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Aims and Scope
The Journal of Reading and Literacy (JRL) is the official journal of the Society of Reading and Literacy, Singapore. This is a refereed journal with interests in reading and literacy issues in both mainstream (including adult education) and special education settings. The journal welcomes manuscripts of diverse and interdisciplinary themes in the aim of improving reading and literacy. Literacy is contextualized within a broad interpretation including traditional literacy, literacy standards, early and/or emergent literacy, comprehensive literacy, content area literacy, adolescent literacy, functional literacy, adult literacy, multimedia literacy, multicultural literacy, literacy and technology as well as any other interpretation that is of interest to the readers and the Editorial Board. Based on this broad conceptualization of literacy, assessment, measurement, evaluation, testing, programming, implementation, remediation, teaching and methodology are examined. The journal is particularly interested in papers investigating reading and literacy from the Southeast-Asian region, and how systems and practitioners are addressing literacy issues from their respective cultural and social backgrounds.
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7. Title of paper: Top of page, capitals, bold, centred

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11. Length: 3000-6000 words

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13. All figures, diagrams, illustrations and tables should be integrated in the typescript.

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15. Submission of papers should be forwarded by electronic mail to the Editor at secretariat@srl.org.sg

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Table of Contents

Message from the President of the Society for Reading and Literacy…………………………..3

Improving word recognition of K-2 Chinese children with low oracy/literacy in English language through concrete poetry teaching
Noel Kok Hwee Chia ..................................................................................................................5

How phonological awareness helped facilitate reading acquisition of a pre-school child in home environment before formal schooling
Ellis Lay Yan Ong & Marieliz Llanos .........................................................................................35

Informal learning from video games of three autistic children in a family: A case study
Norman Kiak Nam Kee ..............................................................................................................45

Does cursive handwriting have an impact on the reading and spelling performance of children with dyslexic dysgraphia: A quasi-experimental study
Lorene Ann Nalpon & Noel Kok Hwee Chia .............................................................................60

Improving Literacy of the Visually Impaired in Singapore: Pre-, Post- and In-Between Literacy Considerations
Meng Ee Wong ............................................................................................................................100

The influence of bilingualism on cognitive development
Chien-Hui Yang ..........................................................................................................................108
Message from the President of the Society for Reading and Literacy

Serene Wee

We are very happy to announce the publication of the inaugural issue of the Journal on Reading and Literacy. This is the brain child of Dr Noel Chia Kok Hwee and his enthusiastic peers from the institutes of higher learning in Singapore. They have worked hard to put together an excellent collection of articles to share with one and all in the education field.

There are many people to thank for coming together to write, compile and publish this E-journal: the writers, the advisors and supporters. It is indeed an honour for The Society for Reading and Literacy to be able to provide a platform for this publication and we look forward to more sharing of knowledge among peers in the education field.

Thank you once again, for being part of this team to support the E-Journal. I hope this will encourage more educators and educationally engaged professionals to come forward to join us by contributing more articles to our E-Journal that will benefit the education sector as we share and learn from one another.
Improving word recognition of K-2 Chinese children with low oracy/literacy in English language through concrete poetry teaching

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Abstract
This six-month study using the single-group pre-test/post-test research investigated the effectiveness of concrete poetry as a strategy to improve word recognition of ten K-2 Chinese children with low oracy/literacy in English language. Concrete poems (a unique genre of poetry) come in all kinds of shapes, sizes, colours, textures, and even flavours. A concrete poem can be static or dynamic. These K-2 children randomly selected from the preschools were taught to compose their own concrete poems and through them learned to recognize many words. It was hypothesized that concrete poetry could help improve receptive and expressive oral vocabulary, which in turn increased word recognition.

Introduction
What is a Word?
Words express meanings that often require, if not imply, their association with other words. Knowing a word or vocabulary requires word knowledge (e.g., affixes, word formation and word origins) and word meanings, knowing known as well as new words used in spoken language for listening and speaking (i.e., receptive and expressive oral vocabulary) as well as written language for reading and writing (i.e., productive and expressive written vocabulary). Vocabulary can also be presented as active vocabulary, i.e., words used in speaking and writing, as well as passive vocabulary, i.e., words used in listening and reading.

A word is the smallest linguistic unit that on its own can be meaningless unless it is placed in a certain context. That is to say its existence makes sense when being placed in speech and writing, with its meaning determined by the context in which it is found, such as a syntactic context (e.g., in a declarative sentence) or in a socio-cultural context (e.g., in a speech situation). For instance, what does the word does mean to you? When asked this question, most people give the same reply: does is a form of the verb “to do”. My response is they are partially correct. The word does can also refer to the plural form of doe – a female deer, or a female mammal like a hare or kangaroo.

1 For correspondence and/or collaborative research with the author, please contact him at kokhwee.chia@nie.edu.sg.
Linguistically speaking, a word is made up of a lexeme – an abstract unit – with or without several inflected forms. For instance, the word *give* belongs to the word class of verbs (more precisely, a lexical verb) and has the following inflected forms: *gives, given, giving, gave* and *gie* (a Scottish variant). Another word *gift* has the following inflected forms that belong to four different word classes: nouns: *gift, gifts, giftedness*; verbs: *gifted, gifting*; adjectives: *gifted*; and adverb: *giftedly*.

**Constituents of a Word**

A word is made up of three interactive elements: orthographic (letters), phonological (sounds) and semantic (meanings) – see Figure 1 (Chia, 1996a, 1996b, 1997a, 1998) below.

![Figure 1: The three interactive elements of a word](image)

The orthographic element can be further divided into two sub-elements: logographic elements (i.e., letter shapes and sequencing), and spelling rules and conventions. For instance, a word like *cat* is written *c-a-t* in the following sequence with *c* at the beginning, *a* in the middle and *t* at the end, and is made up of three letters (orthographic element) that shape as *c, a* and *t* forming its word shape *c a t*. It is spelled in the pattern of consonant-vowel-consonant (CVC), with each letter having its own letter name and letter sound. The letter *c* in *cat* is pronounced */k/*, while *a* is pronounced */æ/ and *t* is pronounced as */t/ (phonological element). The word *cat* can also be heard as having one syllable. It has the onset *c* and the rhyme *at*. When this onset is substituted with other letters such as *b* as in *bat*, or *f* as in *fat*, the meaning of the word is changed (semantic element). Also, the word *cat* can mean different things in different contexts. For instance, the word *cat* in the following sentence:

That *cat* caught a mouse last night.

refers to a feline, while the word *cat* in another sentence such as:

The traitor let the *cat* out of the bag and betrayed his comrades to the enemy.

means ‘to tell a secret.'
Before a child can read, he or she needs to develop the concept of word, i.e., the ability to relate words in the head to words on the page or spoken during a conversation. It is crucial therefore for teachers to understand and know words, their meanings and usage, in order to teach children to read and use them effectively.

**Literature Review**

**Process of Word Decoding**

In decoding a word such as *cat*, it involves more than just the interaction of its three constituent elements mentioned above. Word decoding (see Figure 2) can be an auditory-sequential or visual-sequential process involving the following four stages: (1) word perception, (2) word analysis, (3) word meaning, and (4) word sense. Each of the four stages is briefly described below.

*Figure 2: Process of word decoding*

**Stage 1:**

Word perception takes place during the initial process of word decoding (i.e., reading and/or listening) in the mind of a reader/listener involving visual-sequential and/or auditory-sequential identification of the target word and some degree of meaning (Chia, 1997a). Harris and Hodges (1995) have defined it as the process of understanding the appropriate meaning of a word following its identification (for unfamiliar or new words seen in print or heard) or recognition (for words previously met in print or heard) (Harris & Hodges, 1995). According to Tinker (1965), the visual-sequential and/or auditory-sequential perception of words depends upon the meanings that are present in the identification and recognition of the words. After the word perception, comes the next process of word analysis.

**Stage 2:**

The three sub-processes of word analysis that happen in this stage are word discrimination, word identification and word recognition. According to Chia (1998), word analysis is the process of
analyzing a word in terms of its constituent parts: phonological, orthographic and semantic elements. It involves the process of noting differences in words, especially in their auditory-sequential (phonological) differences or visual-sequential (orthographic) outlines in terms of overall word shape or configuration. For example, the word *lamp* looks and sounds different from *lamb* and *lame*. This is known as word discrimination, which also involves both letter discrimination and letter sequencing (e.g., *there*, *three* and *their*). It is also used to make a sharp distinction between the process of identifying of an unknown word and the process of recognizing a word previously met (Durkin, 1993; Tinker, 1965). The former is known as word identification; the latter, word recognition. Both are two essential interacting cognitive processes that take place in this second stage of word decoding. However, only one of them can happen at any one time during the process of word decoding (Chia, 1997a; 1998).

If a word is new or unknown, word identification takes place. According to Harris and Hodges (1995), word identification is “the process of determining the pronunciation and some degree of meaning of an unknown word” (p.282). That means when the listener/reader is dealing with an unknown or new word, he/she may attempt to do a phonetic analysis of it, i.e., segmenting the unfamiliar word into its constituent phonemes and then pronouncing them as he/she blends them together as a word in its entirety. Also known as recoding, it is an alternative route that a child with dyslexia would resort to when he/she tries to decipher words (Chia, 2007). According to Manzo and Manzo (1994), phonetic analysis involves the reader/listener’s application of letter-to-sound relationships until a hypothesis can be made as to what the word probably is. The hypothesis is then tested against the context in which the word is used. A key component of phonetic analysis is the “distinguishing of boundaries of linguistic elements within the sound stream” (Clark, 1988:8), commonly known as phonemic awareness and phonemic segmentation. Other word identification skills include the following three types: (1) word analytical skills, e.g., phonic analysis and structural analysis; (2) using clues to guess a word, e.g., context clues, configuration clues, picture clues; and (3) dictionary skills.

On the other hand, word recognition involves a word previously met in print or writing. It is a quick and easy identification of the form, pronunciation, and appropriate meaning of a word encountered before. Manzo and Manzo (1994) define word recognition as a reader’s attempt to identify a word rapidly, with little attention to letter-to-sound relationships. This process relies heavily on eidetic imagery, that is, the ability to hold an image in the short-term memory while physically moving past it to other words or images in the working memory, to test to see if the word should be called one thing or another. For instance, is this word *there* or *three*? In word recognition, the reader depends on two additional aids: the most distinguishing features of the word (Gibson & Levin, 1975) and the context in which it is used (Pereira, 1991). Every word has special distinguishing features, including its configuration, or shape (Marchbanks & Levin, 1965). The word recognition process is especially crucial in the learning of phonetically irregular words that are used frequently in everyday speech and writing (Manso & Manzo, 1994).

In addition, both processes of word identification and word recognition also involve letter sequencing in a given word. For instance, the word *cat* is read as it is and spelled as *c-a-t* and is not read as *tac* or *act* and/or spelled as *t-a-c* and *a-c-t*. 
Stage 3:
Word meaning is another important element in word knowledge. When a word is identified or recognized, its meaning is then established. Harris and Hodges (1995) define word meaning as “the concept of concepts associated with a spoken (auditory) or written (visual) word” (p.282). In word meaning, thought and speech are united into a verbal thought (Vygostsky, 1962) which is essential for our cognitive understanding of words.

A word meaning can be denotative or connotative. It can also be literal or figurative. This depends very much on how it is being used in a given context. This brings us to the next stage that is concerned with word sense.

Stage 4:
Word meaning is meaningless until it makes sense within a given context, which can be either a conversation or printed text. For instance, the word *cat* may have its meaning but it does not make any sense until it is placed in a given context as in the following two examples:

1. The *cat* pounced on the frightened mouse and ate it up.
2. Don’t you let the *cat* out of its bag or we’ll all be killed.

Notice that the *cat* in the first sentence has a different meaning from that in the second. The former is a feline; the latter, a secret.

Moreover, a word meaning is determined by its word order – a sequential arrangement of the target word in a phrase, clause or sentence. For instance, the *boy* in the following sentence is the actor of the action *munching*:

> The *boy* is munching an apple.

He is different from the other *boy* – being the victim/receiver of the action, i.e., the robber’s threat – in this sentence:

> The robber threatened to hurt the *boy* unless he surrendered his wallet.

The various research studies and theories (e.g., Chia, 1996a, 1997a, 1998; Ehri, 1991, 1994; Gillet & Temple, 1990) about the word decoding process have given us a clearer view of the different pathways children take to identify or recognize words: (1) by sight word reading, when a child retrieves information about the words stored in his/her long-term memory from previous experiences reading the words; (2) by letter-sound decoding, which involves the child sounding out the letters and blending them into a word; (3) by analogy when the child accesses memory information about the familiar sight words to read unknown words; and (4) by contextual guessing that involves the child using meaning-based cues in preceding text or in illustrations to predict what a word might be (Ehri, 1991, 1994; Gaskins et al., 1997).

Development of Word Learning
According to Ehri’s (1991, 1994) studies, children seem to progress through four different levels of word learning: pre-alphabetic, partial alphabetic, full alphabetic and consolidated alphabetic. These four levels are briefly discussed below.
Level 1: Pre-alphabetic
Before a child develops his/her letter awareness knowledge, he/she reads words by sight through memorization of distinctive visual cues in or around the word. Ehri (1995) called this process of word decoding visual-cue reading.

Level 2: Partial alphabetic
When the child acquires some knowledge of letters and their names and/or sounds, he/she remembers how to read specific words by noticing how a few letters correspond to salient sounds in the word’s pronunciation. Ehri (1995) called this process of word decoding phonetic-cue reading.

Level 3: Full alphabetic
The child fully analyzes the spellings of words by matching up all the letters to sounds in their pronunciations.

Level 4: Consolidated alphabetic
The child uses larger units to remember how to read sight words. In other words, the child finds it easier to read and remember multi-syllabic words as sight words by dealing with chunks of letters (e.g., understanding = under + stand + ing) than each individual letter (e.g., u-n-d-e-r-s-t-a-n-d-i-n-g).

From Ehri’s developmental phase theory of word learning, an explanation has been offered as to why some children might be encountering problems in decoding unfamiliar words. These children have failed to progress beyond the two initial levels in their sight word reading, i.e., they are still relying heavily on visual-cue or phonetic-cue reading (Chia, 1996b; Gaskins et al., 1997).

Problems in Word Recognition
There are four categories of word decoders: (1) those who can recognize words previously met and know how to identify new or unknown words, i.e., readers with good word decoding; (2) those who can recognize familiar words and/or words previously met, but unable to identify new or unknown words, i.e., readers with dyslexia; (3) those who cannot recognize familiar words and/or words previously met, but somehow mysteriously are able to identify new or unknown words, i.e., readers with acquired aphasia and agnosia; and (4) those who cannot recognize nor identify words whether they are previously met or new/unknown, i.e., readers with alexia or word blindness. A fifth group, not found in this classification, refers to the precocious word decoders who are unable to understand what they are reading. They are readers with hyperlexia which may co-exist with autism spectrum disorders. A sixth group, also not found in the classification, concerns those with impoverished vocabulary, word-finding difficulties and
problem in acquiring new words (Bishop, 2006; Cohen, 2002). They are known to have both receptive and expressive language difficulties, and the term specific language impairment has been used to describe their problem (see Chia & Poh, 2009).

There are many children who cannot recognize and read words by sight, even if they have been taught by sounds (i.e., through phonics). They are of normal intelligence and without any impaired vision and hearing. They can converse well and understand what is spoken to them, but they are unable to recognize words. Many of them may have devised coping strategies for learning words but these are not very reliable or efficient (Gaskins et al., 1997). Others may attempt to remember words based on their shapes or salient visual features (Chia, 1996b, 1996c). Yet there are still other children who may rely heavily on a few symbol-sound associations, often for the first and last letters of words which are also known as determining letters (Harris & Hodges, 1995; Gaskins et al., 1997). All these children are sometimes described as being word blind (Chia, 1998) or termed as having word-reading difficulty (Gaskins et al., 1997) different from dyslexia.

**How to Help Children with Poor Word Recognition Ability**

Generally, there are three different approaches to dealing with low or poor word recognition ability (Chia, 1998):

1. The developmental approach is based on the belief that children with poor word recognition ability may have slower brain development. It aims to simply intensify conventional methods of instruction (Chia, 1997b; Spafford & Grosser, 1996).
2. The remedial approach focuses on learning deficiencies of these children with poor word recognition ability (Chia, 1994; Gaskins et al., 1997).
3. The corrective approach emphasizes the assets and interests of the child with poor word recognition ability, and teaches him/her (e.g., words related to the theme of dinosaurs) (Chia, 1997b; McNinch, 1981; Rupley & Blair, 1987).

The author of this present study has taken the third approach to work with a group of ten young children with low oracy/literacy in English language using concrete poetry as the pedagogical strategy to improve the word recognition of these children.

**Concrete Poetry**

Since the Second World War, concrete poetry has become a notable movement and several British poets including Simon Cutts, Stuart Mills and Ian Hamilton Finlay have written successful concrete verses. Two good representative collections of such poetry are *An Anthology of Concrete Poetry* edited by E. Williams (1967) and *Concrete Poetry: An International Anthology* edited by S. Bann (1967).

Concrete poetry reduces a poet’s concern for continuity and the entire linguistic texture of poetry to isolated and particular aspects of visual, phonetic or kinetic structure, abandoning the normal poetic form whose meaning is disclosed at or below the level of the single word (Ousby, 1988:212). Its main objective is to present each poem as a different shape. Hence, it is a matter of pictorial typography that results in “visual poetry”. It may be on the page, or on glass, stone,
wood and other materials (Cuddon, 1979). It is extremely difficult to execute well but the technique lends itself to great subtlety, as Apollinaire (1918) demonstrated in *Calligrammes*.

Different accounts of concrete poetry have either stressed its novel and experimental nature, making links with structuralism and semiotics (Ousby, 1988), or else have claimed a long tradition stemming from older texts whose visual aspects contributed to their meaning, such as George Herbert’s *The Altar* (1633) and Dylan Thomas’s *Vision and Prayer* (1953).

**The Literary Perspective**

Though some hold the view that the moment of concrete poetry is already past, from the literary perspective, some deem it can most usefully be seen as an episode in the continuing assertion of an internationalist avant-garde that has sought to break with the past and establish formal structures reflecting the scale of alteration that technology has unleashed on the world (Chia, 1993; Ousby, 1988).

**The Pedagogical Perspective**

From the pedagogical perspective, concrete poetry offers teachers in both primary schools and preschools a stimulating technique to get their children interested in poetry. There are four main objectives for introducing concrete poetry to children: firstly, it serves to increase understanding of layouts of letters to form a meaningful word; secondly, it allows the meaning of a word to be expressed through the shape, size, and physical layout of its letters; thirdly, it enhances memory for word shapes so as to enable a child to write recognizable words; and lastly, concrete poetry provides the child with a channel for his/her creative expression (Chia, 1991).

When teaching concrete poetry, the emphasis has to be on the visual appearance of letters. There is a need to consider the following factors (Chia, 1991:21):

1. “the shape of each letter in a word;”
2. “the size of each letter in the word;” and
3. “the physical layout of all the letters sequenced to make the word.”

The physical design of a concrete poem puts its form ahead of its content. However, this is not an attempt to imply that that is the proper sequence of things (Chia, 1993). Indeed, most poets would argue that content (that is, feeling, idea and image) should come first, followed by its appropriate form. On the other hand, well-known English poets such as William Shakespeare have embraced both content and form in writing poems. In writing his comedies and tragedies, Shakespeare has worked from content to form, yet he writes over a hundred poems within a set form – the sonnet. Poets like George Herbert and Dylan Thomas have written their poems in which the physical layout is more important to them.

Likewise, children in preschools and primary schools can be turned on by a form, especially if it is a concrete poem. The concrete poems “do not have a line, meter, rhyme, rhythm, stanza or even title” (Chia, 1993:42). The poem consists of a word whose letters act out its meaning (Chia, 1988). There are many ways of teaching concrete poetry to children, but the aim is always to bring in the fun of creating concrete poems to them.

**Teaching Concrete Poetry to Children with Special Needs**
Concrete poetry is taught as a form of creative writing in mainstream schools (Chia, 1991, 1993, 1994, 1996c). The author has been unable to find any studies, other than his (see Chia, 1994, 1996b, 2006), on teaching concrete poetry to children with special needs. Chia (1995, 1996b) used concrete poetry to teach word recognition to children with hyperlexia. In addition, Chia (2006) and Chia et al. (in press) have also used concrete poetry to teach reading comprehension to children with Asperger’s syndrome. This technique differs slightly from the stimulus shaping techniques that were developed in the 1970s to teach sight-word reading to children with mental retardation (see Duker, Didden, & Sigafoos, 2004, for a review of several such studies).

The Study

Aim

The main purpose of this study was to determine the effectiveness of concrete poetry as a strategy to improve the word recognition of ten K-2 Chinese children with low oracy/literacy in English language.

Research Design

This quasi-experimental study used a single-group pre-test/post-test research design to investigate the effectiveness of concrete poetry as a strategy to improve the word recognition of the study subjects, observed at two time points, one before treatment and one after treatment. Two standardized tests were administered as pre- and post-tests. Changes in the outcome of interest (i.e., performance in word recognition measured by the standardized tests) are presumed to be the result of the treatment. No control or comparison group in employed. One reason is that the author was unable to find parents who would agree to put their children in a control group without any treatment. Taking into consideration the time constraints, the author felt that as an exploratory study it was a cost-effective way to discern if a potential treatment was worthy of further investigation in the future.

Single-group pre-test/post-test design meant that subjects of the study group were compared with themselves instead of to a control or nonequivalent comparison group. Data on the variable of interest (i.e., word recognition) were collected from standardized tests administered on the study group prior to the treatment, and after the treatment. The difference in test results is interpreted as the change resulting from the treatment. This is a reasonable way to achieve the goal of an experiment in the sense that all possible time-invariant factors associated with the study subjects are controlled. However, this design does not control for time-varying factors that may be coincidental with the study time frame (Kerlinger and Lee 2000).

The author acknowledges that it was difficult to assess the validity of this study as it did not include any control or comparison group. Hence, it is difficult to assess the significance of an observed change in the subjects. Any change could be due to historical changes unrelated to the treatment or to events that possibly occurred as a result of the experimenter’s treatment, an artifact of testing and maturation of the subjects are amongst the many such threats to internal validity.

However, in order to ensure that the results of this study were reliable and valid, two actions were taken. First, the author introduced five selection criteria for potential subjects before they were chosen to be involved in this study in order to keep the sample as homogeneous as possible.
Second, the author used the Pearson’s $r$ correlation coefficient as an estimate of validity and reliability.

**Participating Subjects**
Initially, 32 interested parents, who came to know about this study by word of mouth, approached the author to express their interest in allowing their preschool children to participate in the study. However, not all met the following selection criteria as set by the author below:

1. The child must have normal intelligence. The author administered the Test of Nonverbal Intelligence-Third Edition (TONI-3) (Brown, Sherbenou, & Johnsen, 1997), which measures an individual’s ability of abstract or figural problem-solving, for anyone ranging in ages from 6 years 0 months through 89 years 11 months. It was used to rule out any mentally challenged or developmentally delayed subjects, in case there was any, who had volunteered to participate in this study.

Two reasons why the TONI-3 was chosen for administration in this study are as follow: Firstly, its nonverbal or language-free format makes it ideal for evaluating the subjects, who spoke, read and/or write little English and displayed a lack of adequate exposure to the English language. It would have been otherwise difficult to assess these subjects with any degree of confidence or precision (Pierangelo & Giuliani, 2006) and, especially, without being socio-culturally biased. Secondly, the TONI-3 meets the highest psychometric standards for norms, reliability, and validity, and with a twenty-year body of reliability (Pierangelo & Giuliani, 2006). According to Brown, Sherbenou, and Johnsen, 2002), the reliability of the TONI-3 Form A using Cronbach’s (1951) coefficient alpha for subjects between 6 years and 14 years old is in the range between .89 and .93, and a standard error of measurement ranging from .85 to 2.02. In addition, the reliability coefficients of TONI-3 Form A only are as follow: content reliability is .93; time sampling is .91; scorer difference is .99; and an average reliability coefficient of .96. Hence, the test has a high degree of reliability.

2. The chronological age of a subject must be between 6 years 0 months and 6 years 11 months of age. This age range was chosen because the lowest chronological age which allows the TONI-3 to be administered is 6 years 0 months.

3. As the study was targeted at K-2 children, the potential subject must be a preschooler currently attending a pre-school, kindergarten or childcare centre. Two preschool children, whose parents expressed interest to participate in this study, had to be excluded as they were home-schooled, and lacked the exposure in the typical learning context of a preschool.

4. The subject must come from a middle-income family with Mandarin-speaking home background. This exclusion criterion might seem racist at first but the author aimed to keep the sample as homogeneous as possible. Another reason is that subjects from different races learn English differently and face a different set of second language learning difficulties because of the interference of their mother tongues.
5. The subject must be identified by his/her form teacher to have low oracy or literacy in English language. The author administered the Word Finding Vocabulary Test-4th Edition (WFVT-4) (Renfrew, 1997), which is a subtest of the Renfrew Language Scales-Fourth Edition (RLS-4) (Renfrew, 1997), to assess the subject’s spoken vocabulary (Fisher & Glenister, 1992) in terms of his/her ability to put a name to a picture shown. There are a total of 50 pictures arranged in order of difficulty for language-normal children, ranging from 3 years 6 months through 8 years 5 months. One reason why the WFVT-4 was administered on the ten subjects in this study is that rapid naming of pictures can be a useful indicator of general naming ability. According to Fisher and Glenister (1992), “naming difficulties may be apparent in the connected, conversational language of aphasic adults and of children who have language disorders. Such difficulty may be described in terms of the accuracy of the match between what was to be named and what was actually said. The presence of naming difficulties may also be indicated by unusually slow rates of word retrieval marked by inappropriate pauses in conversation” (p.1). A second reason is that picture naming can indicate an individual’s word knowledge.

