EVALUATION OF THE EFFECTS OF A MULTISENSORY MALAY LANGUAGE READING PROGRAMME ON THE DECODING SKILLS OF CHILDREN WITH DYSLEXIA

by

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Thesis submitted
in fulfilment of the requirements
for the degree of Master of Arts

April 2016

ACKNOWLEDGEMENT

I would like to take this opportunity to first and foremost thank God for being my strength and guide in the preparation of this thesis. Without Him I would not be able to do so.

I offer my sincere appreciation to my supervisor, Associate Professor Dr Lee Lay Wah, who has been a tremendous mentor for me. She supported me with her patience and knowledge, allowing me the space to work in my own way and to grow as a researcher. Her advices on both research and my career have been priceless. I attribute my Master degree to her encouragement and effort in assisting me to complete the thesis.

I would also like to thank the Ministry of Education Malaysia for the partial financial support through the Mybrain15 programme during this period of study.

I want to thank my friends Wan Lin, Raymond Lim, Michelle Khoo and also all of my other friends who helped and supported me during my study. A special thanks to my family, Papa, Mama, Albert, Amy, Andrew, and Uncle George, who supported me in pursuing my study, and encouraged me to strive towards my goal. Once again, I am so blessed to have such great teachers, friends and family. Thank You.

TABLE OF CONTENTS

CHAPTER 3 - METHODOLOGY

CHAPTER 5 – DISCUSSION

APPENDICES

LIST OF TABLES

LIST OF FIGURES

PENILAIAN PROGRAM MEMBACA MULTISENSORI BAHASA MALAYSIA UNTUK KANAK-KANAK DYSLEXIA

ABSTRAK

MyBACA © ialah program membaca multisensori yang bertumpu kepada proses mendekod dan telah dibina untuk tujuan pemulihan kanak-kanak disleksia. Kajian ini bertujuan untuk menilai kesan program membaca multisensori Bahasa Malaysia ini terhadap kemahiran mendekod kanak-kanak dengan profil disleksia. Kajian ini bertumpu kepada penilaian pencapaian mendekod, kelancaran membaca, motivasi belajar, serta kekuatan dan kekurangan program membaca tersebut. Rekabentuk kajian jenis campuran digunakan untuk memperolehi data kuantitatif dan kualitatif. Kaedah kuantitatif menggunakan rekabentuk *single subject research design*, manakala kaedah kualitatif menggunakan rekabentuk temubual dan pemerhatian. Tiga sampel yang berumur sebelas tahun telah dipilih melalui persampelan bertujuan berdasarkan profil disleksia mereka. Mereka telah diajar secara individu selama tiga bulan. Data kuantitatif dan kualitatif dianalisis secara berasingan dan seterusnya ditriangulasi. Keputusan kajian ini menunjukkan terdapat peningkatan dalam kemahiran mendekod, kelancaran membaca serta motivasi belajar di kalangan peserta. Hasil kajian juga menunjukkan bahawa masalah perkaitan bunyi-abjad adalah ketara dalam kalangan kanak-kanak disleksia. Berdasarkan keputusan kajian, beberapa cadangan penambahbaikan telah dikemukakan. Kajian ini juga menyumbang kepada seruan untuk menggunakan program membaca dengan bukti penyelidikan untuk mengajar kanak-kanak disleksia. Dapatan kajian ini juga terus menyumbang kepada pengetahuan mengenai pengajaran Bahasa Malaysia kepada kanak-kanak disleksia. Kesimpulannya, program membaca ini adalah berkesan dalam membantu kanak-kanak disleksia untuk memperoleh kemahiran mendekod dalam Bahasa Malaysia. Tambahan, hasil kajian empirikal ini juga adalah berguna untuk mencadangkan penambahbaikan kepada program *MyBACA*.

EVALUATION OF THE EFFECTS OF A MALAY LANGUAGE MULTISENSORY READING PROGRAMME ON THE DECODING SKILLS OF CHILDREN WITH DYSLEXIA

ABSTRACT

MyBACA © is a multisensory reading programme focused on Malay Language decoding that has been developed for the purpose of remediating children with dyslexia. This research aimed to evaluate the effects of this multisensory Malay language reading programme on the decoding skills of children with dyslexia. The study focused on the effects of the reading programme on the participants' decoding achievement, reading fluency, learning motivation, and the programme's strengths and weaknesses. A mixed-method design was employed to gather quantitative and qualitative data. The primary quantitative approach used is the single subject research design; whereas the qualitative approach included semi-structured interview and participant observation. Three eleven-years old participants were purposively sampled based on their dyslexia profile. The participants were taught on an individual basis for a period of three months. The qualitative and quantitative data were first analyzed separately and then triangulated to answer the research questions. The results of the research showed that the participants' decoding achievement, reading fluency, and learning motivation increased. However, the persistence in letter-sound correspondence errors was obvious among the participants. Based on the results obtained, recommendations were suggested to improve on the reading programme. The study promoted the use of evidence-based reading programme to remediate children with dyslexia. The findings also directly contributed to research on dyslexia remediation in the Malay Language. In conclusion, this reading programme was effective in helping participants with dyslexia acquire Malay language decoding skills. In addition, the empirical results were also useful to recommend improvements to enhance the *MyBACA* programme.

