was the teaching of phonic and phoneme awareness which has been demonstrated again recently as the basis of mastering reading and spelling, Rack (2004). The teachers, as a group, believed strongly in teaching 'correct phonics' – that is, how they were taught phonics originally by their American trainer.

If the dyslexic Chinese child becomes confused between a Han Yu Pin Yin sound and an English sound then the teacher will explain the differences in the two sounds from the two different languages. Peer and Reid (2000) advocate this approach in teaching multilingual children with dyslexia; and others Cline and Shamsi (2000), Fawcett and Lynch (2000), Hutchinson et al (2003), and Siegel and Smythe (2004) state that dyslexic children from a Chinese background, and/or an EAL background all need to learn phonics because they all have a phonological deficit.

The inconsistencies of the English letter/sound relationship mean that learning the phonics of English will not produce the level of improvement for the dyslexic learner that you would find in another European language such as Finnish. It is this weakness that is identified by the teachers interviewed when they state that the O-G approach was not suitable for dyslexic children with auditory discrimination difficulties

"The ability to detect speech rhythm is thus intimately linked to vowel perception and production. It follows that auditory cues contributing to speech rhythm may be important for representing the syllable in terms of Onset-Rime segments . . . a likely perceptual cause of this difficulty is a deficit in their perceptual experience of regularity or rhythmic timing" (Goswami 2003a,).Goswami also found that as a universal indicator in all language acquisition:

"Some of the processes underpinning language acquisition are disrupted in dyslexia, in particular, the detection of rhythm in speech", (Goswami 2003b, p. 141).

The teachers' solution, which is to introduce Onset and Rime before working on the individual sounds, is one that Goswami (2001, p 25) herself supports:

"Onset-Rime teaching should take place within the context of a mixed approach to phonics"

The interviews show clearly that the dyslexic children from a non-English speaking background need greater exposure to spoken English and therefore the teachers place emphasis on vocabulary and grammar before turning to the more complex aspects of the phonic structure of the language. Many of the teachers interviewed use Project Read, which combines grammatical terms with symbols, to introduce the students to English grammar (Jen 2004).

4.1.6 Other teaching Approaches

i) The Lindamood Phoneme Sequencing Programme (LiPS)

The Lindamood Phoneme Sequencing Programme (LiPS) (Dugal 2003) also derived from the O-G programme, is another teaching approach adapted by some of the teachers in this study. They favour, in particular, its greater emphasis on oral kinaesthetics and use it in conjunction with the O-G method's kinaesthetic tactile component. One of the teachers, Chandani, says that she finds LiPS to be especially suitable for students with auditory discrimination difficulties.

ii) A visual and synthetic phonic approach

A visual and synthetic phonic approach – Jolly Phonics - is used by DAS teachers as a transition to the O-G system, rather than an adaptation. This programme, designed for younger children uses 42 sounds instead of the 44 taught in other phonic programmes and is claimed to be very effective in helping children in a multiracial and multilingual society (Wragg 2004).

4.1.7 Overall Analysis

The O-G system is good for teaching reading, but not as effective in developing writing skills; and that the O-G lesson may not be stimulating enough. Some of the parents made additional comments that their children found the lessons boring and repetitive. It is interesting too, that parents' feedback reflects concerns expressed by Shuang and Salmah with regard to students' needs in writing skills, and it remains to be seen whether the children who have made little or no progress with O-G teaching could be classed as having auditory discrimination problems as defined by Chandani and Yu Ying.

The overwhelming majority of teachers agree that phonics is important for learners with dyslexia, including EAL learners with dyslexia. Onset and Rime is effective for children

with Auditory Discrimination Difficulties Slow and simplistic instruction is the most effective approach for EAL students with dyslexia

The O-G principles are being adapted successfully to meet the needs of Asian children in a multiracial, multicultural and multilingual society.

4.1.8 Conclusion

This evaluative case study demonstrates that multi-sensory and over-learning teaching is most effective when the correction procedure takes account of the mother tongue influence.

There is also a need to use explicit and simpler instructions in teaching children from an EAL background who have vocabulary deficit. The children who do not respond well appear to have Auditory Discrimination Difficulties but it is unclear whether this is predominantly an issue of multilingualism or an issue which affects dyslexic learners in a monolingual society as well.