From among them, only ten were found to be suitable participants for the study. These ten subjects were all K-2 Chinese children (five boys and five girls) aged between 6 years 0 months and 6 years 11 months, coming from Mandarin-speaking middle-income families. The fathers of all the ten subjects are the sole bread-winners while the mothers except one (who was working as a clerical officer during the time of this study) are home-makers.

Table 1 shows the chronological ages (CA) of the subjects and the type of early childhood institution each subject came from.

<table>
<thead>
<tr>
<th>Subject Code/Gender</th>
<th>Chronological Age</th>
<th>Type of Early Childhood Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>6 years 3 months</td>
<td>Church kindergarten</td>
</tr>
<tr>
<td>S2/M</td>
<td>6 years 4 months</td>
<td>Montessori schoolhouse</td>
</tr>
<tr>
<td>S3/F</td>
<td>6 years 6 months</td>
<td>Childcare centre</td>
</tr>
<tr>
<td>S4/M</td>
<td>6 years 6 months</td>
<td>Childcare centre</td>
</tr>
<tr>
<td>S5/M</td>
<td>6 years 7 months</td>
<td>Childcare centre</td>
</tr>
<tr>
<td>S6/F</td>
<td>6 years 8 months</td>
<td>Church kindergarten</td>
</tr>
<tr>
<td>S7/F</td>
<td>6 years 8 months</td>
<td>Montessori schoolhouse</td>
</tr>
<tr>
<td>S8/F</td>
<td>6 years 9 months</td>
<td>Church kindergarten</td>
</tr>
<tr>
<td>S9/M</td>
<td>6 years 9 months</td>
<td>Church kindergarten</td>
</tr>
<tr>
<td>S10/F</td>
<td>6 years 10 months</td>
<td>Church kindergarten</td>
</tr>
</tbody>
</table>

| Mean (Pre-test)     | 6 years 7 months  |
| Mean (Post-test)    | 7 years 1 month   |

The mean chronological age (CA) of the ten subjects was 6 years 7 months (or 79 months) at the beginning of the study; 7 years 1 month (or 85 months) at the end of the study after a six-month treatment.
Table 2 shows the results of TONI-3 which suggest that the nonverbal intelligence (NVIQ) of eight subjects (S2/M, S3/F, S4/M, S5/M, S6/F, S8/F and S9/M) were within the average range (NVIQ between 90 and 110), while the NIIQs of two other subjects (S1/M and S10/F) were above average NVIQ (between 111 and 120). According to Exkorn (2003), any examinee with an NIVIQ of 90 and above based on the administration of TONI-3 is unlikely to have mental retardation even if his/her speech is poor or in the case of a nonverbal child with autism spectrum disorder.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Nonverbal IQ</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>112</td>
<td>Above Average</td>
</tr>
<tr>
<td>S2/M</td>
<td>105</td>
<td>Average</td>
</tr>
<tr>
<td>S3/F</td>
<td>96</td>
<td>Average</td>
</tr>
<tr>
<td>S4/M</td>
<td>93</td>
<td>Average</td>
</tr>
<tr>
<td>S5/M</td>
<td>92</td>
<td>Average</td>
</tr>
<tr>
<td>S6/F</td>
<td>103</td>
<td>Average</td>
</tr>
<tr>
<td>S7/F</td>
<td>104</td>
<td>Average</td>
</tr>
<tr>
<td>S8/F</td>
<td>115</td>
<td>Above Average</td>
</tr>
<tr>
<td>S9/M</td>
<td>98</td>
<td>Average</td>
</tr>
<tr>
<td>S10/F</td>
<td>117</td>
<td>Above Average</td>
</tr>
</tbody>
</table>

Key: S = Subject; M = Male; F = Female

Table 3 shows the results of WFVT-4 based on the raw scores and the equivalent vocabulary ages of the ten subjects. The group’s mean raw score was 26 and six out of the ten subjects, i.e., S2/M, S6/F, S7/F, S8/F, S9/M and S10/F, met the cut-off. The other four, i.e., S1/M, S3/F, S4/M and S5/M, fell short of the group mean. However, when the raw scores were examined using the WFVT-4 norms, the results of all the ten subjects were far below the normative mean (between 35.4 and 37.5). In fact, all of them scored even below the lowest of the middle 50 per cent of their respective ranges of scores, i.e., 31-39 for subjects S1/M and S2/M, 35-41 for subjects S4/M, S5/M and S9/M, and 35-40 for subjects S3/F, S6/F, S7/F, S8/F and S10/F (at the beginning of the study three weeks before treatment). According to Renfrew (1997), failure in this test suggested that “this may be due to low intelligence, environmental deprivation, bilingual home background, emotional blocking, and/or specific word finding difficulty” (p.11).

Results obtained in the TONI-3 ruled out low intelligence. The author’s informal interviews with the parents and observations of the subjects ruled out environmental deprivation and emotional blocking. All the ten subjects were from middle-income families with Mandarin-speaking home background. The only possible causes for their poor performance in WFVT-4 were bilingual home background, and/or specific word finding difficulty. For the first factor, it was a probable cause since all the subjects spoke mainly Mandarin at home and used only a smattering of English in their preschool, kindergarten or childcare centre when conversing with their teachers.
As a result, it would not be surprising if their limited exposure to English or non-English background might have caused them to display some specific word finding difficulty which should not be confused or mistaken to be some form of language disorder.

**Table 3: Performance in Word Finding Vocabulary/Naming Ability**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>RS</th>
<th>VA Equivalent</th>
<th>WFVT-4 Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Means</td>
</tr>
<tr>
<td>S1/M</td>
<td>22</td>
<td>3y 10m-11m</td>
<td>35.4</td>
</tr>
<tr>
<td>S2/M</td>
<td>27</td>
<td>4y 6m</td>
<td>35.4</td>
</tr>
<tr>
<td>S3/F</td>
<td>25</td>
<td>4y 3m</td>
<td>37.5</td>
</tr>
<tr>
<td>S4/M</td>
<td>23</td>
<td>4y 0m</td>
<td>37.0</td>
</tr>
<tr>
<td>S5/M</td>
<td>24</td>
<td>4y 1m-2m</td>
<td>37.0</td>
</tr>
<tr>
<td>S6/F</td>
<td>28</td>
<td>4y 7m-8m</td>
<td>37.5</td>
</tr>
<tr>
<td>S7/F</td>
<td>29</td>
<td>4y 9m-10m</td>
<td>37.5</td>
</tr>
<tr>
<td>S8/F</td>
<td>27</td>
<td>4y 6m</td>
<td>37.5</td>
</tr>
<tr>
<td>S9/M</td>
<td>26</td>
<td>4y 4m-5m</td>
<td>37.0</td>
</tr>
<tr>
<td>S10/F</td>
<td>29</td>
<td>4y 9m</td>
<td>37.5</td>
</tr>
<tr>
<td>Mean</td>
<td>26</td>
<td>4y 4m</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>2.49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key:  
S = Subject; M = Male; F = Female; RS = Raw Score; VA = Vocabulary Age; y = years; m = months; SD = Standard Deviation

**Instrumentation**

Two standardized tests were administered as pre-/post-tests before and after treatment. They are the Comprehensive Receptive and Expressive Vocabulary Test-Second Edition (CREVT-2) (Wallace & Hammill, 2002), and the Word Recognition and Phonic Skills Test-Second Edition (WRaPS-2) (Moseley, 2003).


The CREVT-2 has two subtests that measure both receptive and expressive oral vocabulary (word knowledge and meaning) for anyone ranging in ages from 4 years 0 months through 89 years 11 months. It was used in this study to identify if the subjects were significantly below their peers in oral vocabulary proficiency and also to note the discrepancies between receptive and expressive oral vocabulary.

The CREVT-2 was chosen for pre-/post-test administration in this study because oral vocabulary is probably the most important indicator of general learning ability that is needed in order to perform well in school (Harris & Sipay, 1990). Also, oral vocabulary consists of word knowledge and word meaning which are essential to word recognition/identification and word learning – the precursor to emergent literacy in young children.

The CREVT-2’s overall reliability exceeds .90 and 14 (58 per cent) of its 24 coefficients meet or exceed the more rigorous standard of .95, which is considered the desirable standard
(Nunnally & Bernstein, 1994). The reliability of the CREVT-2 Form A for receptive oral vocabulary has a coefficient alpha (Cronbach, 1951) of .93; a test-retest reliability of .96; and a reliability coefficient for scorer difference of .99. The reliability of the CREVT-2 Form B for receptive oral vocabulary has a coefficient alpha of .93; a test-retest reliability of .98; and a reliability coefficient for scorer difference of .99. The reliability coefficient for alternate form (immediate) between Forms A and B is .94 while that for alternate form (delayed) between Forms A and B is .95.

The reliability of the CREVT-2 Form A for expressive oral vocabulary has a coefficient alpha (Cronbach, 1951) of .89; a test-retest reliability of .94; and that of scorer difference is .99. Similarly, the reliability of the CREVT-2 Form B for expressive oral vocabulary has a coefficient alpha of .89 but a slightly lower test-retest reliability of .93 as well as lower reliability coefficient for scorer difference of .97. The reliability coefficient of alternate form (immediate) between Forms A and B is .88 while that of alternate form (delayed) between Forms A and B is .91.

Finally, the reliability of the CREVT-2 Form A for general oral vocabulary has the same coefficient alpha (Cronbach, 1951) of .95 for both Forms A and B, same test-retest reliability of .96 and same reliability for scorer difference of .99. The reliability coefficient of alternate form (immediate) between Forms A and B is .94 while that of alternate form (delayed) is .95.


The WRaPS-2 can be group or individually administered and is designed to measure a child’s word recognition ability based on his/her word recognition standardized score expressed in terms of
(a) word recognition age equivalent;
(b) ten stages of word recognition; and
(c) the length of a word that is recognized about 80 per cent of the time (Moseley, 2003).

The WRaPS-2 was chosen for pre-/post-test administration in this study because word recognition is “an important measure of children’s developing knowledge about written language as well as the major route to meaning, a fundamental pre-requisite for comprehension” (Moseley, 2003:5). A second reason is that the WRaPS-2 can provide a diagnostic profile of strengths and weaknesses in phonic skills which shows whether the child is sensitive to the appropriate range of cues at a given level of development.

The WRaPS-2 was standardized in 2002-3 on 4775 pupils in 111 schools, after extensive piloting to ensure good item discrimination and equivalence between Forms A and B. The internal consistency reliability of the test is very high, the overall Cronbach’s (1951) alpha value being .97 in both Forms A and B. Even in the Reception year, where children are most likely to resort to guessing, the alpha values are .86 and .84. In addition, a word length score (WLS) was calculated to represent the length of word correctly recognized at least 80 per cent of the time. This too proves to be a reliable index, with an alpha value of .87. Its validity as a measure of progress in word recognition is confirmed because it is strongly correlated with performance on each test ($r = .89$ with Form A raw score and .93 with Form B).
Setting/Schedule
This study was carried out at the Learning Disabilities Centre over a period of six months from March to August 2008. The subjects came to the centre twice a week on Wednesday and Friday evenings from 7.30pm to 8.30pm (i.e., a one-hour session).

Treatment
The author taught concrete poetry to the ten subjects at three different levels over six months. Each level is briefly described below:

**Level 1 (Elementary):** This first level was taught in March and April. At this level, shapes of things (e.g., cup, bowl, house, pen, chair) and animals (e.g., cat, dog, bird, butterfly, snake) were outlined on a piece of construction paper. They were cut out. The author wrote the name of the thing or animal on the cut-out lightly in pencil so that it could be easily erased later. For example, if it is a cut-out of an arrow, the word *ARROW* or *arrow* is written in pencil on the cut-out. The child can identify the object quickly and easily (see Illustration 1 below):

*Illustration 1: A Concrete Poem of an Arrow*

Next, the subjects would be told or shown how the shape of each letter in the given word could fit into the cut-out. A concrete poem would eventually take form (see Illustration 1 above). This is the best way to introduce concrete poetry to those who are new to it.

**Level 2 (Intermediate):** This second level was taught in May and June. At this level, the subjects were given a list of interesting content words like nouns, adjectives and verbs (e.g., eye, tall, look), and be allowed or encouraged to create their own original forms from these words. Illustration 2 below shows some examples of these concrete poems:
Level 3 (Advanced): This third and last level was taught in July and August. At this advanced level, the subjects were encouraged to come up with their very own words and create their original concrete poems. They were also being introduced some other activities involving discussion over some given concrete poems, either among the subjects themselves (pair or group work) or with the author who prompted them with questions. Below are two examples of concrete poems used for discussion with the subjects (see Illustrations 3 and 4):

Illustration 3: A Concrete Poem for Discussion

```
1NE.
2WO..
3HREE...
4OUR....
5IVE.....
```

A question that can be asked: “Can you think of other ways to make a numbers poem?”
Illustration 4: Another Concrete Poem for Discussion

STRETCH
STRETCH
STRETCH
STRETCH
STRETCH
STRETCH
STRETCH

A question that can be asked: “This concrete poem makes us feel visually as if the word is being stretched physically to its limits. Can you come up with another concrete poem that can make one feels visually heavy, light, hot, cold, etc.?”

Results and Discussion
As mentioned earlier, the aim of this study was to determine the effectiveness of concrete poetry as a strategy to improve the word recognition of K-2 Chinese children with low oracy/literacy in English language.

CREVT-2 Results
Table 4 shows the results of CREVT-2 based on the first of the two oral vocabulary subtests, i.e., the test of receptive oral vocabulary, which was administered two days before the treatment began. It “measures the ability of the subject to understand the meaning of individual words when spoken in isolation” (Wallace & Hammill, 2002:29). The mean raw score for the Receptive Oral Vocabulary at pre-test (Form A) was 17.5 (SD = 1.78; $\sigma^2 = 3.17$) with a mean equivalent receptive oral vocabulary (ROV) age of 5 years 4 months (SD = 3.41; $\sigma^2 = 11.6$) below the mean CA (at pre-test phase) of 6 years 7 months (a difference of 1 year 3 months apart), while the mean raw score at post-test (Form B) was 24.9 (SD = 2.77; $\sigma^2 = 7.66$) with a mean equivalent ROV age of 6 years 7 months (SD = 5.87; $\sigma^2 = 34.4$) below the mean CA (at post-test) of 7 years 1 month (a difference of 0 years 6 months apart). This finding suggests the subjects as a group were catching up and closing up the gap between their mean chronological age and mean ROV age from a difference of 15 months apart at pre-test to 6 months apart at post-test.

The correlation coefficient $r$ was computed to determine the strength of the linear association between the subjects’ pre-test and post-test raw scores, their ROV ages and standard scores (SS). It was also to investigate whether there was a significant difference between the pre-test and post-test scores and whether the subjects improved as a result of the treatment. The results indicated that there was a definite but small relationship between the pre-test and post-test raw scores, i.e., a low correlation, $r = .28$. A similar low correlation was also noted in their ROV ages, $r = .26$. However, there was a moderate correlation or substantial relationship between the pre-test and post-test standard scores for the ROV, $r = .48$. Although the standard scores had a slightly better correlation coefficient than the raw scores and ROV ages to show that the standard scores were better predictors of whether concrete poetry did help improve the subjects’ receptive oral vocabulary, it is not considered high enough to be used as a definite predictor (F. William, 1968).
Table 4: Performance in Receptive Oral Vocabulary (ROV)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Form A (Pre-Test)</th>
<th>Form B (Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RS</td>
<td>ROV Age (in months)</td>
</tr>
<tr>
<td>S1/M</td>
<td>14</td>
<td>57</td>
</tr>
<tr>
<td>S2/M</td>
<td>19</td>
<td>66</td>
</tr>
<tr>
<td>S3/F</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S4/M</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>S5/M</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S6/F</td>
<td>20</td>
<td>69</td>
</tr>
<tr>
<td>S7/F</td>
<td>19</td>
<td>66</td>
</tr>
<tr>
<td>S8/F</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S9/M</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S10/F</td>
<td>19</td>
<td>66</td>
</tr>
</tbody>
</table>

Mean | 17.5 | 63.6 | 86.6 | Below Ave | 24.9 | 79.2 | 94.7 | Ave |
SD | 1.78 | 3.41 | 3.10 | 2.77 | 5.87 | 5.46 |
Variance (σ²) | 3.17 | 11.6 | 9.60 | 7.66 | 34.4 | 29.79 |

Key:  S = Subject; M = Male; F = Female; SD = Standard Deviation; RS = Raw Score; ROV = Receptive Oral Vocabulary; SS = Standard Score

From Table 4, only two subjects S2/M and S6/F managed to attain average standard scores of 93 and 90 respectively for the receptive oral vocabulary at pre-test. All the others had below average standard scores at pre-test with a mean standard score of 86.6 (in the below average range). At the post-test, all except S4/M and S5/M attained an average standard score in the receptive oral vocabulary in the range between 92 and 102 with a mean standard score of 94.7 (SD = 5.46; σ² = 29.79) for the group. Standard scores for receptive oral vocabulary of the two subjects S4/M and S5/M were in the below average range for both pre-test (83 and 85 respectively) and post-test (86 and 89 respectively).

As a group, there was an increase in the mean standard score from 86.6 (below average) at pre-test to 94.7 (average) at post-test (an increase by 8.1 points).

Table 5 shows the results of CREVT-2 based on the second oral vocabulary subtest, i.e., the test of expressive oral vocabulary, which was administered two days before the treatment began. It “measures the ability of the subject’s ability to define stimulus words precisely. Because the format of this subtest requires people to say specifically what a word means, its results yield much more definitive information about their knowledge of word meanings than does the receptive vocabulary subtest” (Wallace & Hammill, 2002:29). The mean raw score at pre-test (Form A) was 5.1 (SD = 0.99; σ² = 0.99) with a mean equivalent expressive oral vocabulary (EOV) age of 5 years 1 month (SD = 6.33; σ² = 40.1) below the mean CA (at pre-test) of 6 years 7 months (a difference of 1 year 6 months apart), while the mean raw score at post-test
(Form B) was 7.2 (SD = 0.79; $\sigma^2 = 0.62$) with a mean equivalent EOV age of 6 years 1 month (SD = 4.73; $\sigma^2 = 22.4$) below the mean CA (at post-test) of 7 years 1 month (a difference of 1 year 0 month apart). This finding suggests the subjects as a group were catching up and closing up the gap between their mean chronological age and mean EOV age from a difference of 18 months apart at pre-test to 12 months apart at post-test.

### Table 5: Performance in Expressive Oral Vocabulary (EOV)

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Form A (Pre-Test)</th>
<th>Form B (Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RS</td>
<td>EOV Age (in months)</td>
</tr>
<tr>
<td>S1/M</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>S2/M</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>S3/F</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td>S4/M</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>S5/M</td>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>S6/F</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td>S7/F</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>S8/F</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>S9/M</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td>S10/F</td>
<td>6</td>
<td>69</td>
</tr>
<tr>
<td>Mean</td>
<td>5.1</td>
<td>60.9</td>
</tr>
<tr>
<td>SD</td>
<td>0.99</td>
<td>6.33</td>
</tr>
<tr>
<td>Variance ($\sigma^2$)</td>
<td>0.99</td>
<td>40.1</td>
</tr>
</tbody>
</table>

Key:  S = Subject; M = Male; F = Female; SD = Standard Deviation; RS = Raw Score; EOV = Expressive Oral Vocabulary; SS = Standard Score

As mentioned earlier, the correlation coefficient $r$ was computed to investigate whether there was a significant difference between the pre-test and post-test scores (Odom & Moroow, 2006) and whether the subjects improved as a result of the treatment in terms of their pre-test and post-test raw scores, EVO ages and standard scores (SS). The results indicated that there was a definite but small relationship between the pre-test and post-test raw scores, i.e., a low correlation, $r = .40$. A moderate correlation was also noted in their EOV ages, $r = .42$. Similarly, there was a higher moderate correlation or substantial relationship between the pre-test and post-test standard scores for the EOV, $r = .70$. According to Heffner (2004) and F. Williams (1968), a correlation of .70 and above is almost always significant. These findings suggest that standard scores had a better correlation coefficient than the raw scores and EOV ages and hence, were better predictors to show that concrete poetry did help improve the subjects’ expressive oral vocabulary.

From Table 5, only one subject S3/F’s standard score of 91 for the expressive oral vocabulary remained the same for both pre-test and post-test. Another subject S4/M had poor standard score while the standard scores of three others, i.e., S5/M, S7/F and S8/F, were in the below average range. The mean standard score for the group at pre-test was 88 (below average). At the post-test, all except S4/M and S5/M attained an average standard score in the expressive oral
As a group, there was an increase in the mean standard score from 88 (below average) at pre-test to 92.6 (average) at post-test (a small increase by 4.6 points).

It is interesting to note that when the pre-test (Form A) results of both subtests of CREVT-2 were compared at group level, ROV age of 5 years 4 months (SD = 3.41; \( \sigma^2 = 11.6 \)) was slightly higher than the mean EOV age of 5 years 1 month (SD = 6.33; \( \sigma^2 = 40.1 \)). There was only a small difference of 3 months. Similarly, the mean standard score for ROV of 86.6 (SD = 3.10; \( \sigma^2 = 9.6 \)) was 1.4 points higher than that of EOV of 88 (SD = 4.11; \( \sigma^2 = 16.89 \)) (see Table 6).

<table>
<thead>
<tr>
<th>Subjects</th>
<th>ROV Age (in months)</th>
<th>EOV Age (in months)</th>
<th>SS1 (ROV)</th>
<th>SS2 (EOV)</th>
<th>Difference between SS1 &amp; SS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>57</td>
<td>60</td>
<td>84</td>
<td>90</td>
<td>6</td>
</tr>
<tr>
<td>S2/M</td>
<td>66</td>
<td>60</td>
<td>93</td>
<td>90</td>
<td>3</td>
</tr>
<tr>
<td>S3/F</td>
<td>63</td>
<td>66</td>
<td>85</td>
<td>91</td>
<td>6</td>
</tr>
<tr>
<td>S4/M</td>
<td>60</td>
<td>48</td>
<td>83</td>
<td>79</td>
<td>4</td>
</tr>
<tr>
<td>S5/M</td>
<td>63</td>
<td>54</td>
<td>85</td>
<td>83</td>
<td>2</td>
</tr>
<tr>
<td>S6/F</td>
<td>69</td>
<td>66</td>
<td>90</td>
<td>91</td>
<td>1</td>
</tr>
<tr>
<td>S7/F</td>
<td>66</td>
<td>60</td>
<td>88</td>
<td>87</td>
<td>1</td>
</tr>
<tr>
<td>S8/F</td>
<td>63</td>
<td>60</td>
<td>85</td>
<td>87</td>
<td>2</td>
</tr>
<tr>
<td>S9/M</td>
<td>63</td>
<td>66</td>
<td>85</td>
<td>91</td>
<td>6</td>
</tr>
<tr>
<td>S10/F</td>
<td>66</td>
<td>69</td>
<td>88</td>
<td>91</td>
<td>3</td>
</tr>
<tr>
<td>Mean</td>
<td>63.6</td>
<td>60.9</td>
<td>86.6</td>
<td>88</td>
<td>3.4</td>
</tr>
<tr>
<td>SD</td>
<td>3.41</td>
<td>6.33</td>
<td>3.10</td>
<td>4.11</td>
<td></td>
</tr>
<tr>
<td>Variance ((\sigma^2))</td>
<td>11.6</td>
<td>40.1</td>
<td>9.6</td>
<td>16.89</td>
<td></td>
</tr>
</tbody>
</table>

Key:  M = Male; F = Female; ROV = Receptive Oral Vocabulary; EVO = Expressive Oral Vocabulary; SS = Standard Score; SD = Standard Deviation

In order to investigate whether there was a significant difference between the two subtest results in terms of the subjects’ equivalent ages and standard scores between ROV and EOV at the pre-test, a correlation coefficient \( r \) was computed. The results indicated that there was a definite but small relationship between the equivalent ages and standard scores between ROV and EOV at pre-test, with the following respective low correlations, \( r = .48 \) for equivalent ages and \( r = .46 \) for the standard scores. Both correlation coefficient reliabilities, though may be considered significant (Heffner, 2004), were not high enough to merit using them as predictors to show the
consistency in the measurement (Odom & Morrow, 2006) of the effectiveness of concrete poetry as a strategy to improve word recognition between the ROV and EOV subtests at pre-test.

At individual subject’s level, there was a slightly different picture to be seen. Five (i.e., S2/M, S4/M, S5/M, S7/F and S8/F) of the ten subjects scored higher on the ROV subtest than on the EOV subtest. According to the explanations given by Wallace and Hammill (2002), some of these subjects “could be naturally nonverbal or taciturn in their speech, some are learning English as a second language and therefore understand more words than they use properly in speech, some are affected by varying degrees of expressive dysphasia, some are shy around strangers such as examiners, some are unusually lucky guessers on the Receptive Oral Vocabulary subtest items” (p.30).