CHAPTER 1

THE PROBLEM AND ITS SETTING

1.0 INTRODUCTION

Dyslexia is a learning difficulty that affects a child's ability to develop a strong understanding of language. They experience enduring and unexpected difficulty with reading and writing (Wood, 2006). Besides reading, writing and spelling, other challenges with language and learning are also common among children with dyslexia (Eide & Eide, 2011).

This study aims to determine the effects of a Malay language multisensory reading programme on children with dyslexia. This chapter presents the background, statement of problems, research purposes and objectives, research questions, significance of the study, and the definition of terms used in order to help readers to have a better understanding of the research.

1.1 BACKGROUND OF STUDY

Dyslexia International (2000) reported that at least one in every 10 persons has dyslexia, which means that 700 million people worldwide display traits of dyslexia. The International Dyslexia Association (IDA) claims that approximately 10-15 percent of the world's population is affected by dyslexia (IDA, n.d.). In Malaysia, according to the Education Ministry, about 314,000 school-going children in Malaysia have dyslexia (Wong, 2009). Persatuan Dyslexia Malaysia (PDM)

estimated approximately 500,000 school-going children in Malaysia may be at-risk of dyslexia (PDM, n.d.). Even though a substantial number of children in Malaysia are detected as having dyslexia or are at-risk of dyslexia, yet many more go undetected. A reliable statistic on the actual numbers of children with dyslexia in Malaysia, however, is still not available due to the lack of normed psychometric tests.

Catts and Kamhi (1999) define dyslexia as a developmental language disorder whose defining characteristic is difficulty in phonological processing, which leads to problems with accurate and efficient decoding of single words. Slow, inaccurate word reading leads to poor reading comprehension. Subsequently, reading comprehension and spelling problems contribute to difficulty with written expression (Odegard, 2012; Stanovich, 1986). Stanovich (1986) described it as Matthew effect, where the rich get richer and the poor get poorer.

Furthermore, it is said that by third grade children switch from learning to read to reading to learn, so, if the child has problems reading, he/she will have trouble learning new things (Odegard, 2012). It is therefore essential to tackle reading problems at the early stage of word decoding. Otherwise, they risk life-long illiteracy and inability to function fully in the society (Dyslexia International, 2000), and will not be able to realise their full potential.

It is common knowledge that illiteracy might lead to future social ills. According to the director of the Malaysian Curriculum Development Centre (CDC), En Mahzan Bakar, these students are at-risk of dropping out of the school system, and according to Chapman (2006), they might have a hard time continuing with their education or pursuing a career. These children might develop deep resentment

against the education system, and society in general, which lead to school dropouts and juvenile delinquencies (JUKEN Consultancy Sdn. Bhd., 2004).

The Arizona Republic (2004) reported that children who do not read by third grade often fail to catch up and are more likely to drop out of school, take drugs, or go to prison. The number of non-readers that wind up in jail is so high that Arizona officials have found that they can use the rate of illiteracy to help calculate future prison needs. Approximately 70% of prisoners fall into the lowest two levels of reading proficiency in England (National Institute for Literacy, 1998). This shows how low literacy is strongly related to crime (Rucklidge, McLean, & Bateup, 2009). As illiteracy might cause future social ills such as drugs or other social crimes therefore, the solution for reading difficulties needs to be given prominence.

In Malaysia, children with disabilities are classified as those having visual, hearing and/or some learning disability. Children with learning disabilities include children with intellectual disabilities (autism, Down syndrome, attention deficit hyperactive disorder, speech and language disorder, and dyslexia) (Government of Malaysia, 2010). These children are supported by the government and are placed in either the special education school, special education integrated programme in the regular school, or in the inclusive programme (Government of Malaysia, 2010). Apart from educational institutions, support is also provided through community based rehabilitation centres, non-government organizations (NGO), and private schools (Lee & Low, 2014).

A specialised remedial programme was initiated in schools in 2010, which is the Literacy and Numeracy Screening (LINUS) programme. Under this programme, primary 1, 2, and 3 students are screened to determine if they are progressing at an

expected pace on literacy and numeracy. Those who did not master the literacy and numeracy skills according to the LINUS standard will be pulled out to attend remedial classes (Government Transformation Programme, 2010). Due to the nature of their difficulties, children with dyslexia would typically be found among this group of children. There are special education integrated programme in the regular school that specifically caters for these children with dyslexia. However, such dyslexia programmes are not as wide-spread compared to the special education integrated programme for children with learning disability.

According to Rosana (2009), children with dyslexia might present symptoms such as poor handwriting, spelling, written vocabulary, inaccurate oral reading and delayed verbal response, as well as poor organization of content. In addition, they are also poor in learning. Therefore, systematic teaching is recommended as a teaching method (Gillingham & Stillman, 1997). In addition, the multisensory method will also help to enhance their learning.