The teachers see phonics as a static subject and rely on their belief in 'correct phonics'. This derives partly from an uncertainty of using the English language because it is not their predominate mother tongue and because they themselves have not been taught phonics effectively.

Although the teaching of the non-reading monolingual child with dyslexia (Cotterell 1985) is similar to the teaching of an EAL dyslexic child this case study finds that the teaching of basic English grammar is more important in a multilingual society than would be the case in a monolingual society. This is demonstrated with the popularity of teaching grammar and writing skills.

The hypothesis we put forward for discussion and testing is based on the difference between the current tool and tool that was developed.

After testing on the dyslexic users, the effectiveness of the system can be proven by the feedback. The feedbacks also were tested by giving quizzes that can be tested on the

users and assisted by their respective teachers. The prototype allows the user to test their learning ability, handle the various color choices, associate verbal picture association, sing along and word recognition, recognize prefixes, Bahasa Melayu basic syllables (suku kata).A preliminary investigation was done to test users of the interface design. The result shows that the user can accept the visual feedback of the graphics and can relate to it. Thus this proves that the enhancement of the multi-sensory method has improved the learning for dyslexic children as hypothesized earlier.

H_0: $\mu_1 - \mu_2 = 0$
or by
H_0: $\mu_1 = \mu_2$.

H_0: $\mu_1 - \mu_2 = 0$
$= 20 - 20 = 0$

This means that the null hypothesis is rejected thus, it proves that the enhancement of multi-sensory methods using IT for dyslexics helps the learning process.

4.2 Current Tool V.S. Enhanced Version

(Compared to Fitzroy System from Australia)

Table 4.0: Comparison between Software

Foreign influence	Local Scenarios
Less Multi-sensory	Additional Multi-sensory (voice input)
Simple accessibility	Implementation of E-Content Accessibility
Assistive and adaptive technology	Integrated technology Approach

The table above shows the differences between the software and how the author can actually improve the lack of the current software to the local environment and scenario.