Unlike the other five subjects mentioned above and at the group level, the respective ROV ages of the other five subjects – S1/M, S3/F, S6/F, S9/M and S10/F – were lower than their respective EOV ages. There are fewer plausible reasons to explain why these subjects scored higher on the EOV subtest than on the ROV subtest. Presumably, according to Wallace and Hammill (2002),

“one must know the meanings of words before one can use the same words correctly in free discourse. This being a common presumption, one would therefore expect that instances where examinees score significantly higher on the Expressive Oral Vocabulary subtest than on Receptive Oral Vocabulary subtest would be relatively uncommon. Yet, such instances do occur. Perhaps, a few have undetected visual problems or find the pictures on the receptive subtest confusing. Although theoretically possible, receptive dysphasia is an unlikely explanation for this discrepancy due to the rareness of the disorder. More than likely, this particular discrepancy is the result of test or scorer error, situational error (distractions to the student or examiner, noise level, room temperature), or subject error (inattention, fatigue, low energy level, poor attitude, lack of motivation)” (p.30).

From the comparison of differences between the ROV and EOV standard scores at pre-test (Form A), there was a wide deviation of more than one standard deviation (in a range between 2 and 6 standard deviations) for most subjects except S6/F and S7/F. Moreover, the mean standard score difference between ROV and EOV at the group level was 3.4. However, the discrepancy between the ROV and EOV standard scores for each of the ten subjects reported in the findings here was below the 12-point criterion to be statistically significant ($p < .05$). For instance, consider the subject S1/M’s standard score performance on the ROV and EOV subtests of 84 and 90, respectively (see Table 6). Although the standard score of ROV was 84 in the below average range and his standard score of EOV was 90 in the average range, as the difference between the scores did not reach the 12-point criterion, it was not possible to conclude that S1/M’s ROV was significantly lower than his EOV. There must be a difference score of 12 points or greater to be statistically significant and at the .05 level of confidence (Wallace & Hammill, 2002).

In Table 7, when the post-test (Form B) results of both subtests of CREVT-2 were compared at group level, the mean ROV age of 6 years 7 months ($SD = 5.87; \sigma^2 = 34.4$) was slightly higher
than the mean EOV age of 6 years 1 month (SD = 4.73; $\sigma^2 = 22.4$). There was only a small difference of 6 months. Similarly, the mean standard score for ROV of 94.7 (SD = 5.46; $\sigma^2 = 29.79$) was 2.1 points higher than that of EOV of 92.6 (SD = 3.86; $\sigma^2 = 14.93$). Like in the pre-test, the discrepancy between the mean ROV and EOV standard scores was 2.9, statistically insignificant for saying which oral vocabulary is weaker or stronger than the other.

### Table 7: A Comparison of CREVT-2 ROV & EOV Subtest Results at Post-Test

<table>
<thead>
<tr>
<th>Subjects</th>
<th>ROV Age (in months)</th>
<th>EOV Age (in months)</th>
<th>SS1 (ROV)</th>
<th>SS2 (EVO)</th>
<th>Difference between SS1 &amp; SS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>84</td>
<td>78</td>
<td>102</td>
<td>99</td>
<td>3</td>
</tr>
<tr>
<td>S2/M</td>
<td>81</td>
<td>72</td>
<td>100</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>S3/F</td>
<td>78</td>
<td>66</td>
<td>92</td>
<td>91</td>
<td>1</td>
</tr>
<tr>
<td>S4/M</td>
<td>69</td>
<td>66</td>
<td>86</td>
<td>87</td>
<td>1</td>
</tr>
<tr>
<td>S5/M</td>
<td>72</td>
<td>72</td>
<td>89</td>
<td>87</td>
<td>2</td>
</tr>
<tr>
<td>S6/F</td>
<td>81</td>
<td>78</td>
<td>96</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>S7/F</td>
<td>78</td>
<td>72</td>
<td>92</td>
<td>91</td>
<td>1</td>
</tr>
<tr>
<td>S8/F</td>
<td>78</td>
<td>78</td>
<td>92</td>
<td>95</td>
<td>3</td>
</tr>
<tr>
<td>S9/M</td>
<td>81</td>
<td>72</td>
<td>96</td>
<td>91</td>
<td>5</td>
</tr>
<tr>
<td>S10/F</td>
<td>90</td>
<td>78</td>
<td>102</td>
<td>95</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>79.2</td>
<td>73.2</td>
<td>94.7</td>
<td>92.6</td>
<td>2.9</td>
</tr>
<tr>
<td>SD</td>
<td>5.87</td>
<td>4.73</td>
<td>5.46</td>
<td>3.86</td>
<td></td>
</tr>
<tr>
<td>Variance ($\sigma^2$)</td>
<td>34.4</td>
<td>22.4</td>
<td>29.79</td>
<td>14.93</td>
<td></td>
</tr>
</tbody>
</table>

Key: M = Male; F = Female; ROV = Receptive Oral Vocabulary; EVO = Expressive Oral Vocabulary; SS = Standard Score; SD = Standard Deviation

In the post-test (Form B), most of the subjects except S4/M and S5/M scored in the average range of standard scores between 90 and 110. According to Wallace and Hammill (2002), “when both standard scores are 90 or above, one may conclude that the person is exhibiting an average or better grasp of the abilities measured on the CREVT-2” (p.30). However, on the other hand, if anyone has scored a balanced quotient below 90, this suggests the possibility or “some degree of mental retardation, language disorder, learning disability, or global dysphasia” (Wallace & Hammill, 2002:30) and in such instances, a thorough evaluation of linguistic cognitive ability would be strongly recommended and should include the administration of an appropriate test of nonverbal aptitude (e.g., TONI-3). In this study, all the ten subjects had undergone the TONI-3 administration and found to be in average and/or above average range of nonverbal intelligence. Hence, the subjects’ (especially S4/M and S5/M) poor performance in CREVT-2 could not be due to mental retardation, but other challenging issues such as, in this case, what their learning support teachers suspected them to have, the specific language impairment.

The correlation coefficient $r$ was computed to determine if the difference between the subjects’ equivalent ages and standard scores between ROV and EOV at post-test was significant and...
whether the subjects showed an improvement. The results indicated that there was clearly a moderate correlation and hence, a substantial relationship between the equivalent ages at post-test, \( r = .66 \). As for the standard scores between ROV and EOV at post-test, its correlation coefficient was high with a marked relationship between the two subtests, \( r = .84 \). The correlation coefficient reliability for comparing the ROV and EOV standard scores were high enough to earn confidence to use them as a predictor to show the consistency in the measurement (Odom & Morrow, 2006) of the effectiveness of concrete poetry as a strategy to improve word recognition between the ROV and EOV subtests at post-test.

At the individual subject’s level, there were eight subjects, i.e., S1/M, S2/M, S3/F, S5/M, S6/F, S7/F, S9/M and S10/M, who scored slightly higher on the ROV subtest than on the EOV subtest. There was a change in the post-test group profile. Subjects S1/M, S3/F, S6/F, S9/M and S10/F were the new additions. Their previous standard scores on the EOV subtest were higher than on the ROV subtest (between 1 and 6 points) though not significantly. The two original subjects S4/M and S8/F in pre-test group profile now scored slightly higher on the EOV subtest than on the ROV subtest between 1 and 3 points difference. While it is difficult to explain the change, the discrepancy between ROV and EOV standard scores for S4/M and S8/F was too small to be of any significance.

From these findings, it is interesting to note that all the ten subjects achieved between below-average and average standard scores in both ROV and EOV subtests at post-test. Although the difference between the ROV and EOV scores in this study was not large enough to be significant or clinically useful, the same could be said if the two subtest scores were statistically different. As Kaufman (1990) has pointed out, quite correctly, that one should not assume that the difference has to be large enough to be clinically useful. The use of statistical significance alone will tend to identify too many false positives. According to Reynolds (1985), for data to be clinically useful, the difference between the ROV and EOV quotients must be 24 points or greater to show clinical usefulness.

Table 8 shows the results of the subjects’ performance in the General Vocabulary Composite (GVC), which according to Wallace and Hammill (2002), is the best CREVT-2 measure of what is commonly known as vocabulary or word knowledge. The reason given by Wallace and Hammill (2002) is that “because it comprises information about the vocabulary ability that is derived from two testing formats (i.e., ROV and EOV subtests) rather than just one” (p.28).

Those subjects (especially S1/M and S10/F) who scored well on this composite demonstrated the mastery of word meanings in spoken language, i.e., they could comprehend the meanings of words in other people’s speech and use words properly in their own conversations. In other words, they would be considered to be verbally competent in oral language. This in turn would lead to higher performance in other verbal skills taught and used in school (e.g., reading and writing). Also, for these subjects, they would also score highly on a test of intelligence (or aptitude) as it normally measures oral and/or written vocabulary skills (Wallace & Hammill, 2002).

From Table 8, six subjects (i.e., S2/M, S3/F, S6/F, S7/F, S9/M and S10/F) scored a composite above the mean GVC of 84.8 (SD = 3.82; \( \sigma^2 = 14.62 \)) at pre-test, but only four (i.e., S1/M, S2/M,
S6/F and S10/F) managed to do so at post-test, above the mean GVC of 92.4 (SD = 5.36; σ² = 28.71). Among those subjects who failed to score above the mean GVC at post-test but still attained a GVC in the average range of 90-110 were S7/F, S8/F and S9/M. Only two subjects S4/M and S5/M scored very poorly on the GVC as they scored 87 and 84, respectively, i.e., in the below average range of 80-89. The results indicated that there was clearly a moderate correlation and hence, a substantial relationship between the GVCs at pre-test and post-test, \( r = .63 \), as a predictor on the effectiveness of concrete poetry as a strategy to improve word recognition.

According to Wallace and Hammill (2002), low scores may suggest that the examinee could be “impaired intellectually, who do not speak or understand English well, who have dysphasia, who come from backgrounds that are lacking in sufficient vocabulary enrichment, or who are deaf or have other hearing impairments” (p.29). Without proper attention, these individuals are likely to fail in school. In this study, S4/M and S5/M were the two potential candidates to fit into this profile. As a result of their poor composites, it is important to relook into their ROV and EOV subtest scores.

### Table 8: Performance in General Vocabulary Composite

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Form A (Pre-Test)</th>
<th>Form B (Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sum of SS (ROV = EOV)</td>
<td>GVC</td>
</tr>
<tr>
<td>S1/M</td>
<td>174</td>
<td>84</td>
</tr>
<tr>
<td>S2/M</td>
<td>183</td>
<td>90</td>
</tr>
<tr>
<td>S3/F</td>
<td>176</td>
<td>86</td>
</tr>
<tr>
<td>S4/M</td>
<td>162</td>
<td>77</td>
</tr>
<tr>
<td>S5/M</td>
<td>168</td>
<td>81</td>
</tr>
<tr>
<td>S6/F</td>
<td>181</td>
<td>89</td>
</tr>
<tr>
<td>S7/F</td>
<td>175</td>
<td>85</td>
</tr>
<tr>
<td>S8/F</td>
<td>172</td>
<td>83</td>
</tr>
<tr>
<td>S9/M</td>
<td>176</td>
<td>86</td>
</tr>
<tr>
<td>S10/F</td>
<td>179</td>
<td>87</td>
</tr>
</tbody>
</table>

| Mean     | 84.8              | 92.4 |
| SD       | 3.82              | 5.36 |
| Variance (σ²) | 14.62 | 28.71 |

Key: S = Subject; M = Male; F = Female; Sum of SS = Sum of Standard Scores of Receptive Oral Vocabulary + Expressive Oral Vocabulary; GVC = General Vocabulary Composite

### WRaPS-2 Results

WRaPS-2 was administered two days before the treatment began. Table 9 shows the results of WRaPS-2 based on: (1) word recognition age (in months); (2) word length score, which means that an examinee can recognize at least 80 per cent of words of a given length; and (3) the word recognition/phonics stages.
From Table 9, the results showed that there was a big improvement in the raw scores from pre-test to post-test. The mean raw score for the number of words the subjects could recognize was 15.4 (SD = 2.37; σ² = 5.6) at pre-test but raised up to 28.3 (SD = 7.67; σ² = 58.9) at post-test. There was a significant improvement in word recognition by 12.9 points. The word recognition (WR) age was 4 years 11 months (SD = 4.83; σ² = 23.34) at pre-test, but the WR age at post-test was 6 years 3 months (SD = 6.38; σ² = 40.68). There was a group improvement by 1 year 3 months in word recognition. From the results, a correlation coefficient was computed by comparing between their WR ages at pre-test and post-test with $r = .80$. According to F. Williams (1968), a coefficient of .80 and above is a good linear correlation and indicates that it is a good predictor of the subjects’ performance in word recognition through concrete poetry.

Table 9: Performance in Word Recognition, Word Length Score & Word Recognition & Phonic Skills Developmental Stages

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Form A (Pre-Test)</th>
<th>Form B (Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RS</td>
<td>WR Age (in months)</td>
</tr>
<tr>
<td>S1/M</td>
<td>&lt;12</td>
<td>&lt;54</td>
</tr>
<tr>
<td>S2/M</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S3/F</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>S4/M</td>
<td>13</td>
<td>56</td>
</tr>
<tr>
<td>S5/M</td>
<td>14</td>
<td>58</td>
</tr>
<tr>
<td>S6/F</td>
<td>18</td>
<td>65</td>
</tr>
<tr>
<td>S7/F</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td>S8/F</td>
<td>13</td>
<td>56</td>
</tr>
<tr>
<td>S9/M</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>S10/F</td>
<td>19</td>
<td>66</td>
</tr>
</tbody>
</table>

Mean 15.4 59.3 28.3 74.7
SD 2.37 4.83 7.67 6.38
Variance (σ²) 5.6 23.34 58.9 40.68

Key: S = Subject; M = Male; F = Female; RS = Raw Score; WR = Word Recognition; WLS = Word Length Score; WRPS = Word Recognition/Phonics Stage

Table 10 is a descriptive summary of the progression made by the ten subjects in word recognition and phonics as assessed by the WRaPS-2. The results have clearly shown that these subjects were becoming increasingly sensitive to the structure of spoken and written words. Everyone moved upward to higher developmental levels at post-test. Three subjects S1/M, S7/F and S10/F showed the biggest improvement when they moved up by three developmental levels; five subjects S2/M, S3/F, S6/F, S8/F and S9/M improved by two developmental levels; and two subjects S4/M and S5/M made the least improvement, increasing by one developmental level. What each of these subjects achieved in word recognition and phonics skills at each stage is described briefly below:
Table 10: Performance in Word Recognition & Phonic Skills Developmental Stages

<table>
<thead>
<tr>
<th>Form A (Pre-Test)</th>
<th>Form B (Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td><strong>WRPS</strong></td>
</tr>
<tr>
<td>S1/M</td>
<td>1</td>
</tr>
<tr>
<td>S3/F, S4/M, S5/M, S7/F, S8/F</td>
<td>2</td>
</tr>
<tr>
<td>S2/M, S6/F, S9/M, S10/F</td>
<td>3</td>
</tr>
<tr>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>-</td>
<td>6</td>
</tr>
</tbody>
</table>

Key: S = Subject; M = Male; F = Female; WRPS = Word Recognition & Phonic Skills Developmental Stage

**Stage 1:**
At pre-test, only one subject S1/M was at this developmental level. According to Moseley (2003), “there is virtually no word recognition or letter knowledge” (p.25). At post-test, none of the subjects was at this stage. Subject S1/M improved significantly moving up from this level to Stage 4.

**Stage 2:**
At pre-test, five subjects (S3/F, S4/M, S5/M, S7/F and S8/F) came under this developmental level, where “a few initial letters are known” (Moseley, 2003:28). At post-test, none of the subjects was at this developmental level.

**Stage 3:**
At pre-test, four subjects (S2/M, S6/F, S9/M and S10/F) were at this developmental level. Moseley (2003) described this stage as one where to the reader, only “a few final consonants are known” (p.28). At post-test, two subjects S4/M and S5/M were at this stage, indicating a slight improvement in their word recognition and phonic skills from their previous Stage 2.

**Stage 4:**
At pre-test, none of the subjects was at this developmental level. At post-test, three subjects S1/M, S3/F and S8/F improved to this stage with S1/M making a significant improvement from Stage 1 (up by three levels) while the other two moved up from Stage 2 (up by two levels). Moseley (2003) described this stage as one where “short vowels are known in some words” (p.28).

**Stage 5:**
None of the subjects were at this developmental level at pre-test. At post-test, four of them - S2/M, S6/F, S7/F and S0/M - attained this stage, which according to Moseley (2003), is where “initial consonants and most final consonants are identified, while knowledge of consonant clusters is developing” (p.28).
Stage 6:
None of the subjects were at this developmental level at pre-test. Only one subject S10/F made it to this level at post-test. This is the phase when the subject is noted to have known common long vowel digraphs (Moseley, 2003).

Stages 7-10:
None of the subjects managed to reach these developmental levels at pre-test or post-test. Briefly, Moseley (2003) described each of these stages as follow: “More long vowel spelling patterns are known, including ‘igh’ and magic-‘e’ at Stage 7. All spelling patterns in one-syllable words are recognized, plus common prefixes and suffixes in two-syllable words at Stage 8. Secure knowledge of spelling patterns in two-syllable words, and in some three-syllable words is attained at Stage 9. Finally, at Stage 10, most spelling patterns in the English language are recognized” (p.28-29).

Conclusion
The main purpose of this study was to investigate whether teaching concrete poetry to a group of ten K-2 Chinese children with low oracy/literacy in English language – who would be at risk of failing in school once they moved on to Primary 1 the following year – would be an effective strategy to improve their word recognition. Since very little or none has been reported or published on using concrete poetry as a teaching strategy in mainstream and/or special schools other than the author’s (see Chia, 1991, 1993, 1994, 1995, 1996c, 2006), this study would be a significant, if not an additional, contribution to our pedagogical knowledge of employing such creative strategies to teach, in this case, word recognition to preschool children. The findings reported in this study show that concrete poetry had benefited the subjects’ performance in word recognition. Their WRaPS-2 results showed a significant improvement in terms of their WR ages from pre-test (4 years 11 months) to post-test (6 years 3 months) with an increase by 1 year 3 months (r = .80). Similarly, their performance in the combined mean ROV/EOV standard scores (94.7/92.6 respectively) at post-test (r = .84) were better than the combined mean ROV/EOV standard scores (86.6/88 respectively) at pre-test (r = .46) with respective increases of 10.8/4.6 in ROV/EOV standard scores. Standard scores are chosen for comparison here because they have better correlation coefficients than raw scores and equivalent oral vocabulary ages. The mean General Vocabulary Composite was 92.4, average at post-test, up by 7.6 points from 84.8, below average at pre-test (r = .63). When examining the results of the post-test ROV and EOV separately, the findings suggest that the performance of these subjects in ROV standard scores (r = .48 at post-test) were better than their EOV standard scores (r = .70 at post-test). This interesting finding seems to suggest that concrete poetry is more effective in improving the receptive oral vocabulary than expressive oral vocabulary. One explanation why this is so could be that the meaning of a concrete poem visually expressed through its shape, size and physical layout of its letters enables the subjects to see, understand and remember better what it is like in their mind. The physical design of the concrete poem puts its form ahead of its content. In this way, its form helps them to understand the content of the word without having to describe it in so many words, and hence, a better receptive oral vocabulary. As the saying goes “a picture is worth a thousand words”, this is probably very true here. Another explanation is that through enjoyment of creating their own concrete poems, these subjects learnt better and hence, were able to perform better in their word recognition.
References


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**How phonological awareness helped facilitate reading acquisition of a pre-school child in home environment before formal schooling**

Ellis Lay Yan ONG

Learning Support Teacher
Abstract
A single-subject case study design was conducted on a child aged 5.8 years who was attending K-2 in a private preschool on the basis of poor phonological awareness. The study was administered using Dynamic Indicators of Basic Early Literacy Skills (DIBELS) and Peabody Pictionary Vocabulary Test (PPVT) to assess the level of phonological awareness. This exploratory study provides some grounds to advocate teaching phonological awareness to beginning and early readers to improve reading ability, and their achievement in our bilingual local context (Carson et al., 2000; Hintze, Ryan, & Stoner, 2003; Hogan, Catts & Little, 2005; Scanlon & Vellutino, 1996).

Introduction
In recent years, the Ministry of Education Singapore (MOE) has been making plans to help provide better education to students who need more assistance by increasing the budget, recruiting teachers and developing teaching strategies. The government’s recurrent expenditure on education per student has increased from $3363SGD in 2001 to $3940SGD in 2005 (MOE, 2006). In accordance with the bilingual educational policy, students studying in the local government schools, take English as their first language with English as the medium of instructions in all subjects, while Mandarin is the second language for the Chinese students (Liow & Poon, 1998), Bahasa Melayu as the second language for the Muslims student (Liow, 1999), and Tamil as the second language for the Indians students. With English as the main medium of teaching and learning, it is important for students to achieve strong phonological awareness before formal schooling. Strong phonological awareness is likely to be the key to a child’s reading competence and success in academic achievement in school. This study chose to explore how phonological awareness could have facilitated a pre-school child’s acquisition of reading in a home environment before formal schooling.

Literature Review
What is Phonological Awareness?
Chang, Lei and Wagner (1997) have stated that phonological awareness means that the participants have the ability to recognize and manipulate the sound structure of language. It is the ability to recognize and manipulate the individual speech sound, onset, rime, syllable or word. Phonological awareness involves the ability to think about, notice, or manipulate the individual sounds in words. Acquiring phonological awareness involves the ability to divide words into segments of sound and individual learning of phonemes (Torgesen & Mathes, n.d).

Importance of Phonological Awareness
Stainthorp and Hughes (1998) found that young children who became fluent readers before they began formal instruction in school possessed high phonological sensitivity. There are many research studies conducted to ascertain that phonological awareness is an important aspect in early ready ability for early readers (Carson et al., 2000; Hintze, Ryan, & Stoner, 2003; Hogan, Catts & Little, 2005; Scanlon & Vellutino, 1996).
Children who do not possess adequate phonological skills during their pre-school age are found to have difficulties in reading when they reach their formal schooling years. These children rely on inappropriate word recognition approaches, which become learning obstacles for them (Stainthorp & Hughes, 1998). According to Ehri (1995) and Stainthorp and Hughes (1998), for young children, a strong knowledge of the alphabet is an important predictor of reading abilities at the later stage. Young children who lack such knowledge may be facing reading difficulties in later years (Hamilton & Glascoe, 2006). A study carried out by Ehri (1995) has shown that “weak readers rely primarily on the initial and/or final consonant information to help identify words, rather than making full use of the sound-symbol correspondence” (p.119). Based on this, Treiman (2000) suggests a sequential approach in phonological training and knowledge to enhance reading and spelling.

**Letter Sound in Literacy**

Letter-sound knowledge is knowing the letter sound and its position (Treiman, 2000). It is important for children building the basic foundation for acquiring reading skills to have the ability to match the separate visual symbol (letters) to different components of sound (phonology). Having the ability to manipulate this relationship between symbols and sounds, children can progress to becoming literate (Ziegler & Goswami, 2005). Studies conducted by Ball and Blachman in 1991 (cited in Treiman, 2000) found that training in segmenting spoken words into phonemes together with training in letter-sound relationship helped kindergarten children to read and spell better, and which at the later stage will influence a child’s reading ability. According to the National Reading Panel (2000), evidence has shown that constant teaching of the children to break words into sounds and changing the sounds into words; or teaching knowledge of sounds which are represented by letters of the alphabet and blending them together to form words will help children in reading.

In the area of reading, it is important to have a clear definition and understanding of these terms in the components of reading: phonics is the understanding of a predictable relationship between phonemes and graphemes (the letters) and using this connection for reading and spelling (Uhry & Clark, 2005). Phonological awareness involves sounds and being able to listen to a spoken word and to analyse its sound structure (Uhry & Clark, 2005), while phonemic awareness, an important aspect of learning to read words and ability to hear, means to identify, and manipulate the individual sounds (Armbruster & Osborn, 2001).

**Letter Knowledge in Literacy**

Having the ability to read is to have the ability to identify written or printed words and understand the meaning of characters, words, and symbols. Children are required to identify letters, symbols and sounds in reading. Thus, reading consists of multipart stages and children who do not have an adequate grasp of alphabetic recognition may, at the later stage, face difficulties in reading. This affects their academic performance and achievement in school. Building alphabetic recognition and letter knowledge are important components of phonological awareness (Treiman, 2000). Studies conducted by Stainthorp and Hughes (1998) found that children who were confident readers before they began formal schooling possessed high alphabet knowledge and similarly, Morris, Bloodgood, and Perry (2003) also found that alphabet recognition skill significantly predicted first-grade reading achievement at the end of kindergarten years. In pre-school years, kindergarten children
with a strong foundation in recognition of letters, showed good knowledge and ability in reading and were likely to perform better in school (Denton & West, 2002).

**Rhyming in Literacy**
Nancollis, Lawrie, and Dodd (2005), establish that acquiring rhyming awareness is having the ability to identify whether or not two words rhyme and to know which word is the odd one out. Children who have good rhyming awareness will have better and deeper sensitivity in reading (Stainthorp & Hughes, 1998).

**Bilingual Educational Policy**
In the context of Singapore schools, children who have difficulties in mastering one language (e.g., English) will have difficulties in managing other second languages such as, Mandarin, Malay and Tamil which are the compulsive second languages to be undertaken when their formal schooling begins at the age of seven. The Ministry of Education (MOE) recognizes this issue and thus, provides a platform, for instance, for the Chinese children to learn Mandarin as a second language through the *hanyu pinyin* system. Unlike Chinese, the Malay language with a clear morphological system like the English is an alphabetic syllabic script (Susan, Liow, & Lay, 2004).