A reading programme, named *MyBACA* ©, which is based on the multisensory method of teaching, and which focused on developing Malay language word decoding skills have been developed by the School of Educational Studies, Universiti Sains Malaysia (Grant No. 304/PGURU/6312002). However, this method has as yet not been field evaluated. Therefore, the purpose of this research is to determine the effects of this reading programme on children with dyslexia who exhibits enduring problems in reading. Data will be gathered during this research on the effectiveness of this programme to teach reading to children with dyslexia. As every child has the right to education, including those who learn in a different way, therefore our education system should not leave any one of them out (Dyslexia International, 2000).

1.2 PROBLEM STATEMENT

The Socio-economic and Environmental Research Institute Penang (SERI, 2003), reported that 9.4 percent of children in grade 1 mainstream elementary schools in Penang, Malaysia have some form of difficulties in learning, mostly in reading. These are children considered to be at-risk of dyslexia. Lee (2008a) conducted a research with 117 Grade 1 children using tests developed specifically to assess dyslexia in Malay and identified 6.84% of children (8 out of 117) who have dyslexia. The statistic clearly warns us that this matter should not be taken lightly.

For a child with dyslexia to become a reader, besides an early diagnosis, an effective treatment (reading programme) is essential (Shaywitz, 2003). There are many treatment developed to help children with dyslexia to learn to read (Wood, 2006). Davis (1997), a person who also has dyslexia postulated that children with dyslexia need to use all senses to think and perceive. Therefore, there is a need to teach children with dyslexia using more than two senses, that is, to use a multisensory method (Wood, 2006). Multisensory teaching integrates visual, auditory and kinaesthetic-tactile elements (Henry, 1998). Studies from the National Institutes of Child Health and Human Development (NICHD) have shown that for children with difficulties learning to read, a multisensory teaching method is the most effective approach or treatment (Bradford, 2000). This method helps children to learn by using more than one sense. It employs all pathways of learning at the same time, which are, seeing, hearing, touching, writing and speaking. However, the literature showed that this method of intervention is still not fully exploited in the Malaysian context. Therefore, there is a great need to conduct research related to multisensory instruction for children learning the Malay language.

According to Madam Sariah Amirin, president of the Dyslexia Association of Malaysia, students with moderate to profound dyslexia will need to undergo remedial programmes such as special reading classes to help them cope with learning. An effective remediation programme is essential to teach students with dyslexia. However, there is a lack of such specialised reading programme in Malay language for children with dyslexia (Thanasayan, 2013).

Lee (2008c) in her review stated that, if a child has problems in phonological awareness, phonological memory or short term memory then the child is likely to have problems in reading, writing and spelling regardless of language and culture. A typical developing child is able to learn Malay language according to the traditional method, whereby the emphasis is on spelling of the letter names and syllables. However, for children with dyslexia, the school's spelling method is not enough for them to acquire the Malay language (Lee & Wheldall, 2011). Three major errors were found among children with reading disabilities (Lee & Wheldall, 2011). First, is the error related to the syllable structure of words. Children with dyslexia have difficulty in recognizing the syllable structure accurately. Second, is the phonic structure, as the difficulties recognizing words increase with the appearance of either digraphs, diphthongs, or the code overlap '*e*'. Third, is the error in affixed words. They suggested that these children need to be taught grapheme-phoneme decoding in a systematic and explicit manner, because these children rely on grapheme-phoneme decoding for word recognition. In addition, the Malay language is a transparent language which is suitable to be taught at the grapheme-phoneme level. In this research, the reading programme to be evaluated provides systematic and explicit instructions to teach decoding skill in the Malay language to children with dyslexia.

The study will determine the effect of the reading programme on the decoding skills of the participants.

According to Torgesen and Hudson (2006), word-reading accuracy refers to the ability to recognize or decode words correctly, and fluency is the reading rate of word identification and fluidity while reading connected text. Achieving fluency is important because when the decoding process is mastered and become automatic, the reader can focus more on the comprehension of the material read. This study will determine the effect of the reading programme on the participants' reading fluency of decodable texts.

Some factors which are associated with dyslexia but do not cause dyslexia, are poor motivation, impaired attention and academic frustration. Students with dyslexia might be labelled as lazy, unmotivated or low intelligence because of their language problems. This misconception might lead to many problems such as discouragement, isolation, and low self-esteem (Narayana & Xiong, 2003).

McKenna, Kear, and Ellsworth (1995) found in their study that struggling readers have more negative attitudes towards reading compared to average and above average readers. Similar results for children diagnosed with a reading disability were also obtained by Lazarus and Callahan (2000). Burden (2008) in his review stated that most intervention programmes are not placing much, if any, emphasis on building up the feeling of competence among the students with dyslexia. Therefore, apart from determining the effect of *MyBACA* programme on reading achievement, this research will also seek to identify whether the reading programme has any influence on children's learning motivation towards reading.