4.3 Screenshots

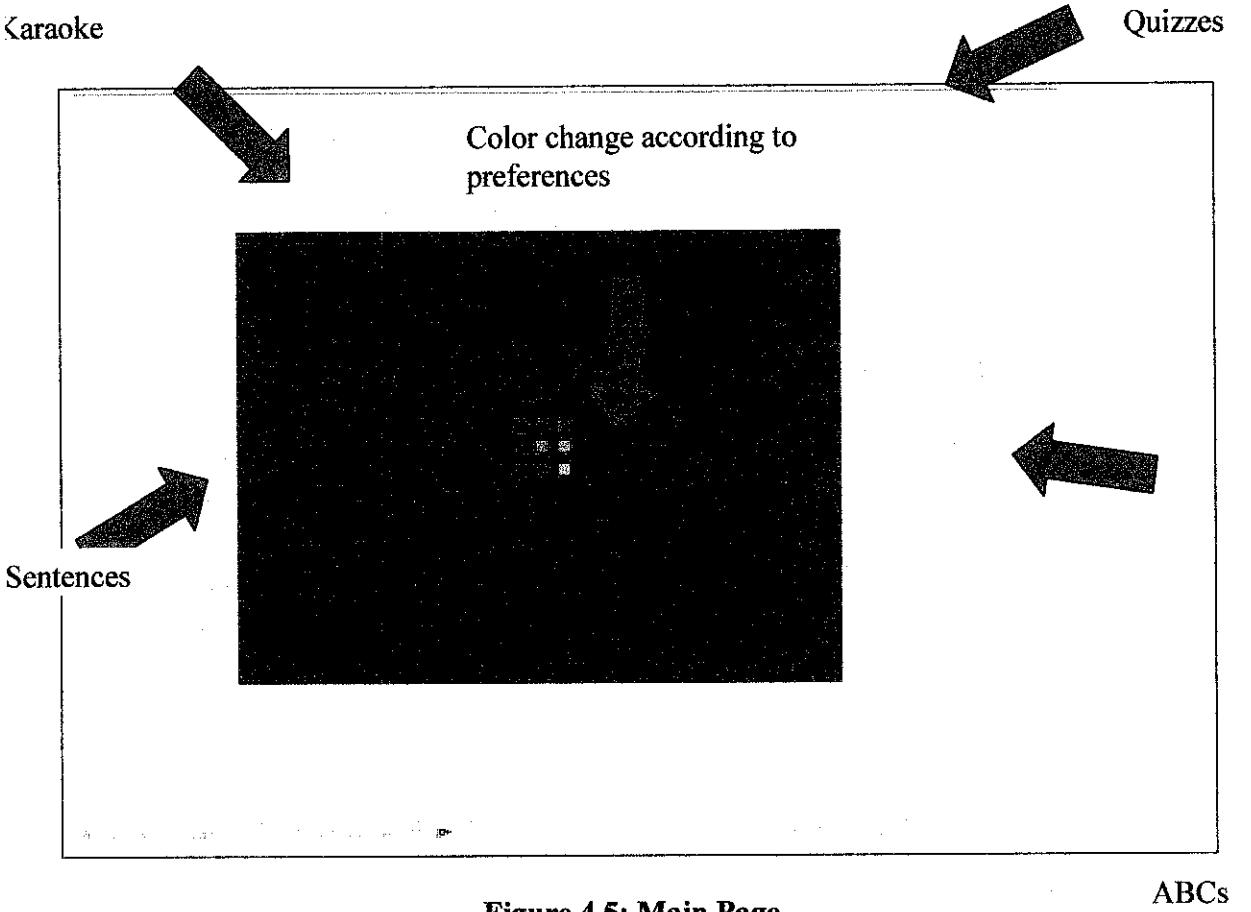

Figure 4.5: Main Page

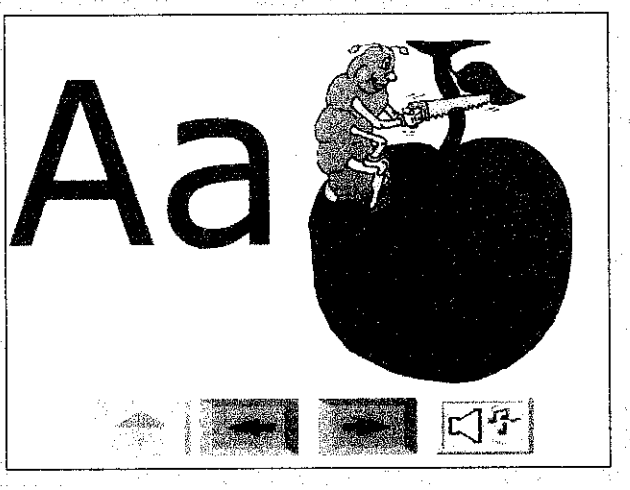

Figure 4.6: Phonics from the Alphabet A

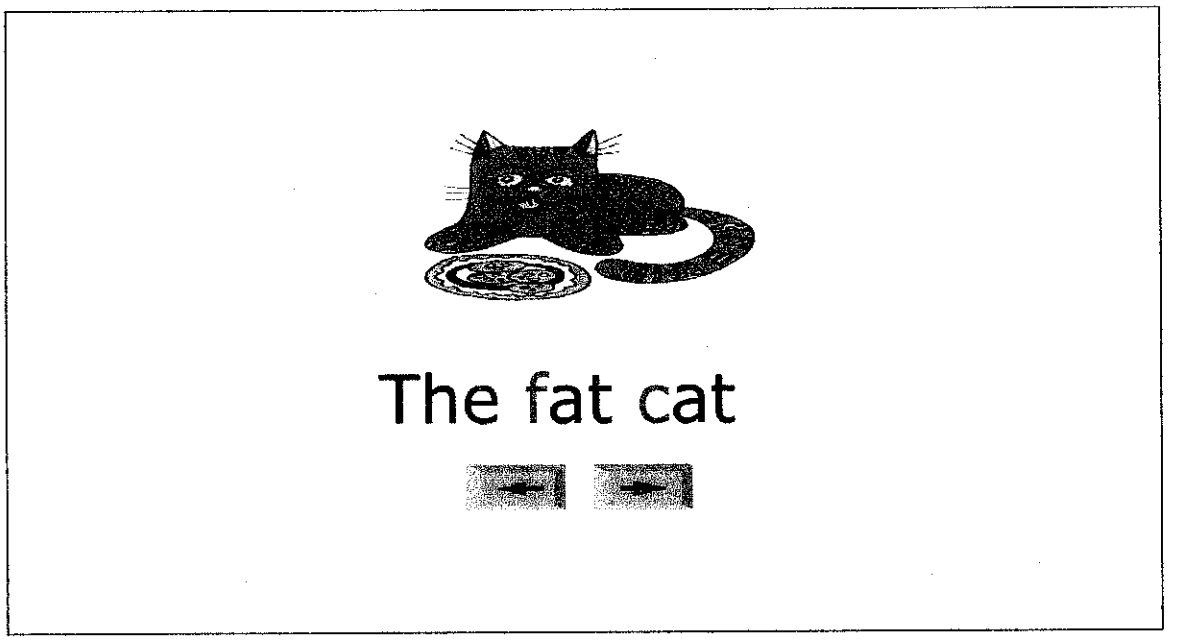

Figure 4.7: The Rhyming and Grouping Strategy

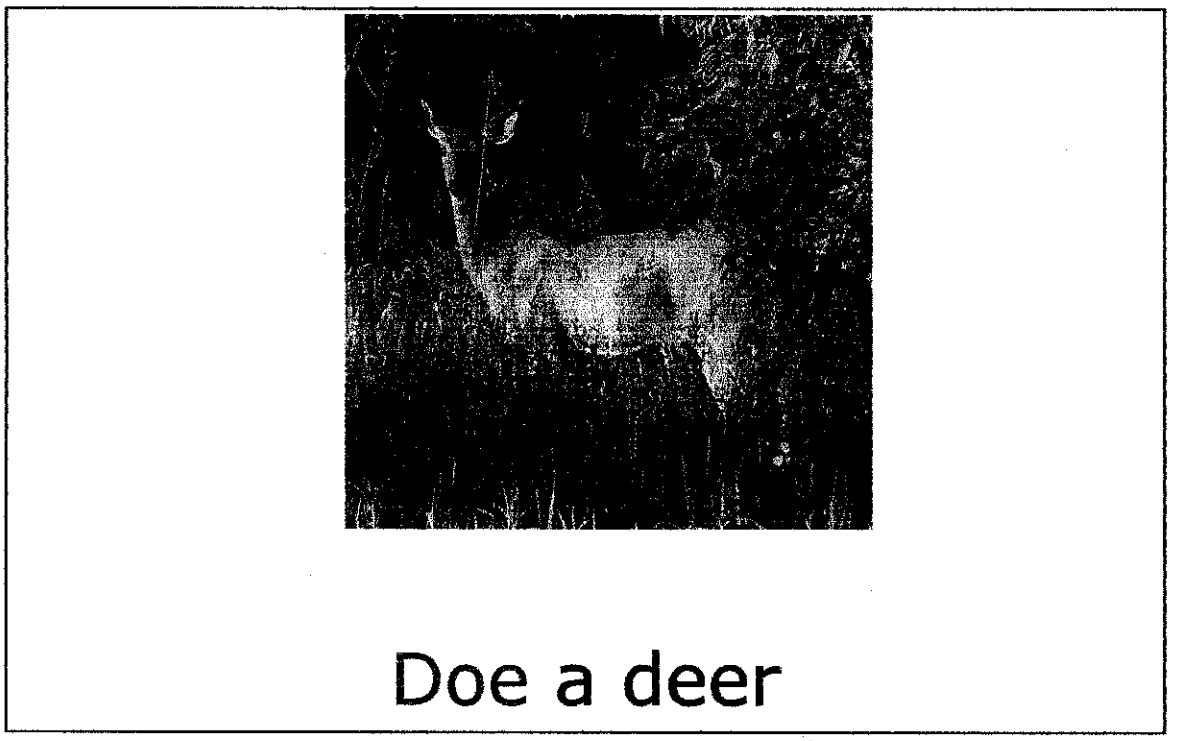

Figure 4.8 Singing Strategy

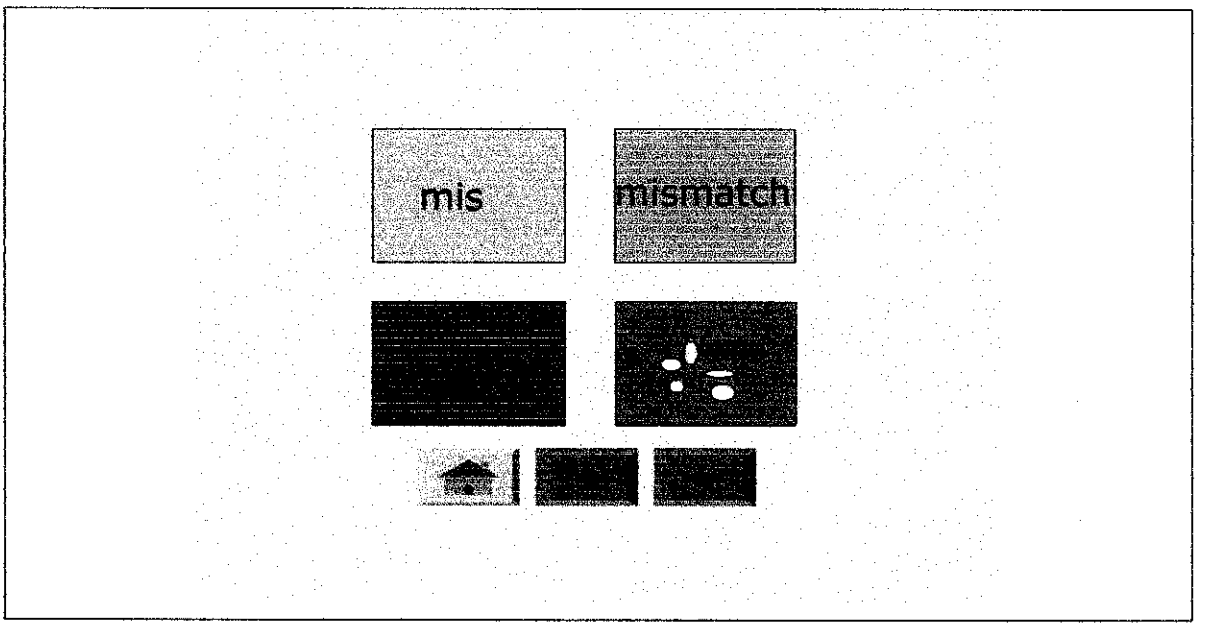

Figure 4.9 The Verbal-Visual Word Association Strategy

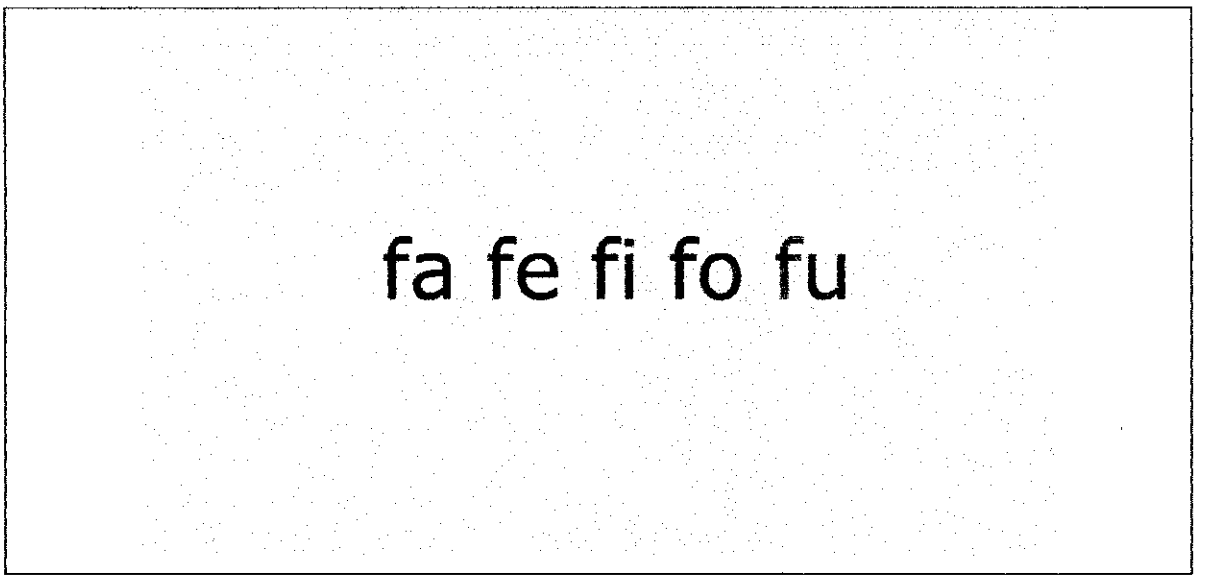

Figure 4.10 Malay (Suku Kata) Page

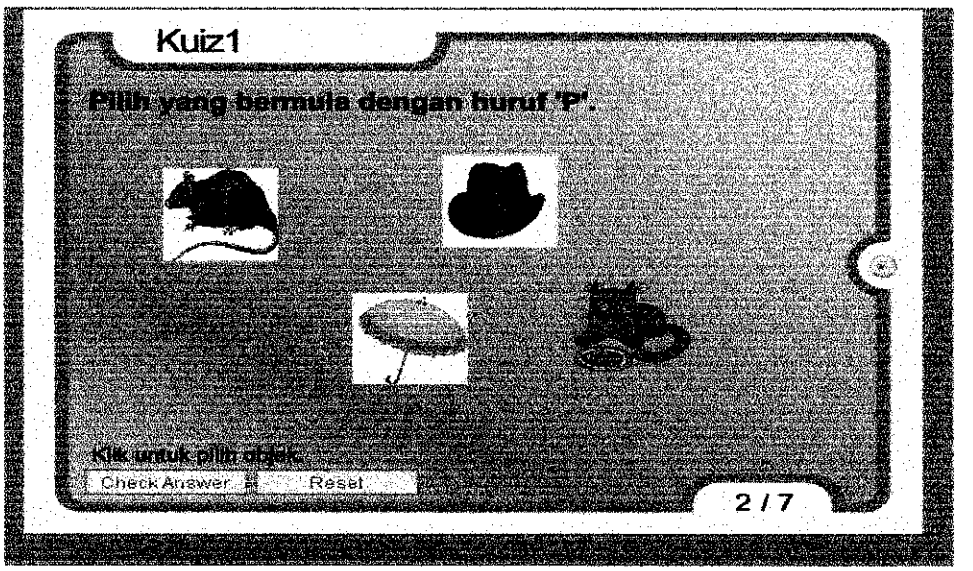

Figure 4.11 Malay Quiz

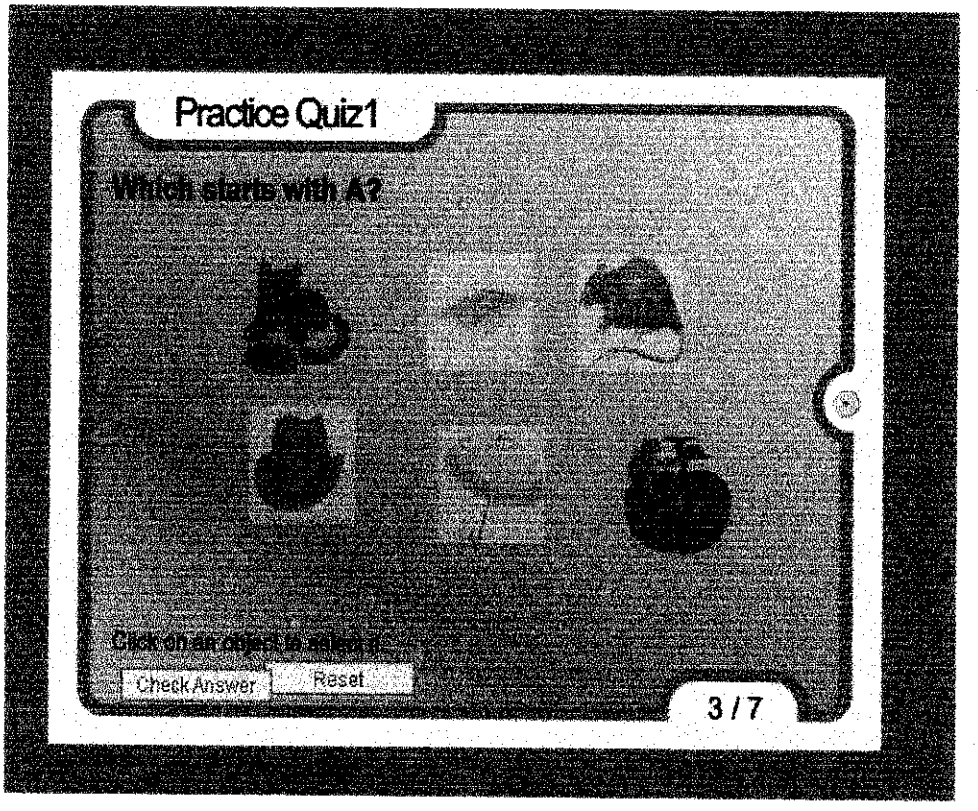

Figure 4.12 English Quiz

CHAPTER 5:

CONCLUSION AND RECOMMENDATION

IT software and hardware is not, and cannot cure or eliminate the difficulties experienced by dyslexic users. At best it can only lessen them and hopefully, as a direct consequence, enhance learning and