Many private preschool operators have provided a somewhat similar pedagogical instruction for both first and second languages to prepare preschool children to cope with two languages when they begin their formal school years. The present authors feel that such an approach may also complicate and confuse children in their knowledge and understanding of reading and may cause them to mispronounce words. The different ethnical and linguistic family backgrounds means that multilingualism is common in Singapore as children are exposed to more than one spoken language at home with parents, siblings, grandparents and domestic helpers speaking a variety of languages. This may confound the child in terms of literacy acquisition (Liow, 2007)

**Social Disadvantage, Language and Literacy Skills**
A study by the United States Department of Education (2001) showed that 46% of children came from family backgrounds with one or more factors that might affect their skills and knowledge’ (cited in Nancollis, Lawrie, & Dobb, 2005, p.326). These factors include single-parent household, low income earners, unemployment parents, parents with little education or parents coming from a non-English background. The academic performance of these children fell to the “at-risk level” and they continued to struggle in school. According to Fisher (1992), parents and family provide a framework and motivation for children in their first step of learning, and the home environment determines their attitude, which may optimize or minimize their learning eventually (cited in Nancollis, Lawrie, & Dobb, 2005).

**Research Question**
In this study, the research question is: How did phonological awareness facilitate a pre-school child’s acquisition of reading in a home environment before formal schooling?

**Methodology**
The present authors chose to use the quasi-experimental study with a single-subject post-test research design. This approach had enabled them to do an in-depth study in understanding how
phonological awareness helped facilitate a single subject (i.e., a preschool child in this study) to acquire reading in a home environment before formal schooling. (Fraenkel & Wallen, 2006).

**Participating Subject**

CG, aged 5.8 years, was in the second year at a private preschool and lives in a Housing Development Board (HDB) mansionette flat. Both her parents are in their early 50s with high school education. The parents work fulltime and they have a combined income of S$80k per annum. CG’s older siblings are in school most of the day. Hence, CG spends quite an amount of time with her grandmother (her main caregiver) who communicates with her in Mandarin. CG uses English to communicate with her parents and siblings.

Occasionally, CG’s father may read to her whenever he can find time from his work schedule. Her mother usually makes random purchase of storybooks from bookstores but she does not spend time reading to CG.

According to CG’s mother, she noticed that her child displayed a strong dislike for reading aloud. Also, CG was observed to read the same book again and again. Hence, she was able to memorize the text rather than recognize or understand the words. She was unable to stay in her reading activity for more than 15 minutes. Most of the time, she displayed her discomfort in reading and would switch to other activities relatively fast, such as, watching her favourite television programmes.

Several observations and assessments of her behavior were done in CG’s home after she returned home from her morning session at preschool. At a recent parent-teacher conference, CG’s parents and teachers shared a common sentiment that CG displayed weak phonological awareness. She also showed little interest in reading and depended heavily on visual cues and rote memory as far as reading was concerned. Further observation also suggested that CG displayed a good level of receptive vocabulary which could be the result of long hours spent on watching television programmes.

**Instruments**

Scheduled interviews and two standardized assessment tools were used in this study.

This is an individually administered test testing the knowledge of receptive vocabulary achievement for Standard English or as a screening tool for verbal ability for children as young as 2.5 years old.

*Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Good, Kaminski, Laimon, & Johnson 1992; Elliot, Lee, & Tollefson, 2001)
DIBELS is a set of measures that specifically assess skills in phonological awareness and alphabetic principle to identify children with reading problems and track their progress (Hintze et al., 2003).

Research by Hintze et al (2003) shows that Initial Sound Fluency (ISF), Letter Naming Fluency (LNF), Phonemic Segmentation Fluency (PSF) and Nonsense Word Fluency (NWF) of DIBELS correlates with the subtest of Comprehensive Test of Phonological Processing (CTOPP) that
measures phonological awareness, while LNF shows slow to strong correlation with all the subtests of CTOPP. Rouse and Fantuzzo’s (2006) study showed that ISF, LNF, PSF and NWF coexist and have predictive strength with general reading ability among kindergarten children.

- **Initial sound fluency (ISF)** is an administered measure of phonological awareness in terms of a student’s ability to produce the initial sound in an orally presented word” (Institute for the Development of Educational Achievement, 2002).

  The examiner presents four pictures and asks the examinee to identify the picture that begins with the same sound as the word presented orally to the student. For example, the examiner shows four pictures and say, “This is a picture of a pink, king, cow and goat. Which picture begins with /p/?” The examinee can either point to the correct picture or say the name of the picture and the examiner will record the time taken by the examinee to complete all items, and later convert the score in terms of the number of correct initial sounds per minute.

- **Letter naming fluency (LNF)** is an administered measure of alphabetic knowledge that provides a measure of risk and is not essential to achieve reading outcomes.

  The examiner presents to the examinee a paper containing both upper and lower case letters in a random order. The examinee is then asked to name as many letters as he/she can in a minute. The LNF score is the number of letters read correctly (Elliot et al., 2001). Preferably, if the examinee is a kindergartener, he/she has to score at least 40 and more correct responses in order to be considered to be at low-risk of having reading problems (Langdon, 2004).

- **Phonemic segmentation fluency (PSF)** is an administered measure for phonological awareness and is appropriate for monitoring the progress of children with low skills in phonological awareness, and testing the student’s ability to break down three- and four- phoneme words into their individual sounds within a minute.

  The examinee will say a word orally, and the examinee is encouraged to say the individual phonemes for each word. For example, if the examiner says, “cat”, and the examinee is able to respond saying: /k/, /a/, /t/, he/she receives three possible points. The PSF score is the number of correct phonemes produced (Coyne & Harn, 2006). The test takes about two minutes to administer and has over 20 alternate forms. If the examinee is a kindergartener, he/she has to score at least 35 and more to be considered to be at low-risk of having reading problems (Langdon, 2004).

- **Nonsense word fluency (NWF)** is an administered measure to test the ability to understand alphabetic principle, letter sound correspondence and blending letters into words.

  The examinee will be presented a sheet of paper containing randomly ordered vowel-consonant and consonant-vowel-consonant nonsense words. The examinee is required to verbalize as many individual letter sounds or read as many nonsense words as possible within a minute. The examinee will be given a score for every correct letter sounds produced (Coyne & Harn, 2006). If the examinee is a kindergartener, he/she is expected to score at least 25 and more correct
responses in order to be considered to be at low-risk of having reading problems (Langdon, 2004).

Procedure
This single subject case study was conducted in 10 sessions in 10 days. The duration of each session varied. Prior to the study, a letter of consent stating the purpose and the process of the research was given to the parents, who were also assured of the full confidentiality of data collected in this study.

The test administration was conducted using a series of interviews and a battery of tests (as mentioned earlier) on the tenth and last day of the study.

The first meeting was a 30-minute interview of the child’s mother (see Appendix 1). There were 12 interview questions which were read out one at a time. Permission was also sought to record the interview session on audiotape. Apart from the 12 interview questions, other background information from family members was also obtained by the authors.

The second meeting was with CG (the subject of this study) alone for a 30-minute interview (see Appendix 2). The interview, which consisted of 12 questions, was conducted using the languages written and spoken by the subject at home. Each question was phrased in the simplest and easiest way possible for a better understanding by the subject.

The third meeting was arranged for CG to be assessed on the Peabody Pictionary Vocabulary Test-Third Edition (PPVT-III; Dunn and Dunn, 1997). The subject was asked to find the picture named from a group of four line-drawn objects on each page. A total of 12 sets with each set consisting of 12 items were administered in an orderly manner. The test stopped when the subject made eight consecutive mistakes in one set. The testing time did not exceed 25 minutes. Practice trials prior to the actual assessment also were carried out.

The fourth meeting was arranged to administer the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good, Kaminski, Laimon, & Johnson 1992; Elliot, Lee & Tollefson, 2001) on the subject. There were four variables to be tested for the kindergarten level in the DIBELS testing, which provides the basic measurement system for the development of basic literacy skills. CG was given practice trials, and clear instructions were given to ensure that the subject understood the task requirements.

Results
On the tenth day, data from the two standardized tests (PPVT and DIBELS) as well as the scheduled interviews were collected for analysis. Findings were shared with CG’s parents. In addition, new teaching strategies and approaches were recommended to assist and improve CG’s phonological awareness and reading ability.
The scheduled interview during the second meeting with CG presented some interesting findings. The subject said that she communicated in English with her friends and teachers in her kindergarten. However, she preferred to communicate in dialect or Mandarin with her grandmother. CG told the authors that she did not like reading because she did not know how to read. When probed further, she mentioned that she could not finish reading a book by herself and no one was willing to read to/with her as everyone was busy at home. The subject also added, “I want to go to the library but no one want bring me there-leg. Po Po always complain leg pain, leg pain.” Therefore, she had not visited the library for a long time. When asked to pronounce some letter sounds, she shooed the authors away and said, “I don’t want to read. I don’t know how to read.” And she ran into her room and seemed upset. The authors had to spend almost 10 minutes to coax her back to the session.

In the PPVT-III (see Table 1), the subject’s raw score was 83 with a standard score of 106, a percentile rank of 66 and a stanine of 6. The results showed that CG displayed a high average score on her receptive vocabulary and age equivalent for her score of 83, which gives an equivalent age of 6 years 3 months.

<table>
<thead>
<tr>
<th>Table 1: PPVT-III Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of testing: 29 February 2008</td>
</tr>
<tr>
<td>Date of birth: 13 June 2002</td>
</tr>
<tr>
<td>Chronological age: 5 years 8 months</td>
</tr>
<tr>
<td>Raw score: 83</td>
</tr>
<tr>
<td>Deviation-type norms</td>
</tr>
<tr>
<td>Standard score: 106</td>
</tr>
<tr>
<td>Percentile rank: 66</td>
</tr>
<tr>
<td>Normal curve equivalent: 58</td>
</tr>
<tr>
<td>Stanine: 2</td>
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<tr>
<td>Development-type norms</td>
</tr>
<tr>
<td>Age equivalent: 6 years 3 months</td>
</tr>
</tbody>
</table>

In the DIBELS scoring (see Table 5), CG scored a percentile rank of 20 with deficit scores for both ISF and PSF as well as at-risk scores for both LNF and NWF. These results suggested the need for CG to receive additional intervention support at home or in her kindergarten.

<table>
<thead>
<tr>
<th>Table 2: Kindergarten DIBELS Benchmark Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>IFS</td>
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<tr>
<td>LNF</td>
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</table>
Discussion
The purpose of this study was to explore how phonological awareness could facilitate a preschool child’s reading acquisition in his/her home environment before formal schooling began. To date, research (see Speece & Ritchey, 2005) has shown that phonological awareness plays an important role in developing early reader’s fluency and improving his/her reading ability.

Firstly, the DIBELS results have shown that CG displayed weak phonological awareness from the four variables that were tested, particularly in ISF and PSF. Therefore, a further intervention has been recommended to help improve her phonological awareness. Secondly, from the PPVT-III results, CG scored a high average score for her receptive vocabulary.

A limitation of this quasi-experimental study is that it does not have a pretest for a comparative study. Its only posttest results cannot be generalized as the study involved only a single subject. For a future study on a similar theme on phonological awareness, there can be a larger preschool sample size whose progress is to be monitored over a certain period in order to achieve reliability and validity. There can also be a correlation study between phonological awareness and vocabulary before formal primary schooling.

An important finding of this study is that although CG displayed good receptive vocabulary, her low phonological awareness resulted in her strong dislike for reading. She found it a chore as she was not a competent reader. The authors feel that an early identification of phonological awareness level in young children is a good start in gauging their reading readiness, and in turn, can boost their confidence level before formal primary schooling begins.

References


**Appendix 1:** Interview Questionnaire (to be completed by the subject’s parent*)

* either the subject’s father or mother

1. Do you think you spend a lot of time reading with your child at home?
2. How long is your reading session you have with your child?
3. How and from where do you borrow or buy books?
4. Do you allow your child to select her own book?
5. Do you select the books which are currently available at home?
6. Why do you think your child reads by memorising the words in the text?
7. Is your child able to pronounce letter sounds without assistance during her reading session?
8. Does your child attend any enrichment classes or have home-based tuition?
9. Do your two other children read to her? Who else reads to her?
10. To what extend do you think your child goes off-task during her reading session at home?
11. What are her preschool teachers’ comments or feedbacks in regard to her reading ability in class?
12. How often and how long do you allow your child to watch television programme and what programme(s) does she watch?
Appendix 2: Interview Questionnaire (to be completed by the subject)

1. Do you like to read at home and/or in school? If yes/no, why?
2. Do you want to finish at least one book a day during your reading session?
3. Do you like to borrow books from the library? Which library?
4. Do you like to buy books from bookshop(s)? Which bookshop(s)?
5. Do you like to select books on your own to read?
6. Do you think you can read? If yes/no, why?
7. Can you recognise and read upper and/or lower case letters?
8. Do you think you can pronounce different letter sounds within a word (e.g., /d/, /o/, /g/)?
9. Do you like to attend extra reading class on a Saturday?
10. Do you want your brother and/or sister to read to you?
11. Why do you think reading is difficult?
12. How can reading be made more interesting for yourself?

Informal learning from video games of three autistic children in a family: A case study
Abstract
Many autistic children are highly interested and motivated by computers (Goodwin, 2008; Grynszpan, Martin & Nadel, 2007). Shafer (2006) in his book “How computer games help children learn” revealed that good computer or video games allow “children to live in worlds that they are curious about, or afraid of, or want desperately to try out” (p.24) and implicitly it is because they want to understand the rules, roles and consequences of those worlds. Autistic people do not have impairment in their understanding of physical causality, and may even be superior relative to mental-age matched controls (Baron-Cohen, cited in Wakabayashi, et al., 2007). The purpose of the case study is to explore for evidences of informal learning from computer and video games of three autistic children in the family of the author directly during period of study of one month and indirectly through past recollections of significant moments of observed learning. The children have played video games from Nintendo consoles (N64, game cube, WII), Nintendo portable devices (Advanced gameboy, DS), Sony playstation console and online internet games and applications. It is the hope of this study to generate interest in considering using computer and video games in special education for learning and literacy (Gee, 2007).

Introduction
Autism spectrum disorder (ASD) is a neurological dysfunction in humans (Mesibov, Shea & Schopler, 2004, p. 19), impairing to different degrees the ability to communicate and socialize; causing those affected to have a narrow range of interest and compulsivity (Heflin & Alaimo, 2007, p.17). The current predominant interventions for ASDs are behavioral and cognitive-behavioral in nature (Martin & Christopher, 2008) where the learning theory is essentially behaviorism (Wilson & Myres, 2000). The fundamental stimulus-response paradigm and token economy of behaviorism may not appeal to ASDs as they reach adolescence, where they may go beyond physiological needs(token economy) to esteem needs based on Maslow’s hierarchy of needs (Maslow, 1968), due fundamentally to the natural biological lifespan development in areas of physical, cognitive, emotional and social needs (Berk, 2004). I would personally reconsider using only the behavioral approach for adolescent and adult ASD people. There is thus a real need to have an education approach that will address the higher level needs for self esteem and learning for life, especially when autistic children reach adolescence.

Many autistic children are highly interested and motivated by computers (Goodwin, 2008; Grynszpan, Martin & Nadel, 2007). Shafer (2006) in his book “How computer games help children learn” revealed that good computer or video games allow “children to live in worlds that they are...
curious about, or afraid of, or want desperately to try out” (p. 24) and implicitly it is because they want to understand the rules, roles and consequences of those worlds.

I would like to advocate situated cognition and social constructivism in this paper, which is generally not considered in autism interventions, to address the need of autistic adolescents through the use of video games. I have observed that my three adolescent sons with autistic spectrum disorder (ASD) to varying degrees, are able to play and achieve some level of success with Nintendo DS and Nintendo WII games, without the need to first read the game manual or refer to game hint books, which I will normally need to before I play. Their interest and perseverance in some games of interest have led them to intuitively not only discover the properties, rules and procedures that must be mastered in order to become a “player” (Rosas, Nussbaum, Cumsille, Marianov, Correa, Flores, Grau, Lagos, Lopez, Lopez, Rodriguez & Salinas, 2003) but also to win the games, perhaps learning more through situated cognition (Wilson & Myres, 2000) of the complex environment of the games than from behaviorism-based teaching.

I am excited about this observation and would like to explore how existing Nintendo games that are of interest to my adolescent autistic children could engage them in meaningful learning (Jonassen, Howland, Moore & Marra, 2003) through the games. The informal learning taking place is predominantly unstructured, experiential and noninstitutional and described by contrasting with formal learning (Berg & Chyung, 2008). In this study, the informal learning is operationalized through explication of meaningful learning attributes (Jonassen, Howland, Moore & Marra, 2003) observed as evidences of informal learning taking place while overcoming the challenges in game play.

What is the problem?
Autistic people do not have impairment in their understanding of physical causality, and may even be superior relative to mental-age matched controls (Baron-Cohen, cited in Wakabayashi, et al., 2007). Thus there is a need to provide ASD children with learning environment that interest them, with affordances of cause and effect (or immediate feedback) that not only sustains their interest but also have the criteria that brings about meaningful learning (Jonassen, et al., 2003). From research literature, computer games (Goodwin, 2008; Passerino & Santarosa, 2008, Huang, 2004) and video games (Gee, 2007a; Gee, 2007b; Shaffer, 2006) are potential learning environments to address the needs. I have personally witnessed sudden switching off of desktop personal computer power due to frustrations, leading to corrupt operating or data when playing computer games. I therefore prefer video games learning environment running on dedicated game consoles like Nintendo DS or Nintendo WII which are certainly more robust and generally designed to be idiot proof and immune to destructive behavior arising from anger. Moreover, video games are easier to manage as there is no need to patch the operating environment or configure the operating environment for game purpose.

Currently, there is no formal consideration in special education, for use of video games for learning by ASD children as there is no formal endorsement of its effectiveness for learning. Two noteworthy and recent Ph. D thesis, “Students’ use of social and cognitive affordances in video game play within educational contexts: Implications for learning”(Sharritt, 2008) and “The invention of good games: Understanding learning design in commercial video games” (Becker,
2008) have revealed the need to describe actual uses of video games for learning (Sharritt, 2008) and shown how commercially and critically successful modern video game supports learning that players must accomplish in order to succeed in the game (Becker, 2008). As both of these recent completed studies are working on neurotypical (mainstream) children, it would be reasonable to infer that research in using video games for non neurotypical children, such as ASDs, in learning would also be in infancy or lacking.

**How has the use of video games been addressed in the literature?**

Many people with autism are highly interested and motivated by computers and computer-assisted learning, where they can focus on numerous academic and support areas of need such as emotion recognition, social interaction, and communication (Goodwin, 2008; Passerino & Santarosa, 2008; Huang, 2004). Educational computer games can be dispensed with great success for the right tasks but have clear limitations and require qualified teachers that can serve as facilitators of learning (Egenfeld-nielsen, 2007).

Annetta (2008) and Gros (2007) have both expounded in their papers that much research remains to be done on video games in education. Gros (2007) insightfully summarized the current status as:

The educational use of computer games is not unexplored research territory, but research is disjointed and the field lacks well-defined boundaries. Research has been distributed over a number of disciplines with little in common except perhaps the interest in computer games. Some of these are literature, psychology, media studies, anthropology, ethnography, sociology, history, business studies, military tactics, literary theory, educational, theory, instructional technology and computer game studies. (p. 24)

Searching for peer-reviewed journals using key words, “video games” and “Autism” did not reveal any published peer-reviewed literature on learning of ASD children through video games from electronic databases such as ERIC and Proquest (done on 3rd March 2009). Though I found a preview Ph. D. dissertation title “Social Skills and Dyadic Computer Game Playing with Autistic children” submitted by Marlene, N. Scholl from Northcentral University in June 2006 (UMI Number:324713), it did not address video gaming. Most published peer-reviewed research on video gaming involves neurotypical (mainstream) children, though there are some non peer-reviewed magazines (Busch & Markle, 2009) and online sites (Susan, n.d.) that have dealt with autism. It is the hope of this study to generate interest in considering using video games in special education for learning and literacy (Gee, 2007) and to address the lack of studies in using games for autistic children.

**Purpose of the Study**

In view of the potential that existing Nintendo video games of interest to my adolescent autistic children could engage them to learn the rules and even win many game levels without the need to refer to manuals, it is the purpose of the study to learn not only how they could have meaningful learnt how to play and win but also explore how to harness the informal learning for curriculum learning and literacy, with appropriate scaffolding when and where possible.

**Research questions**
How does existing Nintendo games that are of interest to my adolescent children, engage them in meaningful learning (Jonassen at al., 2003) of the games?

**Theory Statement**

Good video games (Gee, 2007a) can simulate worlds that provide a safe environment to let players explore. Shaffer(2006), explains that children in the process of playing, are:

“**doing explicitly, openly, and socially what as adults they will do tacitly, privately, and personally. They are running simulations of worlds they want to learn about in order to understand the rules, roles and consequences of those world. They are learning to think by examining alternatives in play**” (pp. 24-25).

Implicitly, the theoretical perspective adopted is social constructionism (Crotty,1998), that is transactional and subjective (Guba & Lincoln, 2005) as game players will need to directly interact with the game environment and game avatars and make sense using situated cognition (Jonassen & Land, 2000) learning. The “social” in social constructionism need not involve persons (and therefore need not be ‘social’ in that sense.) (Crotty, 1998) but rather with computer artifacts, that interact and transact with the player of the game. Interaction of the ASD children with the objects and environment created by the simulated world is thus social. My ontology is relativism (Guba and Lincoln, 2005) that is realities perceived by the game players are local and specific constructed and co-constructed realities (with facilitators). It is assumed that these interactions will cause mental transactions that lead to learning. The epistemological view is thus transactional and subjectivist where the constructed knowledge also depends on the background experiences of the ASD child and the subjective interpretation of the transactions. Crotty (1988) has identified the work of Karl Mannheim (1893-1947) and Berger and Luckmann’s *The Social Construction of Reality* (1967) to be the key scholars in social constructionism. I have found the works of James Paul Gee (2007a, 2007b) and David Williamson Shaffer (2006) the key to understanding what video games have to teach or help children learn. The characteristics identified as good video games for good learning will be used to assess the existing games (Gee, 2007a) for selection for this study. To study the possible effects of learning from the transactions with the game consoles, I will draw from the explication of the attributes of meaningful learning by Jonassen, et al., (2003), which necessitates the experience to be engaging in doing the learning activities.

The social constructionism framework allows me to do a case study research methodology to study what, how and why the existing games may have the potential to bring about the development of desired learning processes (e.g. meaning, self-regulation, incidental learning, conceptualization, motivation and higher-order processing). There is no requirement to control the behavior events as the theoretical framework assumes that learning is constructed through the ‘social’ interactions of the ASD child with the video game simulated environment locally and specifically, a contemporary (current real life) event (Yin, 2009). It would also be valuable to reflect in retrospect what types of cognitive processes are affected by certain categories of selected games(e.g. simulation, action) as classified by Herz system (1997, cited in Rebetez & Betrancourt, 2007). The different selections are necessary as the interest and degree of autism varies between the studied subjects.
The research will be extended to explore how to design and evaluate effectiveness of activities and scaffolds that complement the game playing activities for learning of suitable curriculum (e.g. expressive language, mathematical concepts, music) for adolescent autistic children.

Over the years my personal observation of the studied subjects reveals implicitly that social constructionism is most likely the theoretical framework that explains their learning and discovery of the world around them. Egenfeldt-Nielsen (2007, 2005) in his research paper and Ph.D. thesis reported the support and use of constructionism theoretical framework to complement his empirical study as it provides richer insights to what is happening.

Subjectivities Statement
As my objectivity as a researcher is situated within subjective thoughts influenced by my personal histories, cultural worldviews and professional experiences (Lewis-Beck, Bryman, A., & Liao, 2004), I would like to explicate these influences and my awareness of how my subjectivity may shape my research inquiry and its outcomes (Peshkin, 1988), in the desire to collect trustworthy data in this study. I am the father of the three autistic children in this study and have conducted research on autism using case-based research methodology with two of my children with findings presented in a conference in 2007 (Kee, 2007). Being their father, I have in-depth knowledge of their development and personality since birth and may be objective and subjective at the same time, in determining whether the learning observed is directly from the game playing event or possibly from past experience. I have taken courses on qualitative research methodologies as part of my two masters programme in National University of Singapore and Nanyang Technological University. Essentially my view of ASD is that all individuals are unique and may learn or appreciate the same learning situation differently due to their sensory and perceptual differences as well as cognitive differences, even though they have some common autistic traits. I believe this also happens to neurotypical (mainstream) adults, as my experience with the student teachers taking the same lesson within the institution, reveal different levels of perceptions and understanding of the same learning event, such as watching an educational video. Personally, I have observed that my children construct their own knowledge in different ways, as they generally do not like instructions and learn more by exploration and observation of others than by didactic means. My ontology is thus relativism (Guba and Lincoln, 2005) where realities are local and specific construction by learner and/or co-construction realities when interacting with others in social-cultural context (Crotty, 1998). Consequently, my epistemology is social constructionism or transactional/subjectivist (Guba and Lincoln, 2005) as I have observed variation in my children perception and appreciation of the same physical events.