1.3 PURPOSE OF THE STUDY

This study evaluates the effect of the *MyBACA* reading programme to determine whether the reading programme can improve the decoding performance, and the reading fluency skills of children with dyslexia who exhibits enduring problems in reading. In addition, this study also explores the effect of the intervention on the learning motivation of primary children with dyslexia. Finally, the strengths and weaknesses of the reading programme are identified. Through this research, evidence-based practices can be obtained on the effect of the *MyBACA* reading programme to teach decoding skills to primary school students with dyslexia.

1.4 RESEARCH OBJECTIVES

Specifically this study aimed to:

1. determine the effect of the reading programme (*MyBACA*) on the decoding performance of primary children with dyslexia.
2. determine the effect of the reading programme (*MyBACA*) on the fluency of reading decodable texts.
3. investigate the effect of the reading programme (*MyBACA*) on students' learning motivation in reading.
4. identify the strengths and weaknesses of the reading programme (*MyBACA*) for further enhancement and revisions.

1.5 RESEARCH QUESTIONS

The research questions are:

1. How will the reading programme (*MyBACA*) affect the decoding performance of primary children with dyslexia?
2. How will the reading programme (*MyBACA*) affect the students' fluency of reading decodable texts?
3. How will the reading programme (*MyBACA*) affect the students' learning motivation in reading?
4. What are the strengths and weaknesses of the reading programme (*MyBACA*) identified during intervention?

1.6 SIGNIFICANCE OF THE STUDY

This research will be able to determine the effectiveness of the intervention to teach Malay language word decoding to children with dyslexia. Information gathered will also help to improve on the programme for further research in the future.

The research collected evidences on the effectiveness of the reading programme. This will promote evidence-based practices among educators. Furthermore, such practices needs to be encouraged and promoted in Malaysia in order to support the progress intended in our Malaysian Education Blueprint (2013-2025). Research on programme outcomes in Malaysia is currently much lacking and research-wise the situation is even more detrimental for the Malay language (Lee & Low, 2014). This research will therefore contribute towards dyslexia remediation in schools, in non-government centres, and at home.

There is quite a large research database on the effectiveness of English Language reading programmes but very little research has been done on reading programmes for dyslexia in the Malay language. Therefore, this research is important to provide an evidence-based programme to teach Malay language to children with dyslexia. In addition, many children with dyslexia cannot catch up with their classmates in school, and to close the gap between them and their classmates, they need to learn fast (Shaywitz, 2003). They have no time to waste on a trial and error reading programme.

As stated earlier, in terms of research and practice on dyslexia, Malaysia is still in its infancy, therefore this research will add new knowledge to the field of dyslexia remediation in Malaysia.

1.7 CONCEPTUAL FRAMEWORK

The purpose of this research is to evaluate the effectiveness of a multisensory Malay language reading programme to teach children with dyslexia. In this research the participants are Chinese speaking primary school students with Malay language as their second language. These students are chosen because of the researcher's background in working with Chinese speaking students. However, more importantly, this research intended to test the efficacy of *MyBACA* reading programme with students who are the most challenged in reading. This would be students with dyslexia who still exhibit problems in reading despite undergoing the LINUS programme in school, and with Malay as a second language.

This study begins with identification of children that present a profile of dyslexia. The operational definition of dyslexia for this research was adopted from the United Kingdom's Special Needs Code of Practice (Department of Education, 1996). Based on this definition, a screening was carried out by administering a battery of tests to identify students with dyslexia. The tests comprise of the *Instrumen Senarai Semak Disleksia* (ISD) (The Checklist of Dyslexia*)* and *Senarai Semak Risiko Disleksia USM (*USM Dyslexia Screening Checklist*)* (Lee, 2005) (Appendix A), the Matrix Analogies Test (Naglieri, 1985), *Ujian Bacaan untuk Mengenalpasti Disleksia* (Reading Assessment to Identify Dyslexia) (Lee, 2009), and *Ujian Pemprosesan Fonologi untuk Mengenalpasti Disleksia* (Phonological Processing Assessment to Identify Dyslexia) (Lee, 2011).

The children with a profile of dyslexia are taught using the *MyBACA* reading programme. The goal of the programme is to help participants to acquire decoding skill in the Malay language. The *MyBACA* reading programme is the independent variable in the research. The dependent variables in the research are the decoding skill performance, reading fluency of decodable texts, and the learning motivation of the participants.