output of work. Despite this, many are quick to perceive it as a complete solution rather than as a tool which, if used appropriately, will indeed make a difference.

5.1 Conclusion

What can be concluded is that:-

- We need to work on dyslexics strengths (artistic talents, visual, etc) in other areas to help them overcome their weaknesses.
- It is curable for some if trained from early childhood, we need to have the public aware of this and help detect it earlier.
- Content Accessibility for dyslexic is not the same as for normal student and can be improved

- More research on brain development needs to be done to help understand how exactly to overcome dyslexia until adulthood

5.2 Suggested Future Work For Expansion and Continuation

- Teach meta-cognitive strategies. Teach children similarities and differences between speech sounds and visual patterns across words.
- Provide direct instruction in language analysis and the alphabetic code. Give explicit instruction in segmenting and blending speech sounds. Teach children to process progressively larger chunks of words.

- Use techniques that make phonemes more concrete. For example, phonemes and syllables can be represented with blocks where children can be taught how to add, omit, substitute, and rearrange phonemes in words.
- Make the usefulness of meta-cognitive skills explicit in reading. Have children practice them. Try modeling skills in various reading contexts. Review previous reading lessons and relate to current lessons.
- Discuss the specific purposes and goals of each reading lesson. Teach children how meta-cognitive skills should be applied.