I have also chosen to use my reflections/recollections of past historical significant events of my sons’ learning of the games before the research, as part of the research data, as I believe the data will provide useful insights into addressing practical problems (Lewis-Beck, et. al., 2004) such as how to get autistic children to learn to play video games, when it may be difficult even for some adults. I admit that this data was not methodically collected but only in retrospect, as there was no research questions while I was observing then. However, with my training as an educator and researcher, the inductive findings may add knowledge to the research field as they were derived from insights over long periods of informal observations as a father, educator and researcher.
Research Design
Case study research methodology was selected as the research requires the understanding of the complex phenomenon (Yin, 2009) of how my autistic children are engaged in meaningful learning of Nintendo video games informally in a natural home setting, and how I may harness the informal learning for suitable curriculum learning. The processes are considered complex as ASD children have differences in neurobehavioral patterns and thinking (Mesibov, et al., 2004) when compared to non-ASD children and also between individuals with ASD, where learning needs to be inferred from contextual behavioural information and game output. Moreover, I have little or no control and no requirement over their behaviour (Yin, 2009) to construct learning as the focus is on studying within a real-life context while they are playing video games, a contemporary phenomenon and not a historical event (Yin, 2009). Yin (2009) has suggested that studies meeting the three mentioned conditions are apt for using the case study research method.

The case study research method “remains one of the most challenging of all social science endeavours” (Yin, 2009). Not many researchers used this method for studying autism. I found one study by Johnson (2006), who use the case study research method for his Ph. D. dissertation “The effects of autism on families and educators: A case study”. There are other study cases using single case research design (Horn, Lieber, Li, Sandall, & Schwartz, 2000) and in other disciplines, such as rehabilitation studies where the case study research method is being used (Alan, 2009).

The research setting is my home. This is necessary as autistic children require a safe, predictable, orderly and structured environment with understanding of the “culture of autism” and TEACCH work system (Mesibov, et al., 2004), as well as familiar people to work with before learning can take place. My children are selected for the study as there is also a need for the researcher to understand their temperament, habits and ways for effective communication to build rapport to facilitate and scaffold an environment where informal learning can take place and also for ASDs participants to know and be comfortable with the researcher. Home site, with family member as researcher, naturally satisfies the conditions for suitable environment for informal learning environment facilitation for ASD children learning. Moreover, as my three adolescent children have autism to different degrees (high functioning, moderate and mild), they meet the criteria for independent cases suitable for multiple holistic case study research design, where each needs to be an adolescent with autism and comfortable with working with the researcher.

The research methodology adopts Yin’s (2009) five components of research design, using a multiple-case replication design as below:

1. **Study’s Research questions**
   RQ1. How does existing Nintendo games that are of interest to my adolescent children, engage them in meaningful learning (Jonassen et al., 2003) of the games?

2. **Corresponding Study Propositions (CSP) to operationalise research questions**
   CSP1. Video game playing engages them in meaningful learning by building in opportunities for active manipulation of the game objects with corresponding observation of the effects of what they have done (Jonassen, et al., 2003)
CSP2. Video game playing engages them in meaningful learning by building in opportunities to construct their learning by articulating and reflecting on their game playing experiences (Jonassen, et al., 2003).

CSP3. Video game engages them in meaningful learning by building in opportunities for intentional learning to fulfill some goal (Jonassen, et al., 2003).

CSP4. Video game engages them in meaningful learning by simulating an authentic game playing environment that is complex and contextualized requiring students to solve complex and ill-structured problems as well as simple, well-structured problems (Jonassen, et al., 2003).

CSP5. Video game engages them in meaningful learning by building in opportunities for collaborative and conversational learning with the game artifacts (Jonassen, et al., 2003).

1. Units of analysis
There are three units of analysis or cases; subject 1: very high functioning ASD child in express stream of mainstream school, age 14; subject 2: moderate functioning ASD child, age 13, with intelligence quotient (IQ) of 55; subject 3: high functioning ASD child, age 12 with IQ of 72. Mental retardation is defined by three criteria: cognitive impairment of IQ scores less than 70, adaptive skills deficits, and age of onset prior to 18 years (APA, 2000 cited in Edelson, 2006). Thus only subject 2 has mental retardation.

2. The logic linking the data to the propositions.
CSP1. Observation data will be gathered on evidences of active manipulation with corresponding visual feedback where learner is able to accomplish certain goals of the game. Humans of all ages generally can develop sophisticated skills and construct advanced knowledge meaningfully as they interact with their environment and manipulate objects in that environment to fulfill what they need or want to do, through observing the effects of their interventions and constructing their own interpretation of the phenomenon and the results of the manipulation (Jonassen, et al., 2003, p. 7). Similarly it would be expected that video games providing such affordances will also result in meaningful learning.

CSP2. Data will be gathered by observing for evidences such as pauses where a player can be seen intently looking on and appearing to deliberate on what to do next, resulting in the eventual overcoming of challenges to accomplish certain goals of a game. It is expected that good games will create puzzlement, a catalyst for meaning making. By reflecting on the puzzling experience, learners integrate their new experiences with their prior knowledge or establish goals to make sense of what they observe (Jonassen, et al., 2003, p. 7), generating meaningful experience of learning.

CSP3. Learners who fulfill an intention after thinking and articulating their intention will learn meaningfully. In this study, I am inferring that if a user is observed to be actively trying to achieve a goal, he is explicating intentional learning data (Jonassen, et al., 2003, pp. 7-8).
CSP4. Observed evidences from game play will be gathered on the authenticity of the game playing environment by considering the game playing elements (e.g. number of social artifacts, video game actors generated in the environment, parameters affecting game play, number of possible routes, options available, the degree of ease of play to infer degree of structured problems in game play). Most contemporary research on learning has shown that learning tasks that are situated in some meaningful real-world task or simulated are better understood (Jonassen, et al., 2003, p. 8)

CSP5. Observed evidences for collaborative and conversational learning with game artifacts and facilitator will be collected as humans naturally seek out others (human or game artifact) to help them to solve problems and perform tasks, in learning and knowledge building communities (Jonassen, et al., 2003, p. 8)

3. The criteria for interpreting the findings.
Jonassen et al., (2003) has explicated that meaningful learning has five interdependent attributes - active (manipulative/observant), constructive (articulative/reflective), cooperative (collaborative/conversational), authentic (complex/contextualized) and intentional (reflective/regulatory) - with learning accomplished inferred by participant being able to complete the game activities or task. If the existing Nintendo games used are engaging, with evidences of the five attributes of meaningful learning and accomplishment of game activity goals, then I will infer the observed five attributes are evidences of informal learning taking place.

Case Study Protocol: Data Collection Plan
There were altogether two sessions in this research, where each subject was given a new Nintendo WII game to work through. Each session was about an hour. If any game should prove uninteresting, another game would be offered. The output of the video game was captured in digital video recorder with concurrent videoing of their physical playing. The sessions were as follow:

Session 1. Participants selected a game of their interest and played for about an hour; there was recording of the game console video data with video recorder of participants 1, 2 and 3; there was recording of game play video data with video camera of participants 1, 2 and 3; Researcher Retrospective Reflection to be integrated in discussion.

Session 2. Participants continued with the selected game for another hour. There was recording of game console video data with video recorder of participants 1, 2 and 3; there was recording of game play video data with video camera of participants 1, 2 and 3; Researcher Retrospective Reflection was integrated in discussion.

Validity of Design
Construct Validity. The construct validity of the research design is by establishing a chain of evidence documenting the progress of learning through checking for the listed evidences of the
corresponding study propositions during data collection and thereafter triangulation of analyzed findings from video from video recorder, video from video camera, and retrospective reflection integrated in discussion.

**Internal Validity.** The internal validity is built using pattern matching and explanation-building within and between cases.

**External Validity.** The external validity is built using replication (multiple cases) of high functioning, mild and moderate ASD children.

**Reliability of Design.** The reliability of the research is established by using the case study protocol. This involves using the same procedures for starting the study, collecting data and analyzing data.

**Results**  
**Game Titles Selection**  
**Subject 1 (very high functioning ASD),** browsed through the titles in a game shop and selected Nintendo Wii game “Star Wars: The Force Unleashed” from Lucasarts. The game is rated Teen Violence by Entertainment Software Rating Board (ESRB). The game bridges the two Star Wars trilogies and introduces a new protagonist, Starkiller, as Darth Vader’s secret apprentice. When asked why he selected the game, the reply was that he preferred games with a lot of action, based on movies that he was familiar with, like “Star Wars” and which involves human-like avatars with good realistic computer graphics, animation and sound.

**Subject 2 (moderate functioning ASD) selected Nintendo Wii game “Mario Super Sluggers” developed by Namco Bandai and published by Nintendo. The game is rated for everyone by ESRB. It is a baseball sports video game. He had repeatedly expressed a great interest in this game.**

**Subject 3 (high functioning ASD) did not want to select a game so I suggested “Animal Crossing: City Folk” developed and published by Nintendo to him. As he did not mind, I got the game for him. The game is a simulation of living in a town and it has been reported to be educational in a magazine (Busch & Markle, 2009).**

**CSP1.** The findings for all three revealed that the games did build in opportunities for active manipulation of the game objects with corresponding observation of the effects of what they had done below:

**Subject 1 (very high functioning ASD),**  
Subject initially assumed Darth Vader personality. Just in time onscreen graphic instructions (through pictures of controller and the way to manipulate) were being flashed to teach how to use controllers (Wii Remote and Nunchuk) for a specific attack/defend which he comprehended. Various objects and enemies were then in the way for him to exercise the skills repeatedly. Subject 1 eventually assimilated the skills through overcoming various challenges of his enemies, objects and enemy fires. His competency in using the skills was gradually developed through the constant active manipulation of the game controllers with visual and audio feedback on how well the skills were executed. By five minutes he had grasped the basic skills and exercised the skills to complete...
the first stage within ten minutes. A new video demarcated one stage from the next. Throughout the game, there was the presentation of just in time learning of required skills with constant presentation of enemies to exercise all the skills shown for survival. When the failure to use certain skills was detected by the game intelligence, visual hints of how to execute the powerful attack maneuver were superimposed on the scene in context to provide immediate aid. Subject 1 managed to complete the game in 10 hours.

Subject 2 (moderate functioning ASD)
Subject did not read written instructions and would quickly skip the written and graphic instructions. He, however, read the graphic instructions when he failed multiple times or when the superimposed controller was graphically and explicitly shown with large arrows while in game play for just in time coaching. He eventually mastered the basic skills (batting: normal swing, fielding: throwing the ball) through learning with the active manipulation and immediate feedback that offered plenty of opportunities to correct and fine-tune his batting or fielding skills in baseball by twenty minutes.

Subject 3 (high functioning ASD)
Subject quickly skipped screen instructions and only read when a response was required. Through trial and error and active manipulation and observing the immediate feedback of game affordances, he gradually learnt the basics of the game by himself (e.g. assessing menus, reading maps, walking to different houses, pushing trees to drop pears, pick up pears, checking his pocket for items) within 8 minutes.

CSP2/CSP3/CSP4. The findings for all three subjects in their respective games show that CSP2, CSP3 and CSP4 are closely inter-related and evident in the observations.

Subject 1 (very high functioning ASD), “Star Wars: The Force Unleashed” started with a cinematic movie clip with fantastic 3-D animations, impressive computer graphics, immersive soundtrack and compelling storyline, which he quickly related to, as he has watched the Star Wars movies series, including the existing current television series run of Clone Wars, a computer generated animation show. He assumed the identity of the infamous Darth Vader, who is a very powerful Jedi and fights his way in the first mission. The game environment does certainly simulate an authentic environment as it not only looks like the movie environment but the character also moves and sounds like Darth Vader, and has the same power (able to lift enemies and fling them around through using his force). The opportunity to try out the dark powers of Darth Vader with realism in the game makes the gaming environment engaging, contextualized and complex (CSP4) as what is going to happen next is an unknown as evidenced from the total attention to the game play (eyes glued with synchronised hand coordination without signs of fatigue). The aim to discover how to unleash the power of a powerful Jedi had certainly led the subject to learn by try different techniques (CSP3) as evidenced by him referring to menu options for more information on the arsenal and how best to increase the power, whereby reflection and constructing of the knowledge was expected especially when the new skills (saber lock, force lock, dash, finishing moves, etc) were integrated and used appropriately and dynamically with enemy attacks that were incessant and powerful(CSP2). Upon completing each stage, one is rewarded with another cinematic video clip that provides the context (CSP4) for the new mission (CSP3), where new skills of new found tools (e.g. Jedi Holocron) are presented in each stage to be mastered (CSP2).
**Subject 2 (moderate functioning ASD)**

Subject 2 was captivated by the starting video clip showing a grand entrance of the familiar Nintendo characters as they gather to compete with each other in baseball, as he did not skip the video each time he started the game. His eyes were focused on the screen even though he had cut off the sound effects due to sound sensitivity. He also watched a recording of it repeatedly on the Internet YouTube. He was probably imagining himself as Luigi, his favourite character, as he selected Luigi to be the captain of the baseball team and he played carefully when Luigi was batting or fielding. The game environment did certainly simulate an authentic environment as he could move around with familiar characters and interact and play baseball games with them. The opportunity to be Luigi and play baseball with realism in the game makes the gaming environment engaging, contextualized and complex (CSP4) as the physics of the batting, fielding and ball projectory are realistic as evidenced by his total attention to the screen accompanied by utterances of happy sounds and jumps. The interplay between characters in the baseball team is also complex to coordinate so as he entered the challenges in the game, he could be observed to intentionally learn new skills (CSP3) by his attempt to try out the just in time graphic instructions showing how to move the controllers superimposed on the game play. With trial and error, practice and watching the immediate feedback, he probably reflected on his game play experience and constructed his learning on executing the skills required (CSP2). Evidence of learning is observed by his mastery of the skills in game play.

**Subject 3 (high functioning ASD)**

The game created an authentic and engaging environment with good computer graphics and realistic animations and by allowing the player to decide his own name, name of town, date and time of game play. For instance he set the date/time/year as 2035 which the game accepted nevertheless and he was travelling on a bus towards a town named after his choice, with the option to buy a house and find work. As the subject is fun loving with a mischievous trait, he was elated when all the settings were accepted. He enjoyed the interactions with Rover as shown by his facial expressions. He appeared engaged and he looked forward to what would come next (CSP4). With the arrival of the bus in town, he alighted quickly and did not read instructions to go to the town house. He quickly walked around to explore the town, an intentional learning activity (CSP3) and through trial and error and probably reflections, he constructed learning of the value of the map in relation to his game play positions as evidenced by frequent comparing of his position to the map (CSP2).

**CSP5.** All three subjects did seek opportunities for cooperative (collaborative and conversational) learning with the game artifacts and facilitator to different degrees depending on functioning and literacy level.

**Subject 1 (very high functioning ASD).**
Subject has been observed to search the Internet and converse with his other classmates on techniques, strategies, hints and game cheats to win the game, a cooperative (collaborative and conversational) learning with his social network and network resources (CSP5).

**Subject 2 (moderate functioning ASD)**
Subject when encountering frustrating situations had approached the facilitator for help. Through the interactions with the game and the facilitator, the subject learnt the need to be patient enough to read the screen instructions that were not superimposed, when the facilitator deliberately refused to help, claiming ignorance and the subject had to learn through reading of on screen hint instructions. The frustrating situations of losing multiple times had probably created opportunities for cooperative (collaborative and conversational) learning (CSP5).

**Subject 3 (high functioning ASD)**
The challenges for the subject were greater because the just in time instructions were ignored. Only after failing many times did he read the instructions. His pride and desire to boast of success prevented him from asking for help. For example, he had to greet everyone in town before he was given part-time work by Tom Nook. As he was not careful in checking the menu for names to ensure he had seen everyone by using the map, he did not complete the task of greeting everyone after half an hour. He was visually showing boredom. I had to intervene to encourage him to check the information by prompting. He eventually completed the greeting within the hour and started getting work. He managed to write letters, write on bulletin boards, work for financial gains to pay off his mortgages of his house. With some help and encouragement, by one hour and twenty minutes, he no longer worked for Tom Nook as he finished all the part-time work and he started working for himself by fishing, harvesting pears, growing plants and collecting seashells with many interactions of transactions with Tom Nook (CSP5) and reading the instructions.

**Discussion**
The findings from this limited study revealed that autistic children can and do learn informally from video games to different degrees, depending on the functioning and literacy level, the intended skills and understanding from the design of commercial off the shelf (COTS) popular games of established game publishers such as from Nintendo and Lucasarts. The common findings from all three subjects reveal that they do not read manuals or even onscreen instructions unless they consider it important to do so. The subjects would prefer to go straight into playing the game and learning how to play through trial and error or learning by doing (Jonassen, et al., 2003). Establish game publishers are probably aware of this trait and provide just in time visual guide or hints which are simple, superimposed onto the screen in game play when need arises, such as to introduce new skills or to offer help when repeated failures to use the required skills are detected. The active manipulation of affordances of the game and the immediate visual and audio feedback (CSP1), coupled with diverse and numerous opportunities to practice the skill in game context, certainly aid in meaningful learning and assimilation of the required manipulative skills needed to overcome the challenges. This also provokes, promotes and supports the player to want to intentionally learn the skills and strategies (CSP3) needed to win by providing just in time, visually simple and direct help. The constant onslaught of instances to use skills with immediate feedback probably helps in the construction of learning of the skills as well as assimilation. The sampled subjects support the finding that autistic people do not have impairment in their understanding of physical causality.
Reflecting on the current and past observations, autistic people learn best when the game information presented is visually clear, simple, singular in purpose and timely. For example, graphic pictures of the physical game controller with large arrows to show direction to manipulate the controller, superimposed in game play, provide immediate feedback that is clear and to the point without distractions. It is also apparent from past reflections and existing study there is the need to allow for freedom to explore the game environment and have fun, such as to walk around in and out of different sub-game environment and to play with the artifacts. For example, subject 3 liked to find snow balls and roll them around until they became very big and then either use them to block doors of other town residents or to throw them into the river and see them bob up and down while dissolving and becoming smaller with time. Perhaps, in retrospection, the need is due mainly to our need to do something when we are frustrated or looking for simple fun to amuse ourselves out of boredom. Nintendo is certainly very aware of this human trait and has catered for it.

All three subjects were observed to need captivating and compelling reasons to want to play the game, normally facilitated by watching the starting video trailer of game, which encapsulates the authentic, complex and contextualized game environment (CSP4). The high quality graphics, sound effects, computer animation, realistic movements of avatars and objects and interactions, together with the affordances described earlier (CSP1, CSP2, CSP3) created an immersive environment where situated cognition of the game subjects is transactional with the game artifacts and subjectivist depending on the background knowledge and ability of the subject. All three subjects actually sought help when the difficulty level was high through the game artifacts, the facilitator and/or the social networks available (CSP5). The informal learning witnessed was thus through social constructivism.

A potential area for further research is the use of games such as “Animal Crossing: City Folk” to help autistic people learn and understand a representation of a society with all its activities that encapsulates life in society. For example, subject 3 made his living in the game by catching and selling fishes, harvesting and selling pears to Tom Nook and used his earnings to pay his mortgages for his house. He also generously donated some of his earning to charity and also bought and decorated his home with many different type of furniture. Currently, it is not easy to find ways to help autistic people acquire such complex concepts like society. The game allows “children to live in worlds that they are curious about, or afraid of, or want desperately to try out” (Shafer, 2006) and implicitly it is because they want to understand the rules, roles and consequences of those worlds. Moreover, it also provides a safe virtual environment to understand the potential reality of surviving in a real world, with room for failure and thus making learning experiences less painful, compared to the harsh realities of life.

Conclusion

The current study findings reveal that Nintendo games that are of interest to my adolescent children engage them in meaningful learning through the incorporation of the five attributes of meaningful learning proposed by Jonassen et al., (2003). The study also supports the effectiveness of just-in-time simple and direct visual instructions superimposed in game play, fun elements and opportunities to explore the game environment in game design for autistic people. A potential area for further research is the use of game simulation of virtual worlds to help autistic people learn,
appreciate and survive in our complex societies, safely and without being scarred by the harsh realities.

Limitations of Study
There are several limitations noted in this study. These are mentioned briefly below:
1. The author acknowledged that the study and reporting could be more detailed. The author allowed the subjects to choose the games just before the study started, so that they would be interested to play the new games. As a result, author did not master the games before starting the study and he learnt at the same time with the subjects during game play.
2. The author encountered technical problems in processing and transcribing the videos in Windows Vista, reducing time for reporting.
3. The planned scope of the study was originally larger but was reduced when technical problems were encountered.

References


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A quasi-experimental study

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Abstract
Research on dysgraphia has been rather sporadic and this becomes even more obvious when the focus is on dyslexic dysgraphia. Although dyslexia and dysgraphia appear unrelated, they are often found to co-exist. In addition to the problems encountered in phonological decoding or reading, children with dyslexic dysgraphia also manifest difficulties in spontaneous writing or spelling, but they are able to draw or copy and their finger-tapping speed (a measure of fine-motor speed) is within the normal range for age and grade levels. Twelve children aged between 7 years 10 months and 9 years 7 months were randomly selected to participate in this quasi-experimental study which used the single-group pre-test-post-test research design to determine if cursive handwriting as an intervention strategy was effective to improve their reading and spelling performance. The results showed that both reading and spelling processes were more closely intertwined than cursive handwriting with either reading or spelling process. Hence, the impact of cursive handwriting on either reading or spelling or both was found to be insignificant.

Introduction
In the current literature, dysgraphia has received far less attention than dyslexia (Brunsdon, Coltheart, & Nickels, 2005). Moreover, most research studies (e.g., Rapcsak, 1997; Robinson & Weekes, 1995; Romani, Ward, & Olson, 1999) on dysgraphia have emphasized on its theoretical aspects and neglected investigation of intervention strategies for children with such a learning disability. However, there has been a steady growth of research interest in studying various intervention strategies and their efficacies (e.g., Beeson, Hirsch, & Rewega, 2002; Luzzatti et al., 2000; Rapp & Kane, 2002) for agraphia, but few published single-subject or multiple single-subject intervention case studies of developmental dysgraphia (e.g., Brunsdon, Coltheart, & Nickels, 2005).

The term dysgraphia has been used to include both developmental and acquired types. Strictly speaking, developmental dysgraphia should not be confused with acquired dysgraphia, which is also known as agraphia (Seron et al., 1980). The former is of constitutional origin (hereditary), while the latter is due to brain injuries or strokes. In this investigation, our focus is on developmental dysgraphia and this term will be used interchangeably with dysgraphia. For acquired dysgraphia, we
prefer to use the term agraphia so as to avoid confusion between developmental and acquired dysgraphia.

Dysgraphia, also known as developmental surface dysgraphia (Brunsdon, Coltheart, & Nickels, 2005) and developmental output failures (Kay, 2008), is a learning disability of written language that is constitutional in origin (Deuel, 1995), characterized by (1) an inability to perform motor movement that results in laborious copying from any printed text, untidy or illegible handwriting (also known as cacographia), and poor transcription (Barchowsky, 2008; Willingham, 1998); (2) a serious difficulty in using letters to construct words in accordance with accepted usage and conventions, or committing many misspellings (also known as dysorthographia) (Chia, 2009a; Gerber, 1986; Marshall & Hunt, 2005); and (3) an extremely poor ability to express ideas adequately or clearly resulting in a bad composition. As such, the writing ability of an individual with this impairment falls substantially below what is expected given his/her age, intelligence, and education, such that his/her academic performance and daily activities are significantly affected (Pierangelo & Giuliani, 2006). Emotional factors arising from dysgraphia will often exacerbate the problem (King, 2000). Dysgraphia among children can persist into adolescence and adulthood (Isaacson, 1987).

**Characteristics of dysgraphia**
A list of characteristics which classifies the symptoms of dyslexia into three core areas have been identified (Chia & Ong, 2009). They are difficulty in motor movement, problems in recalling spelling and having difficulties with written expression of ideas and thoughts. Children with symptoms of dysgraphia display a lack in eye-hand motor coordination and may need specific instruction on how to hold a pen or pencil appropriately. They are unable to perceive and/or remember visual images (letters of the Alphabet) accurately. This results in a poor formation of lowercase and/or uppercase letters and confusion in mixing lowercase and uppercase letters used in writing/spelling words (e.g., _AN A_pPle Is rED_. The written product of children with dysgraphia is illegible, untidy and difficult to read. Added to the confusion in demonstrating letter formation, difficulties in spelling and word construction further weaken attempts at writing in a legible fashion. (Pierangelo & Giuliani, 2006) The spelling of a single word may result in five or six different ways of it being spelt. Auditory channel deficits may cause many auditory misspellings (Chia & Ong, 2009). For instance, there may be a display of auditory confusion in selecting certain phonograms, e.g., t/d, ð/ɑ, m/n. The lack of auditory acuity or discrimination problems can cause substitution errors in spelling of words that sound similar (e.g., _beg/bag_). In some situations children with dysgraphia spell through auditory-visual association resulting in errors, e.g., spell _house_ is used for _home_. Finally, the child has a poor or inadequate auditory-visual associative memory and makes wild guesses with little or no relationship between the letters and words used. (e.g., _dog for home, phe for horse_).