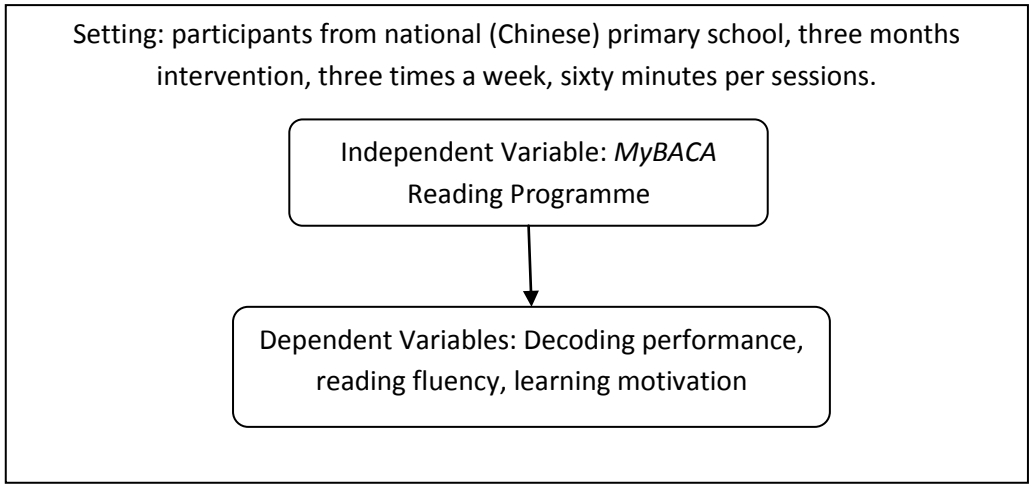

*Figure 1.1.*The conceptual framework of the research.

1.8 LIMITATION AND DELIMITATION

This research is not without limitations. There are several limitations that need to be considered when interpreting the findings.

The first limitation is the duration of the study. The participants will need to complete the *MyBACA* reading programme within the three months period. The participants are all students with dyslexia and had suffered reading failure (Malay Language) for a few years. This duration of the intervention might not be enough to show much change. In addition, due to the time and financial constraints to carry out the study, only five participants are recruited in this study.

As this research intended to test the efficacy of *MyBACA* reading programme with students who are the most challenged in reading Malay, therefore students learning Malay language as a second language was chosen. However, the influence of the first language on Malay language will not be investigated in this research as the intended focus is on the efficacy of the *MyBACA* reading programme.

Generalizability is a major criterion for the quality of a study. Generalization of this research may be limited as the participants are small in number. However to increase reader generalization of a study (Misco, 2007), detailed descriptions are presented in this study so as to allow readers to make inference to generalize the findings to their own settings (Firestone, 2010; Polit & Beck, 2010).

1.9 DEFINITION OF TERMS

Dyslexia: Dyslexia is a neurological condition which primarily affects a child's ability to develop a strong understanding of language such as in reading, writing and

spelling (Shaywitz, 2003; Wood, 2006). In this study, dyslexia refers to a condition of children with significant difficulties in reading, writing, spelling, or manipulating numbers, which are not typical of their other general levels of performance. They may gain some skills in some subjects quickly and demonstrate a good level of oral language ability, yet may encounter sustained difficulty in gaining reading or numeracy skills. Such children can become severely frustrated and may also develop emotional and/or behavioural difficulties (DfE, 1996).

Children with dyslexia: In this study, the children with dyslexia refer to children who are identified by their language teacher as being a low achiever in literacy, and these children will be selected to undergo a battery of screening assessments. The result of the assessments will be analyzed to determine whether the child has dyslexia. The assessments include formal assessments which are the *Intrumen Senarai Semak Disleksia* (ISD) [Dyslexia Checklist], *Senarai Semak Risiko Disleksia USM* (USM Dyslexia Screening Checklist) (Lee, 2005), Matrix Analogies Test (Non-verbal IQ test) (Naglieri, 1985), *Ujian Bacaan untuk Mengenalpasti Disleksia* (Reading Assessment to Identify for Dyslexia) (Lee, 2009), and *Ujian Pemprosesan Fonologi untuk Mengenalpasti Disleksia* (Phonological Processing Assessment to Identify for Dyslexia) (Lee, 2011).

Phonological processing: Phonology is the auditory component in language. Phonological processing refers to the ability to recognize and utilize the letter-sound correspondences of the printed page. Phonological awareness refers to a type of phonological processing ability that involves an awareness of letter-sound correspondences and their relationships (Spafford & Grosser, 1996). Phonological awareness is considered an important predictor of success in reading. Individuals with dyslexia frequently experience difficulties in this area, due to the lack of basic

phonological awareness or phonological processing ability. These individuals are not able to use basic sound units effectively to access the sound sequence of words; therefore they require specific training (Bradley & Bryant, 1983; Perfetti, 1985).

Decoding: Decoding is the ability to apply the knowledge of the phonological processes to correctly pronounce written words (Lee, Yeap, & Low, 2012). According to Spafford and Grosser (1996) decoding involves matching printed words to sound and translating printed words into sounds. In this study decoding refers to the process of translating Malay print to sound.

Reading Fluency: According to Meyer and Felton (1990), reading fluency is the ability to read connected text rapidly, smoothly, effortlessly and automatically. Reading fluency can only be achieved if decoding skills is established (Brenitz, 2006). In this study the reading fluency refers to the accuracy and speed in reading the decodable texts.

Multisensory method: Multisensory teaching approaches use visual, auditory, and kinaesthetic-tactile pathways simultaneously to enhance memory and learning of written language (Gillingham & Stillman, 1997). In this study, the multisensory teaching method is the method used in the *MyBACA* reading programme.