- Provide regular practice with reading materials that are contextually meaningful. Include many words that children can decode. Using books that contain many words children cannot decode may lead to frustration and guessing, which is counterproductive.
- Teach for automaticity. As basic decoding skills are mastered, regularly expose children to decodable words so that these words become automatically accessible. As a core sight vocabulary is acquired, expose children to more irregular words to increase reading accuracy. Reading-while-listening and repeated reading are useful techniques for developing fluency.
- Teach for comprehension. Try introducing conceptually important vocabulary prior to initial reading and have children retell the story and answer questions regarding implicit and explicit content. Teach children the main components of most stories (i.e., character, setting, etc.) and how to identify and use these components to help them remember the story.
- Teach reading and spelling in conjunction. Teach children the relationship between spelling and reading and how to correctly spell the words they read.
- Provide positive explicit and corrective feedback. Reinforce attempts as well as successes. Direct instruction and teacher-child interactions should be emphasized.
- In the near future when biotechnology is mastered, the sense of smell could be incorporated in the learning process using IT.
- By using virtual reality the sense of touch and movement also could be enhanced especially for those children with less decodable auditory skills.

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APPENDICES

Pre-development questionnaires

1. Interview questions with Puan Sariah Amirin from Malaysian Dyslexic Center (September 2005)

1. What is Dyslexia?

In short dyslexia can be defines as a reading or literacy among children usually inherited.