Children with dysgraphia may have “visual channel deficits that can cause many visual misspellings” (Pierangelo & Giuliani, 2006, p.51). The visual memory problems may result in omission errors in spelling (e.g., spell _goverment_ or _goverment_ for _government_); errors in visual memory sequence (e.g., spell _tragedy_ for _tragedy_); problems in displaying visual discrimination (e.g., inversion errors in spelling _uap for nap, raw for ram_). Children with poor or inadequate visual
memory may display manifestations such as spelling non-phonetic words phonetically (e.g., spell *tuff* for *tough*). Other spelling errors displayed include adding unneeded letters, reversing vowels in digraphs (e.g., *ie*/*ei*, *ue*/*eu*), reversing the positions of syllables (e.g., *relevant*/*revelant*), and using phonemic spelling for non-phonemic words. For some children, the consequence of this very conscious effort is a display of fatigue.

There is also a disinterest in writing and/or drawing and a feeling of being overwhelmed or stress when attempting to get started to putting ideas or thoughts in writing. The child with dysgraphia struggles with the organization of ideas in composing a written product (e.g., a story) resulting in a lack of fluency in written expression. This results in words being written incomplete and/or being omitted while writing. The speed of the writing oscillates between fast and slow. To overcome the obstacles the child with dysgraphia resorts to writing sentences with a less complex structure, incorporates fewer ideas in written expression and submits work that is too brief and is too poorly organised to form a cohesive and coherent discourse. The end result is that the reader has difficulty in understanding the writer’s intent (Chia & Ong, 2009). Some children try to rise above the confusion by speaking words while writing. This vocalization is a suggested form of getting the child to recall and focus on the written task (Eide & Eide, 2006). For a child with dysgraphia, explicit instruction on how to use the strategy is necessary so that it becomes an aid and not a further hindrance.

The net result of being afflicted with dysgraphia is that the child displays low classroom productivity and though rare, may experience pain while writing but attribute it to muscle ache or cramping, and consider it only a minor inconvenience. Complaints from teachers about incomplete homework assignments and inattentive behaviour in class are frequent. With such frustration and lack of sense of achievement, it would be inevitable that the child with dysgraphia is a candidate for stress and stress-related illnesses (Chia & Ong, 2009).

Dysgraphia can co-exist with other learning difficulties. They include dyslexia or specific learning/reading disability, dyspraxia or developmental coordination disorder, attention deficit/hyperactivity disorder, visual-spatial perceptual disorder, dysorthographia or specific spelling disorder, academic anxiety syndrome and stress-related issues, autism spectrum disorders (including Asperger syndrome); and Tourette syndrome (Chia & Ong, 2009).

In Singapore, very little specialized help is provided to help children diagnosed with dysgraphia. In fact, most of these cases are treated like dyslexia since dysgraphia is also one of the specific learning disabilities and are often referred to the Dyslexia Association of Singapore (DAS) for remedial intervention. Although dyslexia and dysgraphia are often found to co-exist, it is not always true that an individual with dyslexia will have dysgraphia and vice versa (Chia & Ong, 2009; Wagaman, 2008). In one study Fine (2008) has found that there are individuals with dyslexia with and/or without dysgraphia. For those who have dyslexia without dysgraphia, Paulesu et al. (1996) and Vicari et al. (2005) have called it the functional disconnection syndrome.

The authors’ reasons for choosing to focus on dysgraphia for this study are threefold. Firstly, they feel strongly that more has to be done in understanding dysgraphia as a specific learning disability so that better intervention strategies can be developed to help these children. Secondly, they have
chosen to work on one particular subtype of dysgraphia, that is, the dyslexic dysgraphia in which dyslexia and dysgraphia appear unrelated but happen to co-exist. However, such an individual does not necessarily have dyslexia (Wagaman 2008). Lastly, both authors are interested to find out if developing good penmanship (in this case, cursive handwriting) can help children diagnosed with dyslexic dysgraphia improve their reading and spelling performance.

Literature Review
In order to understand dysgraphia, it is important to recognize the complexity of writing as an expressive language process “involving the integration of eye-hand, linguistic, and conceptual abilities” (Pierangelo & Giuliani, 2006, p.47). The term written language refers to a variety of three interrelated graphic skills as described briefly below:

Handwriting and transcription
Handwriting and transcription are two different forms of motor skills; the former is graphomotor and the latter, psychomotor. The term psychomotor relates to movement or muscular activity associated with mental processes and affects, while graphomotor concerns movements used in writing (Chia, 1999, 2001). “Transcription is a psychomotor skill involving spelling, legibility, punctuation, capitalization, and indenting (or paragraphing)” (Chia, 1999, p.5). It overlaps with handwriting which is “a graphomotor skill … involving memory of letter formations, spelling, grammar, context and more” (Barchowsky, 2008, p.1).

Spelling
Spelling appears in both transcription and handwriting. In addition to the mechanics of proper formation of uppercase and/or lowercase letters, spelling is also a cognitive process involving both auditory-sequential and visual-spatial processing of letter sounds and letter symbols in phoneme-grapheme correspondence applied in word formation governed by morphophonemic rules (Carlisle, 2000; Carlisle & Stone, 2005; Singson, Mahoney, & Mann, 2000) and orthographic conventions (Badian, 2005; Casalis, Cole, & Sopo, 2004; Mann, 2000).

Composing and composition
The term composing is a process while the other, composition, is a product. The other term writing is sometimes used interchangeably with composing to mean the same thing. According to Harris and Hodges (1995), writing is “the process or result of recording language graphically by hand or other means, as by letters, logograms, and other symbols in which a meaningful set of ideas is expressed” (p.284). However, Bromley (1988) described writing as a composing process that requires the use of expressive language to construct meaning graphically, and added that by “composing”, it means forming in combination or creating. Hence, the process of composing involves more than just writing; it is a cognitive process of putting ideas and thoughts into print for a purpose whose meaning can be understood by the writer himself/herself and/or understood and shared between the writer and a reader, i.e. written expression. In other words, when a person writes, he/she also composes or creates meaning with words (Chia, 2005). Chia (1991, 1994, 2007) has defined writing as an exercise of imagination in the mind of a writer expressed in written language as the writer creates or sub-creates a written product (e.g., a letter for job application, a report or a story). In addition to writing, higher cognitive and/or meta-cognitive processes such as imagining,
plotting, proof-reading and editing are also involved in the process of composing (Chia & Ong, 2009) (see Figure 1).

Figure 1: Model of Composing Process (Chia & Ong. 2009)

![Diagram of Composing Process]

In brief, written expression requires an individual “to synchronise many mental functions at once: organization, memory, attention, motor skill, and various aspects of language ability. Automatic accurate handwriting is the foundation for this juggling act” (King, 2000, p.1). An individual who manifests deficit(s) in any of the three interrelated graphic skills may suggest the possibility of having dysgraphia that can interfere with the individual’s ability to express his/her ideas and thoughts in written form.

Writing = composition + transcription + imagination?

Do the terms writing and written expression as well as composing and composition mean the same thing or are different? Literature on language and literacy arts education has never been clear about the definitions of these terms including transcription and handwriting. The understanding of these terms will help us better understand the real issues involved in children with dysgraphia. The main question to ask is whether dysgraphia is a disorder of (1) writing and written expression or (2) composing and composition or (3) both. Chia (2005) has argued that “writing is more than just both composition and transcription; it also includes imagination” (p.1) that is to say that a child with dysgraphia might have a problem with his/her imagination – the thoughts and ideas that are essential for creating a written product such as a story.

According to Bromley (1988), composition is “the mental act of creating ideas, identifying, and selecting words, and using appropriate grammar. Transcription, on the other hand, is the physical act of spelling, legibility, punctuation, capitalization and indenting” (p.295). However, without imagination, Chia (2005) argued, “composition cannot occur, and without composition, transcription cannot take place” (p.1). Imagination is that “affective process of
evoking ideas, thoughts and feelings that are based on one’s prior knowledge and past experiences” (Chia, 1994, p.47).

Composition and transcription sometimes conflict since they occur concurrently; and one often impedes the progress of the other. For instance, if our children are overtly concerned about proper spelling and punctuation, they may be unable to transcribe or communicate their ideas. Or our children sometimes misspell or omit words because their ideas flow faster than their ability to transcribe what they are thinking. Problems with transcription may also stifle creativity and that is what we have often observed in children with dysgraphia.

Causes of dysgraphia

Debates concerning the causes of dysgraphia are still on-going and experts are unable to pinpoint exactly what causes dysgraphia. No single cause has been implicated but it is generally agreed that there are two main types of dysgraphia which can be classified according to their respective causes. The first type is often observed and/or diagnosed in children. Known as developmental dysgraphia, it is inherited and often there is a tendency for some of their family members or close relatives to exhibit dysgraphic symptoms. The second type occurs in an adult and is usually caused by head trauma, some types of diseases or brain damage. This is known as acquired dysgraphia or agraphia.

Several studies (e.g., Chia, 2009b; Cubelli & Lupi, 1999) have suggested that dysgraphia involves a serious dysfunction in the interaction between the brain’s two main efferent systems that allows an individual to translate mental into written language, p. (1) phoneme-to-grapheme translation, i.e., sound to symbol; and (2) lexicon-to-grapheme translation, i.e., mental to written word. The dysfunction results in difficulties that include spelling errors, word omission and substitution, punctuation, non-grammatical sentences, and lack of organization (Englert & Thomas, 1987; Gerber, 1986). These errors reflect an underlying deficiency in syntactic and morphological knowledge (Rubin, Patterson, & Kantor, 1991). As children with dysgraphia progress through school, these writing difficulties become even more evident (Owens, 2004).

There are also studies that have shown other causes of dysgraphia due to split attention or attention deficit-hyperactivity disorder (Sattler, 1988), memory overload (Eide & Eide, 2006; Fincher, 1997), haptic perception deficits (Hardman, Drew, & Egan, 1996), auditory processing deficit (Niemann, 1996), inability to construct words using uppercase and lowercase letters in accordance with accepted conventions (Chia, 2009a), and insufficient writing practice (MacArthur, 1996; Wanderman, 1997) that affects writing ability. According to King (2000) and Deuel (1995), a typical individual with dysgraphia manifests an illegible handwriting associated with poor fine-motor coordination, inability to re-visualize letters, and difficulty in remembering the motor patterns of letter forms.

Subtypes of dysgraphia

Research studies (e.g., Chia, 1999,2001; King, 2000; Robinson &Weekes, 1995) have identified several subtypes of dysgraphia and there are also individual variations that affect both treatment and prognosis. The current research interest is to determine the root causes
and more specific types of dysgraphia. Below is a brief description of each subtype of dysgraphia.

**Dyslexic dysgraphia**
This subtype of dysgraphia is associated with “difficulties in producing spontaneously written text or spelling; however, drawing or copying or finger-tapping speed (a measure of fine-motor speed) are within the normal range for age and grade levels” (Pierangelo & Giuliani, 2007, p.23). Although dyslexia and dysgraphia appear unrelated, they are often found to co-exist. However, a person with dyslexic dysgraphia does not necessarily have dyslexia (Wagaman, 2008).

**Motor dysgraphia**
Also known as motor agraphia (Barriere & Lorch, 2003; Ogle, 1867), this subtype of dysgraphia is due to motor clumsiness (Kay, 2008) as a result of deficient fine motor skills, poor dexterity, poor muscle tone, or unspecified muscular incoordination (Deuel, 1995). Motor dysgraphia may be part of the larger problem of motor apraxia. Generally, written work is poor to illegible, even if copied by sight from another document. Letter formation may be acceptable in very short samples of writing, but this requires extreme effort and an unreasonable amount of time to accomplish, and cannot be sustained for a significant length of time. Letter shape and size becomes increasingly inconsistent and illegible. Writing is often slanted due to holding a pen or pencil incorrectly. The spelling skills are impaired and the finger tapping speed results are below normal.

**Spatial dysgraphia**
This subtype is due to a defect in the understanding of space (Kay, 2008). As a result of this defect in the understanding of space, an individual with spatial dysgraphia displays normal spelling and normal tapping speed but illegible spontaneously written work and illegible copied work.

**Phonological dysgraphia**
According to Chia (2001), this subtype of dysgraphia refers to “individuals who are able to repeat spoken non-words immediately or after a delay, but make numerous errors when spelling or writing non-words (e.g., *pog, foop* and *tep*) to dictation. Word writing is largely preserved apart from occasional derivational substitutions (e.g., *ascend* is spelled *ascent*). “They are unable to segment words into phonemes or write letters in response to their sounds” (p.39).

**Lexical dysgraphia**
While this is a rare subtype of dysgraphia, it is more common in languages such as English and French, which are less phonetic than a language such as Spanish. According to Chia (2001), it is evident in individuals who “are able to write non-words to dictation while committing many errors on words containing ambiguous segments. Their difficulty is not due to failure to comprehend the words. Errors occurred on irregular or ambiguous words tended towards regularization (i.e., production of phonetically plausible spellings). “The performance of these individuals on non-words is almost perfect” (p.39).
**Dysorthographia**

Because written language is involved here, specific learning disability in spelling is sometimes considered as a subtype of dysgraphia (Chia, 2009a). Symptoms observed in dysorthographia include addition of unnecessary letters, omission of necessary letters, reversals of vowels, consonants and/or syllables, phonemic spelling of non-phonemic words, and difficulty in understanding the letter-sound/sound-letter correspondence (Pierangelo & Giuliani, 2007). In addition, because the underlying deficit of dysorthographia involves poor or inadequate phonological processing, this disorder is also associated with dyslexia.

**Cacographia**

It is also known as pseudo-dysgraphia. Though not considered as a true subtype of dysgraphia, cacographia is the most common writing problem and it concerns poor or illegible handwriting or penmanship. Poor handwriting may often result in poor spelling skills. Some of the cacographic symptoms or characteristics are “incorrect letter formation, inconsistent height of letters, variable slant of down strokes, poor alignment, incorrect joins, incorrect spacing between letters or words, and poor presentation” (Chia, 2001, p.37). According to Chia (2001), there are two ways in which cacographia contributes to misspellings: (1) handwriting or transcription errors that make a word look like another word; and (2) slow, laboured writing or formation of letters that causes an individual to forget the word he/she is trying to spell.

**Identification of children with dysgraphia**

To identify children with dysgraphia, Chia and Ong (2009) have proposed that their case histories and records of their past performance in penmanship, spelling and written expression must be examined first. Any child suspected to have dysgraphia should be referred to a registered psychologist or board certified therapist for a psycho-educational assessment, e.g., the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991) or Fourth Edition (WISC-IV) (Wechsler, 2003). This is to assess the child’s intellectual ability, but more importantly, to identify a learner with dysgraphia from other disabled learners.

In one single-subject case study conducted by Brunsdon, Coltheart, and Nickels (2005), a child diagnosed with developmental surface dysgraphia was found to perform poorly on the following four subtests of WISC-III (Wechsler, 1991): Arithmetic, Digit Span, Coding and Symbol Search. Muter and Likierman (2008) have also found children with motor dysgraphia to perform poorly on the Mazes subtest of the WISC-III Performance Scale. Kay (2008), in her study on dysgraphia, has noted poor scores in the Processing Speed Index from the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) (Wechsler, 2003) when comparing with the other three WISC-IV indexes, i.e., Verbal Comprehension Index, Perceptual Reasoning Index and Working Memory Index. In a recent single-group pre-test/post-test quasi-experimental research study on a group of ten children diagnosed with dyslexic dysgraphia conducted by Chia (2009b), the Verbal IQ were found to be lower than Performance IQ in all the subjects. In addition, the subjects were also found to satisfy the Bannatyne’s (1971) dyslexia profile as follows: the sum of WISC-III subtest scores on Sequential Category (Digit Span, Picture Arrangement, Coding) < the sum of WISC-III
subtest scores on Conceptual Category (Comprehension, Similarities, Vocabulary) < the sum of WISC-III subtest scores on Spatial Category (i.e., Picture Completion, Object Assembly, Block Design). Poor WISC-III subtest scores on Acquired Knowledge Category (Information, Arithmetic, and Vocabulary) were noted too.

In addition to the WISC-III or WISC-IV administration, Kay (2008) has recommended two other categories of assessments useful in diagnosing dysgraphia. In the first category of assessment, one or more of the following should be included for administration: Developmental Test of Visual-Motor Integration, Bender Visual-Motor Gestalt Test, Jordan Left-Right Reversal Test, and/or trails tests from the Halstead-Reitan Neuropsychological Test Battery. In the second category of assessment, one or more of the following should also be administered: Test of Written Language-Third Edition, selected subtests from the Aston Index-Revised, Woodcock-Johnson-III Battery (which consists of two distinct, co-normed batteries: tests of achievement and tests of cognitive abilities) and/or Wechsler Individual Achievement Test-Second Edition.

The rationale behind the administration of all the above suggested assessment battery is to provide a comprehensive screening of an individual suspected to have dysgraphia. This is because “dysgraphia cannot be diagnosed solely by looking at a handwriting sample” (King, 2000, p.1) or a piece of written expression. Moreover, it is not enough to assess “only the finished product, but also the process, including posture, position, pencil grip, fatigue, cramping, or tremor of the writing hand, eyed-ness, handedness and other factors. The examiner may assess fine-motor speed with finger tapping and wrist turning” (King, 2000, p.2).

**Intervention programmes for children with dysgraphia**

Dysgraphia and its potential severity on the educational impact on a child is often a very misunderstood learning disability in our mainstream schools. As a result, the issue of concern relating to handwriting difficulties and the various solutions thought to be effective are often not appropriately addressed for children diagnosed with dysgraphia in both regular classroom and resource room. Most teachers might have mistaken that repeated handwriting practice alone would improve the ability of a child with dysgraphia to use paper and pen or pencil as a useful tool to complete all his or her written assignments. In reality, this is rarely the case (Chia & Ong, 2009).

While occupational therapy is helpful to a certain extent in improving the handwriting of a child with dysgraphia, it must not be forgotten that as the child grows older and moves on to higher grades, written demands also increase. As a result, many of these children begin to feel frustrated and stressed out when they are unable to cope with their written assignments (Johnson & Carlisle, 1996). It is, therefore, not surprising to find many of them choosing to write the minimum for their class essays or giving incomplete answers, ungrammatical sentences or short phrases to reading comprehension questions. To a significant degree, their attitude towards studies and academic self-esteem can be negatively impacted. Emotional behavioural challenges related to their frustration in failing to complete written tasks start to crop up.
Chia and Ong (2009) have argued that a successful intervention programme for children with dysgraphia should be a two-pronged approach. First, the teachers should determine when and what accommodations need to be provided to these children. To do so, they must meet with the child and/or his/her parents to express concern about the child’s difficulties in written expression, and be prepared to listen to the child’s perspective, which is often ignored. Second, the teachers should work with allied educators and other professionals who can provide additional learning and behavioural support especially in the area of emotional needs.

When considering accommodating or modifying expectations to help children with dysgraphia, Jones (1999) has offered several recommendations. One of them is that more time and/or special arrangements be provided to the child to complete his/her written tasks (e.g., note-taking, test taking); the start time for projects/assignments should be earlier or ahead of the peers; a buddy should be assigned to help him/her; and where possible, keyboarding should be allowed in place of hand written work. Another recommendation is to allow some accommodations to such a child to partially complete a written assignment (e.g., to come up with an outline of an essay with the main headings and sub-headings before embarking on it; assign a scribe to take what has previously been written. Finally, the teacher could provide the child with instruction and worksheets as this removes the necessity of copying work from the board.

As writing is a complicated task, it is always important to reduce its complexity. Jones (1999) has suggested that this can be achieved by breaking writing into stages and teaching the child to do the same (e.g., in the process writing activity: brainstorming for ideas, drafting, editing, and proof-reading). Furthermore, the critique of the teacher should focus on the content of the written draft and there should not be any emphasis of the number of spelling errors made in the written draft. Alternatively, the child should be allowed to use a spell checker. In addition, Jones (1999) has raised the need to consider tools such as pencil grips, mechanical pencils, fountain pens and triangular shaped pencils which help the child hold the writing instrument correctly; adopting penmanship style such as cursive handwriting or manuscript to write depending on whichever is more legible; use writing surfaces such as paper with raised lines to keep writing on the line; to use paper of different colours; and to utilise assistive technology that includes the use of a word processor as one possible option if the child shows severe hearing impairment; and use of speech recognition software if the child has an underlying speech challenge. Finally, Jones (1999) has argued that children with dysgraphia be allowed to submit oral reports and visual presentations using the Microsoft™ PowerPoint. The teacher may want to establish a rubric to define what the child needs to include in the report and/or presentation.

**General pedagogical principles when working with children with dysgraphia**

Chia and Ong (2009) advise that pedagogical principles should be borne in mind when working with children with dysgraphia. Labelling children with dysgraphia with terms such as “useless”, “lazy”, “careless” and “unmotivated” can damage their self esteem. Levine recommends that laziness should be seen as the child having output failure due to suffering from hidden handicap/s that disrupt/s and interrupt/s the child’s output (Levine, 2003). The teachers, the parents and other professionals in the school system such as the learning support coordinator, the counsellor, the special needs officer and the professionals beyond the school...
system such as the occupational therapist need to work collaboratively to understand and support the child. Their respective individual actions and goals can be formalized, and documented into an Individualized Education Plan which maps out the appropriate and adequate paths that need to be undertaken to ensure that the child receives the appropriate treatment to address the output failure (Tod, Castle, & Blamires 1998). This collaboration allows for the overall treatment to be viewed as part of a team effort rather than fragmented and individualized treatment which may not take into consideration the input of others.

Moat (1994) views teaching children how to read and spell as a very demanding task. Teachers need to be aware that regardless of their level of motivation and experience, they need to have in possession knowledge about spoken and written language structure. Teachers need to be updated on how to deliver lessons of phonemic awareness and the orthographic system of the English language, they need to understand the relationship between spoken and written language, and finally, teachers must be able to analyse how children spell and read (Moats, 1994). Inculcating classroom practices based on a range of research-based components and practices will enable the teacher to better interpret the errors of the children and prescribe the relevant treatment for teaching single word reading and spelling. Finally a well skilled teacher will be able to integrate the skills of single word reading and spelling into a global language arts program (Moats, 1999).

Children with dyslexic dysgraphia benefit from learning and expressing what they have learned via the multisensory approaches and when the planning for the remediation takes into account the auditory, kinaesthetic tactile and visual preferences of each individual child (Henry, 1998; Markova, 1992). Gillingham emphasises that the learning experience should be a time when the child experiences joy and actively participates in the activities whilst acquiring the structure of language necessary for demonstrating reading and writing (Appelle, Banyas, & Goranson, 1997) The multi pronged multisensory presentations allow the child to form and reinforce accurate patterns necessary for future recall (Eide & Eide, 2006).

Finally, a child with dyslexic dysgraphia benefits when there is support by a buddy or somebody who is responsible, patient, understanding and keen to be a good friend and render help in times of need. There is no one best way to teach children with dysgraphia. Experience and creativity are needed to make the lesson delivery suitable and meeting the needs of the child with dyslexic dysgraphia. As no two children with dyslexic dysgraphia are alike, there is a need to customize and/or redesign the teaching intervention strategy to meet the needs of the specific child.

**Cursive handwriting as an intervention strategy**

The acquisition of transcription ability for spelling and handwriting needs to be viewed as an explicit and specific step by step process with four distinctive phases which overlap and are continuously reviewed and returned to for the purpose of recall as well as for being the platform for providing additional input in terms of learning new phonemes, syllable patterns, generalisations, sight words and acquiring the etymology of words of foreign origin (see Figure 2).

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**Figure 2: Phases in process to acquire transcription skills for reading and spelling**
Phase 1: Developing psychomotor transcription conventions

It is important at the beginning to ensure that the child is psychomotor ready to receive the training to develop the ability to read and spell. Early consistent teaching of handwriting is crucial to success (Sheffield, 1996). Specific and exact instructions are required to ensure that the proper steps and stroke orientation for each letter has been drilled into the psychomotor muscle memory of the child. King and Slingerland advocate that before actually teaching the strokes and movements for writing, it is necessary to get the children by to “sky write” and form arcs initially (Uhry & Clarke, 2005). The child will later utilize this ability to form the letter “a”.

With the ability to produce the desired psychomotor pattern, the child is shown in progression how the arc becomes the letter “a”. The child is encouraged to model what the teacher has done and convert the arcs into the letter “a”; in the initial attempts, the child is encouraged to write the letter large and on the classroom whiteboard or on large sheets of paper. Once there is competence in writing the letter “a”, the child is then encouraged to shrink the writing size of the letter. At this point, the child is then introduced to the positioning of the paper and the pencil grip as well as the arms and legs position and body posture required for writing (see Appendix 1). Left-handed children are also instructed not to position their wrist in a hook like manner for writing (Uhry & Clarke, 2005).

Nalpon and Lim (2006) note that in their experience in the classroom, the children benefitted from practising the transcription and association of the letter “a” on a piece or sheet of B3 size blank art paper with a crease forming the base line across the paper; the crease was more forgiving than a printed base line. When an accurately formed letter “a” was accidentally seated beneath the crease/base line, the letter did not look erroneous. With practice, the children were eventually able to seat the “a” on the crease/baseline. A piece of B3 size paper was used until the children in the classroom were able to seat the letters on the baseline automatically and shrink the writing size of the letters to a height acceptable for use in the lines recommended by Gillingham and Stillman (1960) (see Figures 3 and 4 below).

Figure 3: Lines for right-handed learners
In the initial lessons, the lines had to be marked “t”, “m”, “b” and “bm” to indicate if they were the top, middle, base or basement line (see Figure 5).