Reading Programme: According to the dictionary, reading programme is defined as a programme designed to teach literacy skills. In this study the intervention (*MyBACA*) is the reading programme.

MyBACA: MyBACA is a Malay language reading programme that utilizes the multisensory approach to teach reading to primary students with dyslexia (Lee, in preparation). The reading programme focuses on intervention of decoding skills as

decoding is the primary cause of dyslexia. It was developed by Dr. Lee Lay Wah from Universiti Sains Malaysia.

Effectiveness: Effectiveness refers to the degree to which something is successfully producing the desired result (Oxford University Press, 2015). In this study, the effectiveness of the multisensory reading programme (*MyBACA*) is determined by achieving its goal, which is to improve the user's decoding skill.

Learning motivation: In this research, the learning motivation refers to the psychological process in an individual that causes the desire or willingness to learn or be involved in learning activities (Lee, 2010).

1.10 CONCLUSION

This research is concerned with the effectiveness of the reading programme on the decoding performance, fluency skills, and the learning motivation of the participants. It is also interested with the strengths and weaknesses of the programme. The research gathers evidence of the effectiveness of the reading programme and provides us with some understanding of the learning pattern of the children with dyslexia. It will contribute to our education system especially in the field of special education. In addition, if a programme, such as *MyBACA*, yields positive results, then there is opportunity for this programme to be replicated and used, which potentially benefit more children with reading disabilities. The next chapter discusses the literature review of the research.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

Dyslexia had been researched for more than a century and yet a universal definition is still in debate, however, this did not stop the research on intervention to aid the learning of dyslexia. A child with dyslexia faces difficulties mainly in reading. Many research studies across different languages prove that the difficulties were primarily caused by the lack of phonological awareness (Catts & Kamhi, 1999; Shaywitz, 2003). Decades of intervention practices have also revealed that the multisensory teaching method is effective in teaching children with dyslexia (Guardiola, 2001).

Malaysia is a multiethnic country, with a population of 29 million people (Department of Statistic Malaysia, 2012). Generally, Malaysians are trilingual or bilingual. Malay language is the national language, while English is the second official language in Malaysia (Gomez, 2004). Therefore, both Malay and English languages are taught in all schools. In addition, children studying in the national type primary schools use an additional language that is Mandarin or Tamil. As the manifestation of dyslexia is dependent on language profiles (Lee, 2014), it is therefore not difficult to imagine that children with dyslexia in Malaysia who are trilingual might have a harder time to cope in schools than children in monolingual populations.

The purpose of the *MyBACA* reading programme is to teach decoding skill in the Malay language to children with dyslexia. The preliminary test during the development of the reading program had showed positive outcome.

2.1 HISTORICAL DEVELOPMENT OF DYSLEXIA

Inspired by Hinshelwood's journal on the relationship between visual memory and word blindness, Morgan published the first case of learning difficulty in the British Medical Journal (1896 in Guardiola, 2001). The journal described a child with normal intelligence with no eye sight problems, yet was unable to read. Even then, Morgan's description confirmed that dyslexia is not due to low intelligence.

Knowledge of dyslexia and the development of treatments began in the late 19th century. In the beginning dyslexia was assumed as a deficit in the visual aspect and in eye-hand coordination, however later it was confirmed that the major underlying problem was the deficits in phonological processing (Liberman & Shankweiler, 1979; Shaywitz, 2003). A reader must acquire phonemic awareness in order to be able to decode and phonological weaknesses in children with dyslexia undermines the decoding process, and therefore causes reading and spelling challenges (Eide & Eide, 2011).

In 1925, an American neurologist, Dr. Samuel Terry Orton proposed the theory of specific reading difficulty, which he postulated may be a result of emphasis on the dominance of one (right) side of the brain (Henry, 1998). More importantly, he developed the multisensory teaching strategies during his research and this strategy is still the most dominant intervention for children with dyslexia till today.

Orton suggested a theory, where reading problem in dyslexia is due to the dominancy of the right brain hemisphere during reading. This theory was confirmed by Galaburda, Sherman, Rosen, Aboitiz, and Geschwind, (1985). There was an unusual asymmetry in the planum temporal, and the structure in corpus callosum was also different in the brain of individual with dyslexia (Robichon, 1998; 2000). Research also identified several chromosomes that are responsible for the dyslexia symptoms (Siegel, 2006). Brain structure and function had added to our knowledge of dyslexia and may lead to even more effective teaching strategies.

Studies have shown that there is connection between the nerve functions and brain disorder (Anderson & Meier-Hedde, 2001). Dyslexia is neurological in origin, studies using Functional Magnetic Resonance Imaging (fMRI) to detect brain activation when reading indicated that there are differences between children with and without dyslexia (Narayana & Xiong, 2013; Shaywitz, 2003). In other words, the child with dyslexia is using a different route when learning to read. This different nerve path ways in the brain may be a cause for deficits in phonological skills (Shaywitz, 2003).