2. Awareness level of dyslexia in Malaysia?

The awareness level of Dyslexia in Malaysia is not that extensive but it has become known in recent years, due to campaigns and the openness of Malaysians.

3. When was the centre associated?

The centre was actually initiated in 1993 due from parents' requests and moved to the current location at Jln Kuantan, Setapak in 1999

4. Most effective teaching method?

It depends on the child but the most commonly used is phonics and word recognition.

5. How old are the children that go this center?

Usually the children that come to this center are aged between 5-7 years. It also can depend when they were first diagnosed as dyslexics.

6. How long do the students go to the center?

Usually most come here for mostly 3 months, if it takes longer than a year for them to increase in their reading ability or literacy skill, we usually conclude that there other disability with the child other than dyslexia. We would recommend the parents to afterwards diagnose the children again to find out the other disability or problem.

7. Is there a need for Malay spelling courseware?

Not much since Malay has 'suku kata'(syllables) which are easier to follow ansd spelled as easily as it sound which differs from the English language.

8. How much has IT/multimedia have helped the dyslexic children?

It has helped greatly and the children like using the software because of the fun and games.

9. What courseware does the centre use?

The centre uses the Fitzroy(1997) system that it has bought from Australia for more than a few hundred Ringgit.

10. Dyslexia as known to experts vary according to the different symptoms, how do you cope?

We try to focus on the pupils disabilities because each and every differed, that's why some solutions for a type of dyslexics can't be used for the other dyslexic

Questionnaires given out randomly to 20 students

1. Do you know what Dyslexia is?

   ☐ Yes

   ☐ No

2. Are you dyslexic and if yes, what type are you?

   ☐ Yes Type:_____

   ☐ No

3. Do you think IT can help dyslexics improve in reading?

   ☐ Yes

   ☐ No

4. Do you know what it means by multi-sensory teaching techniques?

   ☐ Yes

   ☐ No

5. List the following according (scale 1 to 5) to the most effective you think is in learning.

   ☐ Smell

   ☐ Touch

   ☐ Movement

   ☐ Visual

   ☐ Auditory

6. According to scale from 1 to 5. Rate the learning strategy you think is the most effective for children learning to read? Name other strategies you think is effective.

- ☐ Phonics
- ☐ Rhyming
- ☐ Comparison
- ☐ Memorizing

Other:_____

7. Do you think integration of the senses will be effective for teaching dyslexics?

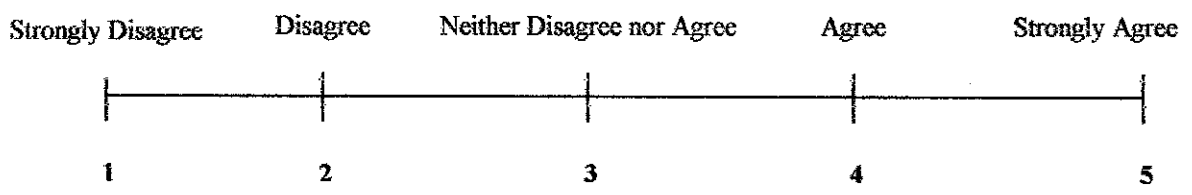

TABLE 1 : PROJECT TIMELINE

ACTIVITIES	WEEK NO/DATE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Research Title Initial Proposal/Preliminary Report																
Preparation on Research - Determine Scope of survey - Finalize questionnaires																
Research Work - Distribution of questionnaire - Interview																
Data Analysis of Research																
System Analysis : - Analysis on System Requirements																
System Design : - Storyboarding - Content																
System Development																
System Testing																
Revision of System																
Preparation on Final Report/ Dissertation																

GLOSSORY

Morpheme

The smallest unit of meaning in a language. A word may consist of one morpheme (house, happy) two morphemes (house/ing, un/happy) or three or more morphemes (house/keep/ing, un/happi/ness).

Motor control

Being able to match physical actions to perform tasks, such as coordinating hands, feet and eyes when driving a car.

Multi-sensory

Using visual, auditory and kinaesthetic modalities, sometimes at the same time