Besides providing a visual guide for initial letter formation, Nalpon and Lim (2006) revealed that the lines provided the necessary orientation points for teaching letters with many strokes such as the letters “r”, “s” and “f”. Once there was sufficient competence in producing letters in words with uniformity and legibility, the children were encouraged to write on commercially available standard lined paper (see Figure 6).

The cursive handwriting font templates used in this investigation is the font recommended by (Appelle, Banyas, & Goranson, 1997) and the Handwriting Practice Guide (Smith, 1988) (see Appendix 3 and Appendix 4). Smith (1988) acknowledges that this template was originally developed by Green (1969) in “Alphabetic Phonics Workbook 1 Teachers Manual”. The font
templates are simple to recall and are relatively close to the print form of the letter fonts. In the recommended cursive handwriting font template, all the lower case letters flow from left to right and begin and end on the baseline except for the letters ‘v’, ‘o’, ‘w’ and ‘b’ which end at the middle line. Cox (1992) and King (1987) state that each letter is unique in its form so that there is the unlikelihood of reversal confusion like letters such as “b” and “d” whose identical mirror images in the manuscript font other can cause letter identification confusion (Uhry & Clarke, 2005).

Phase 2: Associating a phoneme with its corresponding grapheme

Once the child is comfortable forming the letter “a”, the learning moves towards learning to associate writing the letter “a” and linking the transcribed form with the phoneme sound “ă”. Initially, the sound is introduced via the presentation of a key word. The teacher says the key word “apple” followed by the sound “ă” and simultaneously writes the letter “a”. The child is then encouraged to model what has been said and done and to also write the letter simultaneously. Gillingham and Stillman (1960) refer to this association process of speaking, hearing and writing simultaneously as the language triangle (see Figure 7).

Learning to associate the name of the letter with a key word and the sound of the letter has to be repeated until all of the letters and phonemes of the English language are mastered. The introduction of the letters and the phonemes follows a sequence which is recommended by Appelle, Banyas, and Goranson (1997). This sequence is accompanied by a list of standardised key words for the phonemes (see Appendix 1). It is essential that each phoneme and letter association is learned explicitly as individual items. Children need to learn how language is represented in the print form (Torgesen & Mathes 2000). Gillingham and Stillman (1960) have recommended that the letters “a”, “b” “h”, “f”, “m”, “j”, “k” and “l” be introduced in the initial lesson. Nalpon and Lim (2006) based on their classroom experience recommend that the letters “a”, “d”, “g”, “i” and “m” are the first letters to be introduced so that the child will be transcription ready to assimilate the learning coming from the language triangle. In both recommendations, the short form of the vowels is to be introduced.

Children with dyslexic dysgraphia need to be presented the learning in a manner that their working memory can support the learning (Eide & Eide, 2006). After the child has learned
two phonemes, the child can then be given a two-letter/phoneme syllable and be tasked to identify, isolate, delete, and rearrange the two phoneme sounds within the syllable. Children with dyslexic dysgraphia need to also learn how to manipulate and blend phoneme sounds to produce syllables and words. The manipulation of phonemes encourages the child to generate possibilities for how words can be sounded (Torgesen & Mathes, 2000). Through writing and joining, the child visually sees the blending process. Having developed the phonological ability to blend with just two phonemes, additional phonemes can be introduced to the phonemic awareness process. The increments have to be done at a pace suitable to meet the learning ability of the child. Besides using phonemes to develop competence in syllables, the phonemic awareness can also be used to introduce the child to consonant blends such as “cl”.

**Phase 3: Learning to read and spell non-phonetic words**

Besides being taught to read and spell words with a visual print and auditory oral phonemic association, reading and spelling fluency also requires that the child is introduced to reading and spelling sight words or words with no phonemic association between their print and auditory form. Whilst there is no phonemic association to support and reinforce the learning and remembering of the word, Gillingham recommends an increased frequency in reading and practising of spelling of the word as this will eventually help the child read the word later and be able to spell the word (Appelle, Banyas, & Goranson, 1997). Slingerland stresses on practising the writing of the non-phonetic word in the air initially with a seen model and eventually writing the whole word with the eyes closed (Uhry & Clarke, 2005). Cursive handwriting with its continuous movement therefore, is the ideal choice of writing as there is no confusion as every stroke is part of a letter.

**Phase 4: Applying knowledge of syllable patterns, spelling generalisations and etymology**

An understanding of syllable patterns allows the child to decide on the appropriate vowel sound and hence the reading will be more fluent. Segmenting words according to syllable patterns allows for an easy and systematic process in trying to recall the reading and spelling of the whole word syllable by syllable rather than the entire phoneme sequence of the word. The syllable patterns have been summarised by Gillingham and Stillman (1960). An ability to spontaneously draw upon the knowledge of the 17 spelling generalisations enables students to better understand the structures that govern the English language and improve the spelling. Similarly, the reading and spelling processes can be enhanced when the child has the etymology information of words which are non-English in origin (King, 2006).

The literature has shown that the learning process of reading and spelling is demanding and different children will take different lengths of time to achieve reading and spelling fluency. Teachers need to be trained to understand and deliver each phase of learning spelling and reading so that the appropriate amount of time, type of presentation methods and number of revision cycles are put in place and the information and skill can be imprinted into the memory of the child. Van Cleave (2004) recommends that in the initial stages of learning to read and spell, the curriculum time is devoted to handwriting, phonics and single word reading. There is no recommended time frame as to how long this initial period may take. King (2006) stresses the importance of lesson delivery to be done at a pace that allows sufficient opportunities for re-presentation of the same content for over-learning to occur. Some children may never be able to spell reliably (King, 2006). If the initial grapho-motor transcription skills are not appropriately instilled, introducing the more complicated elements
of reading and spelling will only make the task of reading, understanding, spelling and written expression a frustrating activity.

Research Statement
This study aimed to find out if cursive handwriting would be an effective intervention strategy to improve the performance of children diagnosed with dyslexic dysgraphia in their reading and spelling.

The Study
Aim
The main purpose of this study was to determine the effectiveness of cursive handwriting as an intervention strategy to improve the reading and spelling performance of children with dyslexic dysgraphia.

Research design
This quasi-experimental study used a single-group pre-test/post-test research design to investigate the effectiveness of continued handwriting as an intervention strategy to improve the reading and spelling performance of 12 children diagnosed with dyslexic dysgraphia by the psychologists from the Dyslexia Association of Singapore (DAS), observed at two time points, one before treatment and one after treatment. Two standardised tests – reading and spelling – were administered as pre-test and post-test. Changes in the outcome of interest (i.e., performance in reading and spelling measured by the single word recognition and single word spelling subtests of the British Ability Scales-Second Edition (BAS-II) (Elliot, Smith, & McCulloch, 1997) were presumed to be the result of the treatment. No control or comparison group was employed. One reason is that the authors were unable to find parents who would agree to put their children in a control group without any treatment. Another reason is that given the short time to carry out and complete this study, the author felt that as an exploratory study, it was a cost-effective way to discern if a potential treatment was worthy of further investigation in the future.

The defining characteristic of this single-group pre-test/post-test design is that subjects of the study group were compared with themselves instead of to a control or non-equivalent comparison group. Data on the variable of interest (i.e., word recognition/reading and spelling performance) were collected from standardised tests administered on the study group prior to the treatment, and after the treatment. The difference is interpreted as the change resulting from the treatment. This is a reasonable way to achieve the goal of an experiment in the sense that all possible time-invariant factors associated with the study subjects were controlled. However, this design did not control for time-varying factors that might be coincidental with the study time frame (Kerlinger & Lee, 2000).

It was difficult in this study to evaluate its validity as there was no control or comparison group. The authors want to caution that it becomes difficult to assess the significance of an observed change in the subjects. Any change could be due to historical changes unrelated to the treatment or to events that possibly occurred as a result of the experimenter’s treatment, an artifact of testing and maturation of the subjects are amongst the many such threats to internal validity (Chia, 2009). The authors had taken two actions to ensure that the results of
this study were reliable and valid. Firstly, five selection criteria for potential subjects before they were chosen to be involved in this study were introduced in order to keep the sample as homogeneous as possible: (1) the subject’s chronological age had to be between 9 years 0 months and 10 years 11 months; (2) he/she was currently attending a mainstream school; (3) he/she had been diagnosed by a registered psychologist or therapist to have dyslexic dysgraphia; (4) the subject had to be attending the remedial program at one of the learning centres managed by the DAS; and (5) the subjects had to be free from any emotional and/or neuromotor issue which would make the acquisition of cursive handwriting a difficult process. Secondly, the Pearson’s $r$ correlation coefficient was used in this study as an estimate of validity and reliability.

**Participating subjects**

Out of more than 400 children currently undergoing remediation at two learning centres managed by the DAS, five girls and seven boys (with written permission obtained from their parents) were selected to participate in this study. All the 12 children aged between 7 years 10 months and 9 years 7 months were attending the mainstream government or government-aided schools in Singapore. The 12 children had previously been diagnosed for dyslexia by the psychologists from either the DAS or the Psychological Services Branch of the Ministry of Education, Singapore. Their Full Scale IQs, Verbal IQs and Performance IQs are shown in Table 1.

### Table 1: The WISC-III FSIQs, VIQs and PIQs of Subjects

<table>
<thead>
<tr>
<th>Subjects (N = 12)</th>
<th>Chronological Age (in months)</th>
<th>FSIQs</th>
<th>VIQs</th>
<th>PIQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>96</td>
<td>133</td>
<td>110</td>
<td>145</td>
</tr>
<tr>
<td>S2/M</td>
<td>94</td>
<td>124</td>
<td>98</td>
<td>120</td>
</tr>
<tr>
<td>S3/M</td>
<td>100</td>
<td>113</td>
<td>103</td>
<td>118</td>
</tr>
<tr>
<td>S4/M</td>
<td>102</td>
<td>112</td>
<td>79</td>
<td>115</td>
</tr>
<tr>
<td>S5/F</td>
<td>103</td>
<td>103</td>
<td>98</td>
<td>104</td>
</tr>
<tr>
<td>S6/M</td>
<td>103</td>
<td>103</td>
<td>79</td>
<td>92</td>
</tr>
<tr>
<td>S7/F</td>
<td>105</td>
<td>102</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>S8/M</td>
<td>109</td>
<td>102</td>
<td>84</td>
<td>127</td>
</tr>
<tr>
<td>S9/F</td>
<td>110</td>
<td>99</td>
<td>90</td>
<td>110</td>
</tr>
<tr>
<td>S10/F</td>
<td>113</td>
<td>99</td>
<td>65</td>
<td>108</td>
</tr>
<tr>
<td>S11/F</td>
<td>113</td>
<td>94</td>
<td>73</td>
<td>96</td>
</tr>
<tr>
<td>S12/M</td>
<td>115</td>
<td>91</td>
<td>74</td>
<td>92</td>
</tr>
</tbody>
</table>

All the 12 subjects selected to participate in this study were further screened for dysgraphia. Table 3.1 shows that their Verbal IQs were lower than their respective Performance IQs. Moreover, all their respective psychological assessments reported poor performance on the following four subtests of WISC-III (Wechsler, 1991): Arithmetic and Digit Span on the
Verbal Scale, and Coding, Mazes and Symbol Search on the Performance Scale. These findings are in agreement with those in the current studies (e.g., Brunsdon, Coltheart, & Nickels, 2005; Chia & Ong, 2009; Muter & Likierman, 2008) on children with dysgraphia. The 12 subjects were also found to perform poorly on the Developmental Test of Visual-Motor Integration and the Bender Visual-Motor Gestalt Test. In addition, all the 12 subjects were found to satisfy the Bannatyne’s (1971) dyslexia profile where the sum of WISC-III subtest scores on Sequential Category (Digit Span, Picture Arrangement, Coding) is lesser than the sum of WISC-III subtest scores on Conceptual Category (Comprehension, Similarities, Vocabulary), which is, in turn, lesser than the sum of WISC-III subtest scores on Spatial Category (Picture Completion, Object Assembly, Block Design). As a result of the two co-existing specific learning disabilities, i.e., dyslexia and dysgraphia, all the 12 subjects were identified as having dyslexic dysgraphia – one of the subtypes of dysgraphia.

Instrumentation
The key instrument used to measure the pre- and post-test achievement abilities was the single word recognition and the single word spelling subtests of the British Ability Scales-Second Edition (BAS-II) (Elliot, Smith, & McCullouch, 1997) that has stated that the standardised assessment provides practitioners with information, which is reliable, valid, objective and lacks biasness, and it also provides further details about a child’s learning style and characteristics. The correlation of the BAS-II and WISC-III in terms of spelling is .47 and in terms of word recognition is .54. The reading and spelling batteries are considered to be achievement batteries and the scores in these achievement batteries are indicative of possible achievement at the school level. The administration of the two subtests form part of the standard assessment procedure at the DAS and at the Ministry of Education Psychological Service Branch to establish the performance ability of the child.

The BAS-II allows the re-testing to occur as early as within six months of the previous assessments. Both the BAS-II word recognition and spelling subtests need to be administered to the children individually. However, the design of both subtests is such that they can be conducted economically, efficiently and be completed within a matter of minutes. If the psychologist conducting the assessment has background information about the child’s history and reading and spelling abilities, the assessment can be initiated from a suitable point in the assessment battery and focus on the child’s ability. This efficiency allows for an accurate and reliable mass assessment of the word recognition and spelling achievements of the children. Finally, the BAS-II is considered to be culturally fair.

Treatment
The treatment for this study was training the children with dysgraphia dyslexia with the cursive handwriting skill. The method of teaching the children was based on the Orton-Gillingham approach to providing remediation to children with dyslexia (Appelle, Banyas, & Goranson, 1997). The training was carried out over six months. The treatment process was divided into four parts: The first part of the learning focused on getting the child to adopt psychomotor transcription and writing conventions; the second part focused on developing an association between the print and auditory aspects of a phoneme and written words; the third part focused on teaching the reading and spelling of sight words; and the final part of the learning focused on acquiring knowledge of syllable patterns, spelling generalizations.
and etymology. The treatment involved was carried out during the regular remedial classes the children attended at the DAS as part of their remediation to help them cope with their dyslexia.

**Setting/Schedule**
This study was carried out at two learning centres managed by the DAS over a period of six months from March to August 2008. The subjects came to the centre twice a week in the afternoon after school for a one-hour session.

**Procedure**
It was critical that the teachers involved in providing the treatment for teaching the children cursive handwriting were also familiar with skills associated with developing phoneme and grapheme associations and had knowledge about the structure of the English language. The teachers at the DAS were selected to participate in this investigation as they had previously been trained in phonology and dealing with children with dyslexia. Through the senior management, teachers from the DAS were invited to participate in the training and implementation of cursive handwriting into the DAS remediation curriculum. Six teachers responded to the invitation.

As part of the intervention procedure, the participating teachers had to attend 10 hours of pre-treatment training. This training focused on how to write the cursive font and also how to deliver cursive handwriting lessons. The training was conducted by the author at one of the learning centres of the DAS over three lessons which were spread over three weeks. The participating teachers were also asked to recruit children from amongst their students who met the sample criteria and therefore could participate in the research. Twelve children positively responded and formed the sample of the study. As the number in the sample was small, only four of the six teachers who volunteered were utilized to participate in delivering the treatment.

*The pre-intervention teacher training.*
Assurance was given to the teachers that cursive handwriting is currently in the mainstream primary school English language curriculum (Ministry of Education, 2001). The teachers had indicated that they were not familiar with the actions and procedures associated with cursive penmanship. The pre-intervention training included training the participating teachers on how to write in the cursive form as well as how to teach cursive handwriting for the purposes of developing reading and spelling skills. The teachers were taught the necessary posture and position required for writing whilst seated and when standing and the correct way of holding a pen and whiteboard marker. The participating teachers were also presented with the lower case cursive form letters of the English for the left-handed and right-handed. As the teachers themselves were not explicitly taught cursive handwriting whilst they were themselves school children, the pre-intervention training had to include teaching the teachers every stroke of each single letter. During the pre-intervention training, the participating teachers were encouraged to vocalise whilst writing the letters in order to appreciate the action of vocalisation as a means of supporting the process of spelling when decoding an unfamiliar word. The drill cards which the teachers were trained to use during their instruction in phonology were used to reinforce the grapheme phoneme association.
Implementing the treatment
The children attended the 60-minute classes twice a week after school at one of the two DAS learning centres. The children in the study were placed in classes of four children. Each class had only one child from the sample population. The other three children were not part of the sample population because they could not fit into the criteria for the sample selection. However, these non-sample children in the class were also taught cursive handwriting. The classroom desks were arranged in a horse shoe shape with the teacher seated in the middle and within an arm’s length of each seated child.

Teacher training and procedure
In the initial stage of the learning, the curriculum focused on getting the children to make use of their gross motor arm muscles. A photograph of what was expected was shown to the teachers (see Figure 8)

Figure 8: Beginners learning to draw arcs before actually writing the letter “a”.

A picture of the “a” being formed from the arcs was next presented to the teachers (see Figure 9). The teachers were instructed to celebrate the achievement of converting the arc into “a” and to note if the child had difficulties at any stage in the writing of the letter. Children who had difficulty had to spend time writing the “a” large on the white board. Children who could form the “a” well were encouraged to write “a” again but in a shrunken size and eventually write the “a” on paper whilst seated.
With the ability to form the grapheme “a”, the teacher then trained the child to associate this grapheme with its corresponding phoneme sound “ă”. The was done through showing the child a phoneme card with the letter “a” and saying the name of the letter, the key word and the corresponding phoneme sound. The teacher was given a list of key words to use for their corresponding grapheme (see Appendixes 1 and 2). The child was then trained to perform the drill of saying the name of the letter, its key words and corresponding sound while simultaneously writing out the grapheme of the letter. In subsequent lessons, the teacher would flash the drill cards and the child would perform the routine of saying the name of the letter, its key word and its corresponding sound while tracing the letter in the cursive form.

The next grapheme introduced was “d”. Similar to the steps taken for “a”, developing competence in writing the grapheme of the letter was taught first and subsequently, the learning shifted to focus on developing the phoneme grapheme association.

With the knowledge of two phonemes, the teacher then introduced the process of blending two phonemes to form a syllable. The teacher provided a model of how the two phonemes “a” and “d” sounded when they were blended to form the syllable “ad”. The sequence of the two phonemes was interchanged to create a new syllable “da”. The child then practiced the act of blending with the two syllables.

The teacher next introduced the child to the concept of spelling. The teacher said the word “dad” and asked the child to say out loud the individual phonemes that could be heard in the word “dad.” The child was also asked to count the number of phoneme sounds in the word and then to say out loud the phonemes in the order they were arranged in a word i.e. “d” “ă” “d”. The child was then asked to write the word “dad” and simultaneously say the sounds of the phonemes of the word being written.

The table on the scope and sequence was used as a guide to sequencing the introduction of the graphemes and phonemes (see Appendix 3). With more graphemes and phonemes, the number of syllables and words that could be introduced for the purpose of spelling and reading increased. When the children were able to automatically decode and code phonemes, syllables and phonetic words, non-phonetic words were introduced. The children were trained to say out the names of the letters and simultaneously write out the letters of these non phonetic words several times. In the initial round, the child looked at the word and said the names of the letters as the word was being written in the cursive form. After two or three rounds of this, the child then wrote it out without any visual cue or reference. The non phonetic words were then used in reading as well as in spelling and dictation exercises.
Finally, knowledge about words in the English language which are not English in origin were also introduced to the children. For instance, the children were taught that words beginning with “con” are Latin in origin.

**Materials used**

In the initial stages of developing cursive handwriting, white boards and markers were used to learn how to write the letters. There are photographs of how the initial stages of handwriting were presented to the teachers to enable them to have a clear idea of how the initial lesson could be carried out (see Figure 9).

Subsequently, the letter writing was then taught in a sitting position and the children wrote on pieces of B3 size paper and paper with suitable guide lines (see Figure 3 and Figure 4). 2B pencils were used. Besides the conventional paper surface, writing was also done on balloons, plastic writing tablets and other novel writing surfaces.

Reference lists were used to ensure correct posture and body position when writing; proper adoption of the proper strokes including their sequence; the correct formation of letters and the use of suitable key words for grapheme phoneme associations. There were also reference lists of the six syllable patterns, the seventeen spelling generalizations and also a list of non-phonetic words. The scope and sequence table (Appendix 3) provided the teacher with a road map for introducing the graphemes, phonemes, syllable patterns, generalizations and also the non-phonetic words. A phonogram checklist provided the teacher with a form of documentation to record what had been taught and also the level of competence of the child. Each child in the sample was assigned one checklist.

**Professional Sharing**

Throughout the investigation period, the participating teachers were encouraged to share and document their ideas, insights and expertise related to the teaching of cursive handwriting and the development of reading and spelling competence amongst the children with dyslexic dysgraphia. The teachers were encouraged to share how they used cursive penmanship in their respective classes.

**Treatment monitoring**

At the end of the period, the psychologists from the DAS conducted the single word recognition and the single word spelling subtests of the British Ability Scales-Second Edition (BAS-II) (Elliot, Smith, & McCullough, 1997) to establish the reading and spelling ability of each child involved in the study.

**Results and Discussion**

As mentioned at the beginning, the aim of this study was to determine the effectiveness of continued handwriting as a strategy to improve the reading and spelling performance of children diagnosed with dyslexic dysgraphia.

In this section, the author of this study made the following four comparisons of results:

1. Comparison between pre-test (before handwriting treatment) and post-test (after handwriting treatment) results on word recognition/reading performance;
2. Comparison between pre-test (before handwriting treatment) and post-test (after handwriting treatment) results on spelling performance;
3. Comparison between pre-test (before handwriting treatment) results of word recognition/reading and spelling performance; and
4. Comparison between post-test results (after handwriting treatment) of word recognition/reading and spelling performance.

**Word recognition/reading performance: Comparison between pre-test and post-test results**

Table 2 shows the results (in terms of reading age equivalent expressed in months) of the performance of the 12 subjects on the BAS-II Single Word Recognition/Reading Subtest at both pre-test and post-test.

At pre-test, the mean chronological age of the 12 subjects was 105.25 (SD = 6.82) and their mean reading age was 78.17 (SD = 27.08), 27.08 months behind their mean chronological age. The reading ages of the respective six male subjects S1/M, S2/M, S4/M, S6/M, S8/M and S12/M, and those of the respective three female subjects S5/F, S10/F and S11/F were above the mean reading age at pre-test. Only three subjects S3/M, S7/F and S9/F failed to meet the criterion. When comparing their reading ages with their respective chronological ages, only subject S2/M showed a higher reading age (105 months) than his chronological age (94 months).

However, at post-test, the subjects’ mean chronological age was 111.16 (SD = 6.83) and their mean reading age was 100.42 (SD = 19.04), 10.74 months behind the mean chronological age. The reading ages of the respective three male subjects S1/M, S2/M and S12/M and two female subjects S5/F and S9/F were above the mean reading age at post-test. The only subject S9/F, who failed to meet the reading criterion at pre-test, now showed a big jump or improvement in her word recognition/reading performance from a reading age of 68 months at pre-test to 129 months at post-test, an increase by 61 months! When comparing their reading ages with their respective chronological ages, two male subjects, S1/M and S2/M, and two female subjects, S5/F and S9/F, displayed higher reading ages than their respective chronological ages.
<table>
<thead>
<tr>
<th>Subjects (N = 12)</th>
<th>Pre-test Chronological Age (in months)</th>
<th>Pre-test Reading Age (before HWT*) (in months)</th>
<th>Post-test Chronological Age (in months)</th>
<th>Post-test Reading Age (after HWT) (in months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>96</td>
<td>88</td>
<td>102</td>
<td>137</td>
</tr>
<tr>
<td>S2/M</td>
<td>94</td>
<td>105</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>S3/M</td>
<td>100</td>
<td>73</td>
<td>106</td>
<td>91</td>
</tr>
<tr>
<td>S4/M</td>
<td>102</td>
<td>79</td>
<td>108</td>
<td>92</td>
</tr>
<tr>
<td>S5/F</td>
<td>103</td>
<td>80</td>
<td>109</td>
<td>113</td>
</tr>
<tr>
<td>S6/M</td>
<td>103</td>
<td>88</td>
<td>109</td>
<td>85</td>
</tr>
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<td>S7/F</td>
<td>105</td>
<td>78</td>
<td>110</td>
<td>78</td>
</tr>
<tr>
<td>S8/M</td>
<td>109</td>
<td>99</td>
<td>115</td>
<td>90</td>
</tr>
<tr>
<td>S9/F</td>
<td>110</td>
<td>68</td>
<td>116</td>
<td>129</td>
</tr>
<tr>
<td>S10/F</td>
<td>113</td>
<td>99</td>
<td>119</td>
<td>87</td>
</tr>
<tr>
<td>S11/F</td>
<td>113</td>
<td>84</td>
<td>119</td>
<td>83</td>
</tr>
<tr>
<td>S12/M</td>
<td>115</td>
<td>76</td>
<td>121</td>
<td>110</td>
</tr>
<tr>
<td>Mean</td>
<td>105.25</td>
<td>78.17</td>
<td>111.16</td>
<td>100.42</td>
</tr>
<tr>
<td>SD</td>
<td>6.82</td>
<td>27.08</td>
<td>6.83</td>
<td>19.04</td>
</tr>
</tbody>
</table>

*r = -0.22

*HWT = Handwriting Treatment

There was an improvement in the 12 subjects’ mean reading age from 78.17 months to 100.42 months (an increase by 22.25 months), closing the pre-test/post-test chronological age-reading age gap by 16.34 months.