Individuals with reading difficulties are also found to be less-sensitive to speech rhythm and prosody (Leong & Goswami, 2014). They have problem detecting auditory rise-time changes (amplitude change in the beginning of sound) (Goswami, Thomson, Richardson, Stainthorp, Hughes, Rosen, & Scott, 2002). Research shows significant relation between rise-time sensitivity and phonological ability (Hamalainen, Salminen, & Leppänen, 2012). This actually affects the counting of syllable when the individual cannot detect the stress beat (Goswami, 2002).

Dyslexia symptoms may range from mild to severe. Not all people with dyslexia are poor in academics, as with adequate instruction, some are capable of equally high levels of achievement as their non-dyslexic peers (Henry, 1998).

Many people believe that dyslexia affect males more than females (Siegel, 2006). Lubs et al. (1991, in Spafford and Grosser, 1996) suggested that this perception is supported by teachers' referrals as the numbers of boys referred were significantly higher than girls. However, this was not always substantiated by research. Shaywitz, Escobar, Shaywitz, Fletcher, and Makuch (1992), in their study found no significant differences between the numbers of both sexes. Pennington and Olson (2005, in Kelly & Phillips, 2011) also indicated that genetic influence of dyslexia operates similarly in both boys and girls.

Many issues arise in developing a universal definition for dyslexia. The major problem is due to the failure of providing a standardized diagnosis. There are no universal tests to distinguish individual with and without dyslexia, therefore the distinction of dyslexia is arbitrary where the screening standard varies from study to study (Siegel, 2006; Wong, 1986).

Dyslexia accommodated many professional disciplines. Despite over 100 years of research history, the definition for it is still in debate (Guardiola, 2001). Every field or professions have developed their own definition for dyslexia (Wong, 1986). In 1965, The National Institute of Child Health and Human Development (NICHD) led by Reid Lyon coordinated a massive search on dyslexia literature in medical, psychological and educational fields. These searches provide evidences and bring us closer to the understanding of dyslexia. The finding shows dyslexia not only has a biological cause, it often comes with other disorders. Individuals with dyslexia

have primary problems in reading, and with decoding being a reliable predictor of reading, the decoding skills eventually affects reading comprehension (Henry, 1998). Comparative analyses of several definitions also show that reading deficits is the common symptom in dyslexia (Doyle 1996). In this study, extra precaution was taken in the sampling process.

2.2 DEFINITION OF DYSLEXIA

There are many definitions for dyslexia and the most widely used research based definition comes from the International Dyslexia Association (IDA):

> Dyslexia is a learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede the growth of vocabulary and background knowledge. (IDA, n.d.)

However, Malaysia adopted a school based version of the definition, adapted from the United Kingdom's Special Needs Code of Practice. Their Department of Education (DfE) refers to children with dyslexia as:

> Some children may have significant difficulties in reading, writing, spelling or manipulating numbers, which are not typical of their general level of performance, especially in other areas of the curriculum. They may gain some skills in some subjects quickly and demonstrate a high level of ability orally, yet may encounter sustained difficulty in gaining literacy or numeracy skills. Such children can become severely frustrated and may also have emotional and/or behavioural difficulties. (Department of Education, 1996. P.71)

The literature review shows that there is no universal agreed set of criteria for the diagnosis of individuals with dyslexia, therefore Elliott and Grigorenko (in Wheldall, Castkes, & Nayton, 2014) suggested that there is no reason to label an individual as having dyslexia. They suggested that it is better to have a profile of the child's study skills and with that to develop intervention plans without the need for labels. However, according to Symthe (2010), the labelling actually helps to make sense of their reading problems and enable teachers to understand and help these children. According to Burns and Gibbons (2008), labelling should be viewed in terms of allocation of resources, and contributes towards development of intervention and research to provide us with knowledge to better understand dyslexia.

2.3 DYSLEXIA IN MALAYSIA

In Malaysia, under the Ministry of Education (MOE)'s special education programme, children with disabilities including those with dyslexia are either placed in special education schools, special classes within the mainstream schools (special education integrated programme), or in the inclusive education programme (National Education Blueprint, 2013-2015). Special Education schools are schools for students with special education needs. Students in the integrated programme study in special classes in mainstream schools. Students in the inclusive education programme study with other students in the same classroom (Yusof, Daniel, Abddullah, & Aziz, 2011). In 2004, special education integrated programmes specifically for children with dyslexia were introduced in 30 primary schools in all the states of Malaysia (Philips, Razalli, Kway, Ahmad, Muhammad, & Yusuf, 2007).

Presently there are no Malaysian normed instruments to identify children with specific reading difficulties. However, there are some tests which has been validated and standardized, and is used in this research. In March 2001, the Ministry of Education officials from the Department of Special Needs collaborated with professionals from the Universiti Putra Malaysia (UPM) to formulate a checklist for screening all Malaysian children in primary schools for specific reading difficulties (dyslexia) (Gomez, 2004). This checklist is used in this study, and together with four other tests (*Senarai Semak Risiko Disleksia USM*, Matrix Analogies Test, *Ujian Bacaan untuk Mengenalpasti Disleksia*, and *Ujian Pemprosesan Fonologi untuk Mengenalpasti Disleksia*) was used for the purpose of selecting participants for this study. The checklist (known as 'Instrumen Senarai Semak Disleksia' [ISD]) consists of three elements: namely the level of mastery in reading and writing, and numeracy skills; the teachers' or parents' perception of the child's strengths; and symptoms of dyslexia. This screening instrument is currently being used in the local primary schools to identify children with symptoms of dyslexia.

More recently, the Response to Intervention (RTI) model of identifying struggling learners has been utilized. RTI is a school-wide, tiered approach to providing instruction and identifying of students who struggle with particular skills. Tier I involves normal classroom setting and screening which identifies students at-risk for failure. Tier II provides early intervention in the form of supplemental instruction for the at-risk students. In Tier III, students who continue to struggle receive more intensive intervention, and it is often provided by special education teachers (Burns & Gibbons, 2008; Lee, Yeap, & Low, 2012; Tompkins, 2010).

The Malaysian government started The Performance Management and Delivery Unit (PEMANDU) to oversee The Government Transformation Programme (GTP). The National Key Result Areas for Education (EDU NKRA) under GTP aimed to improve Malaysia educational structure. Similar to RTI in 2010, EDU NKRA implemented the Literacy and Numeracy Screening Programme (LINUS) to screen and identify students who are at-risk in Malay language and Math for students of primary one Malaysia (GTP, 2010). *Figure 2.1* shows the process of LINUS screening. Children who fail the LINUS test repeatedly after LINUS intervention will be referred for a medical assessment, and children diagnosed with learning difficulties will be placed in the special education programme. The success of LINUS 1.0 has encouraged its enhancement and expansion in LINUS 2.0 to include English literacy screening (GTP, 2014). Children with dyslexia are included within this group of children.

The ultimate aim of the LINUS screening programme is to ensure that all students acquire basic literacy (Malay language & English Language) and numeracy before primary four. The screening is done twice a year in government primary school as students move from primary one to primary three (GTP, 2014). According to the 2013 GTP annual report, the screenings had been reduced from three times to twice a year in LINUS 2.0 to give teachers the opportunity to help students who fail to meet proficiency requirements.

The MOE has set a target of 30% of students with special education needs in the inclusive education by 2015 (National Education Blueprint, 2013-2025), with the motive of responding to children's diversity and to form a society that respects people with diverse needs and backgrounds.

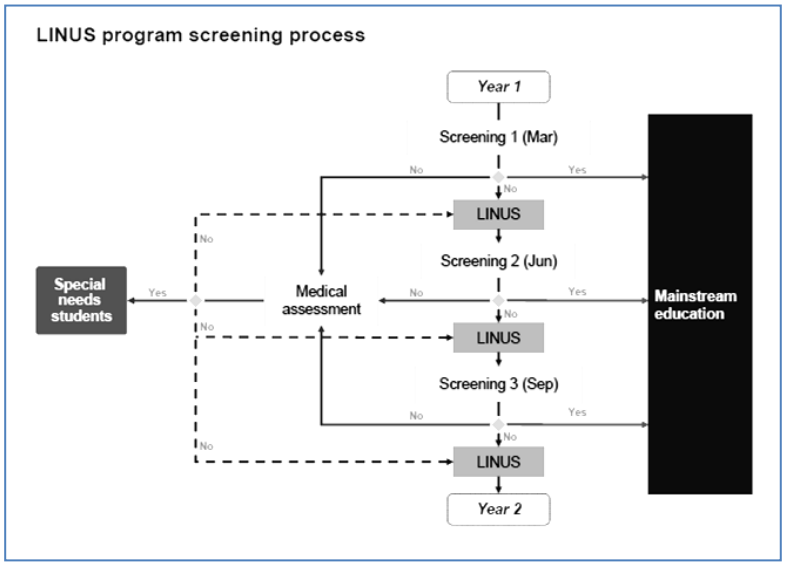

Figure 2.1. The LINUS programme screening process (GTP, 2010).

2.4 MALAY LANGUAGE

Language is a complex and dynamic system of conventional symbols that is used to communicate and express thoughts (Catts & Kamhi, 1999). Each language is written in a distinctive graphic form that map onto the spoken language, which readers need to decode and encode to understand the meaning of the written language (Shaywitz, Morris, & Shaywitz, 2008). As each language script is distinct, therefore each language has its own distinctive mapping challenge (Perfetti & Dunlap, 2008).

In an alphabetic orthography, a language can be considered to be transparent when the mapping of grapheme and phoneme are consistent. English is an inconsistent language where reading and spelling may require different strategies in mapping grapheme and phoneme (Ng & Yeo, 2013). There are homophone (e.g. right & write) and homograph (e.g. read & read) in English which add to the inconsistent characteristic of the language (Shankweiler & Lundquist, 1993). Malay language in contrast is very consistent (Winskel & Widjaja, 2007). It has an almost