The correlation coefficient $r$ was computed to determine the strength of the linear association between the 12 subjects’ pre-test and post-test scores in their word recognition/reading performance expressed in terms of reading ages. It was also to investigate whether there was a significant difference between the pre-test and post-test reading scores and whether the subjects improved as a result of the treatment. The results in this study indicated that there a negative value for correlation $r$ of -0.22, implying a negative or inverse association. As the correlation $r$ falls between -0.3 and +0.3, this suggests that there is little or no association (Simon, 2005) between the pre-test and post-test results in the word recognition/reading performance. In other words, after having undergone a six-month intervention programme using the cursive handwriting as a strategy to improve reading and spelling performance, results did not suggest any significant improvement in the subjects’ word recognition/reading improvement despite reported improvement in four subjects’ word recognition/reading performance.

**Spelling performance: Comparison between pre-test and post-test results**
Table 3 shows the results (in terms of spelling age equivalent expressed in months) of the performance of the 12 subjects on the BAS-II Single Spelling Subtest at both pre-test and post-test.

At pre-test, the mean chronological age of the 12 subjects was 105.25 (SD = 6.82) and their mean spelling age was 86.17 (SD = 17.25), 19.08 months behind their mean chronological age. The spelling ages of the respective four male subjects S1/M, S2/M, S4/M and S8/M and those of the respective two female subjects S10/F and S11/F were above the mean spelling age at pre-test. Fifty per cent of them or six subjects S3/M, S5/F, S6/M, S7/F, S9/F and S12/M failed to meet the criterion. When comparing their spelling ages with their respective chronological ages, it was the same subject S2/M, who showed a higher spelling age (117 months) than his chronological age (94 months).

However, at post-test, the subjects’ mean chronological age was 111.16 (SD = 6.83) and their mean spelling age was 102.58 (SD = 17.09), 8.58 months behind the mean chronological age. The spelling ages of the respective three male subjects S1/M, S2/M and S12/M and two female subjects S5/F and S9/F were above the mean spelling age at post-test. The three subjects, S5/F, S9/F and S12/M, who failed to meet the criterion of attaining at or above the mean spelling age at pre-test, now showed a big jump or improvement in their respective spelling performance at post-test: an increase by 47 months for S5/F, 53 months for S9/F and 53 months for S12/M. There was also a drop in spelling performance (in terms of spelling age) from pre-test to post-test for several subjects, i.e., S1/M, S4/F, S8/M, S10/F and S11/F. When comparing their reading ages with their respective chronological ages, two male subjects, S1/M and S2/M, and two female subjects, S5/F and S9/F, displayed higher reading ages than their respective chronological ages. The chronological age and spelling age of the subject S12/M at post-test had a small difference of 1 month with his chronological age higher than his spelling age.

There was an improvement in the 12 subjects’ mean spelling age from 86.17 months to 102.58 months (an increase by 16.41 months), closing the pre-test/post-test chronological age-spelling age gap by 10.5 months – an even smaller gap than the pre-test/post-test chronological age-reading age gap of 16.34 months.

Table 3: Performance in the BAS-II single word spelling subtest
<table>
<thead>
<tr>
<th>Subjects (N = 12)</th>
<th>Pre-test Chronological Age (in months)</th>
<th>Pre-test Spelling Age (in months)</th>
<th>Post-test Chronological Age (in months)</th>
<th>Post-test Spelling Age (in months)</th>
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</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>96</td>
<td>91</td>
<td>102</td>
<td>132</td>
</tr>
<tr>
<td>S2/M</td>
<td>94</td>
<td>117</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>S3/M</td>
<td>100</td>
<td>67</td>
<td>106</td>
<td>92</td>
</tr>
<tr>
<td>S4/M</td>
<td>102</td>
<td>97</td>
<td>108</td>
<td>93</td>
</tr>
<tr>
<td>S5/F</td>
<td>103</td>
<td>71</td>
<td>109</td>
<td>118</td>
</tr>
<tr>
<td>S6/M</td>
<td>103</td>
<td>81</td>
<td>109</td>
<td>86</td>
</tr>
<tr>
<td>S7/F</td>
<td>105</td>
<td>71</td>
<td>110</td>
<td>82</td>
</tr>
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<td>S8/M</td>
<td>109</td>
<td>104</td>
<td>115</td>
<td>93</td>
</tr>
<tr>
<td>S9/F</td>
<td>110</td>
<td>70</td>
<td>116</td>
<td>123</td>
</tr>
<tr>
<td>S10/F</td>
<td>113</td>
<td>104</td>
<td>119</td>
<td>97</td>
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<tr>
<td>S11/F</td>
<td>113</td>
<td>94</td>
<td>119</td>
<td>85</td>
</tr>
<tr>
<td>S12/M</td>
<td>115</td>
<td>67</td>
<td>121</td>
<td>120</td>
</tr>
<tr>
<td>Mean</td>
<td>105.25</td>
<td>86.17</td>
<td>111.16</td>
<td>102.58</td>
</tr>
<tr>
<td>SD</td>
<td>6.82</td>
<td>17.25</td>
<td>6.83</td>
<td>17.09</td>
</tr>
</tbody>
</table>

\[ r = -0.14 \]

*HWT = Handwriting Treatment

The results in this study indicated that there a negative value for correlation \( r \) of -0.14, implying a negative or inverse association. As the correlation \( r \) falls between -0.3 and +0.3, this suggests that there is little or almost negligible relationship (Williams, 1968) between the pre-test and post-test results in the spelling performance. In other words, after having undergone a six-month intervention programme using the cursive handwriting as a strategy to improve reading and spelling performance, results did not suggest any significant improvement in the subjects’ spelling improvement despite reported improvement in four subjects’ spelling performance.

**Reading and spelling performance: Comparison of results at pre-test**

Table 4 shows the results (in terms of reading and spelling ages equivalent expressed in months) of the performance of the 12 subjects on the BAS-II Single Word Recognition/Reading and Spelling subtests at both pre-test.
**Table 4: Comparison of reading ages & spelling ages at pre-test (before handwriting treatment)**

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Chronological Age (in months)</th>
<th>Reading Age (before HWT*) (in months)</th>
<th>Spelling Age (before HWT) (in months)</th>
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</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>96</td>
<td>88</td>
<td>91</td>
</tr>
<tr>
<td>S2/M</td>
<td>94</td>
<td>105</td>
<td>117</td>
</tr>
<tr>
<td>S3/M</td>
<td>100</td>
<td>73</td>
<td>67</td>
</tr>
<tr>
<td>S4/M</td>
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<td>99</td>
<td>97</td>
</tr>
<tr>
<td>S5/F</td>
<td>103</td>
<td>80</td>
<td>71</td>
</tr>
<tr>
<td>S6/M</td>
<td>103</td>
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<td>81</td>
</tr>
<tr>
<td>S7/F</td>
<td>105</td>
<td>78</td>
<td>71</td>
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<td>S8/M</td>
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<td>104</td>
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<tr>
<td>S9/F</td>
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<td>68</td>
<td>70</td>
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<tr>
<td>S10/F</td>
<td>113</td>
<td>99</td>
<td>104</td>
</tr>
<tr>
<td>S11/F</td>
<td>113</td>
<td>84</td>
<td>94</td>
</tr>
<tr>
<td>S12/M</td>
<td>115</td>
<td>76</td>
<td>67</td>
</tr>
<tr>
<td>Mean</td>
<td>105.25</td>
<td>78.17</td>
<td>86.17</td>
</tr>
<tr>
<td>SD</td>
<td>6.82</td>
<td>27.08</td>
<td>17.25</td>
</tr>
</tbody>
</table>

\[ r = 0.93 \]

*HWT = Handwriting Treatment

At pre-test, the 12 subjects with the mean chronological age of 105.25 months (SD = 6.82) or 8 years 9 months had the mean reading age of 78.17 (SD = 27.08) months or 6 years 6 months was 8 months lower than their mean spelling age of 86.17 (SD = 17.25) months or 7 years 2 months.

The correlation coefficient \( r \) of 0.93 shows that there is a strong positive association between the reading and spelling ages at the pre-test. This is probably so because both reading and spelling involve lexical-phonological processing which includes awareness of letter sounds, knowledge of phonological rules and understanding of letter-sound/sound-letter correspondence (Pierangelo & Giuliani, 2007) and hence, both processes intertwine with each other (Chia, 2007) (see Figure 10).
The results provide an interesting finding: all the 12 subjects were identified and confirmed by psychologists to have dyslexic dysgraphia and so they should have performed more poorly in their spelling than reading. However, at the surface level, the results did not show that to be the case. Although this finding appeared to be contradictory, it did not mean that there was a misdiagnosis. On the contrast, the finding has helped to confirm that these subjects did indeed have dyslexic dysgraphia. The reasons are twofold. Firstly, the mean word recognition/reading age of the 12 subjects was 78.17 months, which was 27.08 months or more than 2 years below the mean chronological age of 105.25 months. This is a significant discrepancy between the mean chronological age and mean word recognition/reading age. Hence, it can be safe to
conclude that, in addition to the WISC-III and BAS-II results, these 12 subjects manifested dyslexic symptoms. Secondly, their mean spelling age of 86.17 months was 19.08 months or slightly more than 1½ years below the mean chronological age of 105.25 months – a significant discrepancy between the mean chronological age and mean spelling age. Their poor performance on the Developmental Test of Visual-Motor Integration and the Bender Visual-Motor Gestalt Test also pointed to the presence of handwriting or perceptuo-motor movement difficulties which are one of the three core dysgraphic symptoms; the other two being spelling difficulties and problems with written expression of ideas and thoughts (Chia & Ong, 2009).

In summary, the pre-test results confirmed that the 12 subjects were indeed dyslexic dysgraphic at the beginning of the study before they underwent the six-month handwriting-based intervention programme.

**Reading and spelling performance: Comparison of results at post-test**

Table 5 shows the results (in terms of reading and spelling ages equivalent expressed in months) of the performance of the 12 subjects on BAS-II Single Word Recognition and Spelling subtests at both post-tests.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Chronological Age (in months)</th>
<th>Reading Age (after HWT*) (in months)</th>
<th>Spelling Age (after HWT) (in months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1/M</td>
<td>102</td>
<td>137</td>
<td>132</td>
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<tr>
<td>S2/M</td>
<td>100</td>
<td>110</td>
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<td>S3/M</td>
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<td>S4/M</td>
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<td>S5/F</td>
<td>109</td>
<td>113</td>
<td>18</td>
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<tr>
<td>S6/M</td>
<td>109</td>
<td>85</td>
<td>86</td>
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<td>S7/F</td>
<td>110</td>
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<td>82</td>
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<td>S8/M</td>
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<tr>
<td>S9/F</td>
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<td>S10/F</td>
<td>119</td>
<td>87</td>
<td>97</td>
</tr>
<tr>
<td>S11/F</td>
<td>119</td>
<td>83</td>
<td>85</td>
</tr>
<tr>
<td>S12/M</td>
<td>121</td>
<td>110</td>
<td>120</td>
</tr>
<tr>
<td>Mean</td>
<td>111.16</td>
<td>100.42</td>
<td>102.58</td>
</tr>
<tr>
<td>SD</td>
<td>6.83</td>
<td>19.04</td>
<td>17.09</td>
</tr>
</tbody>
</table>

$r = 0.97$

*HWT = Handwriting Treatment
At post-test, the 12 subjects with the mean chronological age of 111.16 months (SD = 6.83) or 9 years 3 months had the mean reading age of 100.42 (SD = 19.04) months or 8 years 4 months which was 3 months lower than their mean spelling age of 102.58 (SD = 17.09) months or 8 years 7 months.

The correlation coefficient $r$ of 0.97 shows that there is a strong positive or marked relationship between the reading and spelling ages at the post-test. This confirms that both reading and spelling are associated closely with each other through the lexical-phonological processing (Chia, 2009) involving three interlinked sub-processes of letter-sound/sound-letter correspondence which is labelled [a], affix-meaning correspondence labelled [b], and letter sound-meaning correspondence labelled [c] (see Figure 10).

In summary, the post-test results also confirmed that the 12 subjects were indeed dyslexic dysgraphic at the end of the study after they had completed the six-month handwriting-based intervention programme.

**Conclusion and Recommendations**

The main aim of this study was to investigate the effectiveness of handwriting as an intervention strategy to improve the reading and spelling performance of children with dyslexic dysgraphia.

Findings of this study showed that handwriting had little or no impact on the reading and spelling performance of children with dyslexic dysgraphia. The correlation coefficient $r$ of -0.22 between pre-test (before handwriting treatment) and post-test (after handwriting treatment) results for performance in single word recognition reading fell between -0.3 and +0.3 indicating that there was little or no association between the two sets of results (Lanthier, 2002). The same was also noted in the spelling performance with a correlation coefficient $r$ of -0.14. In other words, inferentially, it means that handwriting as an intervention strategy has not been shown to make any significant improvement in the subjects’ reading and spelling performance before and after treatment.

However, on the other hand, findings of this study show that there was a strong correlation coefficients $r$ of 0.93 and 0.97 between reading and spelling performance of the subjects at pre-test (before handwriting treatment) phase and post-test (after handwriting treatment) phase respectively. One reason to explain why it could be so is that both reading and spelling are visual-auditory in nature and they are phonological coding processes (Chia, 2007, 2009a). Unlike these visual-auditory processes, handwriting is not auditory and does not involve phonological coding (see Figure 11). It is a visual-haptic process (Hardman, Drew, & Egan, 1996). As mentioned earlier in the literature review, handwriting is “a graphomotor skill … involving memory of letter formations, spelling, grammar, context and more” (Barchowsky, 2008, p.1).

A second explanation is that while both reading and spelling processes share a similar semiotic system involving phonemes as signifiers and their symbolic representations as
signified, handwriting as a process is a totally different semiotic system. Its signifiers consist of glyphs and its signified are letters, graphemes and/or characters (Eco, 1979).

Another explanation is that without administering a formal or informal assessment of handwriting to determine the age equivalent of each subject’s handwriting development in the same way that was done for reading and spelling, the interpretation of findings related to how handwriting could impact on reading and spelling performance had to be inferred using the results of the single word recognition reading and the single word spelling subtests of the British Ability Scales-Second Edition (BAS-II) (Elliot, Smith, & McCullouch, 1997) that had been administered. Hence, a major limitation in this study was the absence of a formal handwriting assessment such as the Test of Handwriting Skills-Revised (Milone, 2007) and/or the informal Children’s Handwriting Scale (Phelps, Stempel, & Speck, 1985) to be included in its instrumentation.

*Figure 11: A comparison among the three processes: Handwriting, reading and spelling*

<table>
<thead>
<tr>
<th>Skills</th>
<th>Skill types</th>
<th>Sensory processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handwriting</td>
<td>Graphomotor</td>
<td>Visual-haptic (kinaesthetic-tactile)</td>
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<tr>
<td>Reading</td>
<td>Phonological</td>
<td>Visual-auditory (aural): silent reading</td>
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<td></td>
<td></td>
<td>Visual-auditory (oral): oral reading/reading aloud</td>
</tr>
<tr>
<td>Spelling</td>
<td>Phonological</td>
<td>Visual-auditory (oral): oral spelling/spelling aloud</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual-auditory (aural)-motor: written spelling</td>
</tr>
</tbody>
</table>

The findings of this study have two interesting implications for working with children with dyslexic dysgraphia. Firstly, these children still need to be taught how to read and spell using phonological strategies rather than through handwriting as an intervention strategy though for dyslexic-dysgraphic children, handwriting as an intervention strategy still plays an important role in treating the haptic perception deficits in the overall intervention programme. As explained earlier, this is because handwriting is a graphomotor skill involving visual-haptic sensory process. In other words, it is not an appropriate approach to be used to improve performance in reading and spelling – both are phonological analytic coding skills that are visual-auditory sensory processes. Secondly, an appropriate formal or informal handwriting assessment is needed to measure handwriting development rather than using other unrelated tests such as reading and spelling assessments.

Finally, it is recommended that should there be another similar study done on the efficacy of handwriting as an intervention strategy, a standardised handwriting assessment such as the Test of Handwriting Skills-Revised (Milone, 2007) is preferred and should be administered at the pre-test and post-test phases in addition to the standardised reading and spelling assessment battery for a more thorough comparative study to be done on the impact of handwriting on reading and spelling respectively.
References


Appendix 1:  
Key words for phoneme grapheme association (vowels). Taken from Appelle, Banyas, and Goranson (1997).

<table>
<thead>
<tr>
<th>Letter (List 1)</th>
<th>Key Word</th>
<th>Letter (List 2)</th>
<th>Key Word</th>
<th>Letter (List 3)</th>
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Appendix 2:
Key Words for phoneme grapheme association (Consonants). Taken from Appelle, Banyas, and Goranson (1997).

<table>
<thead>
<tr>
<th>Letter (List 1)</th>
<th>Key Word</th>
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<tr>
<td>s</td>
<td>nose</td>
<td>ce, ci, co</td>
<td></td>
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<td>t</td>
<td>top</td>
<td>cu, cy, gl</td>
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<td>v</td>
<td>van</td>
<td>gr, ga, ge</td>
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<tr>
<td>w</td>
<td>words not memorized.</td>
<td>gi, go, gu, gy</td>
<td></td>
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</tbody>
</table>

Appendix 3:
Scope And Sequence Table. Taken from Appelle, Banyas, and Goranson (1997).
<table>
<thead>
<tr>
<th><strong>Phonograms</strong></th>
<th><strong>Parallel and Subordinate Topics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>b,d,f,h,j,k,l,m,n,p,r,t,v,w,y,z</td>
<td>Language function explained; drill cards explained; key words explained</td>
</tr>
<tr>
<td>a,e,i,o,u, y (short vowel sounds)</td>
<td>Detached syllables and made up words (CVC words); pronunciation symbols of letters introduced; consonant blends; detached syllables and made up words (blends); spelling patterns as needed for dictation</td>
</tr>
<tr>
<td>qu and x</td>
<td>Vocabulary Study</td>
</tr>
<tr>
<td>Consonants with Two sounds: c,g,s</td>
<td>Pronunciation of c,g,s explained; dictionary</td>
</tr>
<tr>
<td>Hard and Soft c and g</td>
<td>Diagraphs contrasted with blends; history of the English language</td>
</tr>
<tr>
<td>Diagraphs: ch, ck, ph, sh, tch, th, wh</td>
<td>Refer to six syllable patterns</td>
</tr>
<tr>
<td>Syllable types</td>
<td>Effect on preceding vowel; detached and made up syllables</td>
</tr>
<tr>
<td>Silent e</td>
<td>Introduction of vowel sounds in new situations; detached syllables and made up words and sentences; accents (stress); practice with pronunciation symbols</td>
</tr>
<tr>
<td>a-e, e-e, i-e, o-e, u-e, y-e</td>
<td>Pronunciation explained; detached syllables and made up words and sentences; dictionary Continued</td>
</tr>
<tr>
<td><strong>Vowels Finished</strong></td>
<td>Pronunciation explained</td>
</tr>
<tr>
<td><strong>Syllable Division Patterns</strong></td>
<td>Pronunciation explained; spelling generalisations; dictation; formal English; paraphrasing and précis work.</td>
</tr>
<tr>
<td><strong>ar and or</strong></td>
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<tr>
<td><strong>diphthongs</strong>:oa, ai, ay, ee, oe, eu</td>
<td></td>
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<tr>
<td>er, ir, ur</td>
<td></td>
</tr>
<tr>
<td><strong>diphthongs</strong>: oi, oy, au, aw, ea</td>
<td></td>
</tr>
<tr>
<td>3 sounds of ed, ble, dle, fle, gle, kle,tle</td>
<td></td>
</tr>
<tr>
<td><strong>diphthongs</strong>: ey ie, oo, ou, ow</td>
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<td>tion, sion</td>
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<tr>
<td>ei, ue, ew</td>
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<td>eigh, igh</td>
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<tr>
<td>ang, ing ong, ung</td>
<td></td>
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<tr>
<td>ink, onk, unk</td>
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**Improving Literacy of the Visually Impaired in Singapore: Pre-, Post- and In-Between Literacy Considerations**
Abstract
This paper underscores the importance of a multi-prong approach to literacy when considering literacy needs of the visually impaired in Singapore. While acquisition of literacy is often considered as a single prong approach, there is a need to satisfy the pre-literacy; post-literacy and in-between literacy needs if persons with visual impairments are to have equitable access to information. Each of these three prongs is considered in turn focusing particularly on braille, alternative formats and access to such mediums of communication for the visually impaired. These are critical given that it is through multiple modalities that the visually impaired are able to access a diversity of materials. The absence of information in one modality may be available in an alternative format. The needs also extend beyond the young as with the prospect of an aging society looming, the elderly who are predisposed to visual impairment will need to be equipped with literacy skills.

Introduction
At the inaugural International Education Roundtable (IER), education ministers representing top performing school systems met to discuss how education systems can continuously improve to equip and skill youth to meet the fast changing and unpredictable future. As the global economy shifts from industrial-based to knowledge-based, so will there be a shift from education for a small elite group to education for all. Future jobs will demand not just basic, but a post-secondary education (Ministry of Education, 2009a).

In Singapore, human capital is not only Singapore’s single resource, but also the basis for survival and success. The Ministry of Education is keenly aware of this need and has a mission to equip citizens so that through education, the potential of every citizen is realized to fulfil personal aspirations as well as to contribute to the community and nation (Ministry of Education, 2009b). If education is the cornerstone by which human capital is built, literacy must then form the building blocks of this framework. What then is understood by literacy?

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines ‘Literacy’ as the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning to enable an individual to achieve his or her goals, to develop his or her knowledge and potential, and to participate fully in the wider society’ (UNESCO, 2004).

Visual Impairment and Literacy
The function to read and write or literacy is therefore the fundamental building block to education for all students, including those with disabilities. The issue of literacy concerning the visually impaired, however, requires additional consideration given that the nature of visual impairment impacts the medium of reading and writing resulting in necessary modifications in order to access information. Where literacy for the sighted person is taken to mean ability to read and write via print, what constitutes reading and writing for the visually impaired involves multiple modalities. It is therefore necessary to first establish from the onset what these modalities are before mainstream notion of improving literacy can be considered.

Acquiring a visual impairment can be both congenital and adventitious. The onset of the visual impairment has implications on one’s visual memory. Further, the severity of the impairment will determine the extent of intervention necessary to support the person with the visual impairment. Given the prospect that Singapore is an increasingly aging society, the notion of literacy of the visually impaired will need to be confronted progressively as the senior citizen population swells.

The modalities for the visually impaired include braille, modified print, reading and writing through the help of assistive technology via screen readers, optical character readers (OCR) and close-circuit televisions (CCTVs). In short, the modifications can take on tactile, auditory or modified visual channels (Wong & Lee, 2010). These will be divided into braille and alternative modalities.

**Reading with Braille**

2009 signifies the 200th anniversary of Louis Braille who was born on January 4, 1809, the inventor of braille. Today, braille continues to be seen as the primary means of communication for the visually impaired. Braille has opened many opportunities for persons with visual impairments to access literacy, independence and for self-expression. Today, braille is available in both traditional hard copies as well as electronic formats with refreshable braille displays (Ivers, 2003). It has been called the ‘key to opportunity’ (Schroeder, 1989) and an equivalent system to print that is flexible and adaptable Stephens, 1989). Two hundred years later, the tactile system has been adopted for almost every language in the world and its impact cannot be ignored. For example, governments such as the European Union (EU) have made it obligatory for braille labels to be incorporated in lifts. Further, since October 2005, the EU has made it mandatory for medicines to carry braille labels. If this is not evidence of its utility and relevance, countries including France, Germany, Spain, India, Mexico, Colombia and Costa Rica are considering introducing braille options to extend citizen rights of voters with visual impairments to participate independently in elections (Zurita, 2009).

The use of braille is not merely functional, but braille literacy also points to an advantage in accessing employment. The American Foundation for the Blind (AFB) reports that of the 32 percent of persons with visual impairments who have held jobs, 90 percent of this population are braille literate (Kirchner, Johnson, & Harkins, 1997).

While this statistic emphasizes the importance of braille literacy, access to timely and diverse braille material and the advancement of assistive technology raises questions of reliance on a single modality. Reading only with one modality has been challenged by (Corn & Koenig, 2002;...
Lusk & Corn, 2006) and researchers have proposed dual literacy programmes of braille and print where appropriate. Moreover, depending on the environment of the employment, it is unlikely that colleagues function in braille. Compounding this is an estimate that only five percent of the world's publishing output is made accessible in alternate formats for people who cannot use print (Epp, 2006). Persons with visual impairments do not have the luxury of walking into a shop and picking up a braille book of their choice. Books to be transcribed to braille need time for transcription. With a paucity of braille books available to the visually impaired, it is therefore restrictive to limit braille alone as a single measure of modality of literacy.

These counter points are raised not to disparage the relevance of braille, rather, to draw attention to the increasingly available alternative formats to information. It is an affront to relegate braille as an outmoded medium because of the disparity in access to equitable information. Societal failure to provide accessible formats cannot justify the denial of the building blocks to acquisition to literacy for the blind. Braille remains a cardinal mode of communication for the visually impaired. While braille is used by a minority of persons with visual loss, it is undeniable that there is universal impact. The question is how to combine braille with emerging technologies.

There are no concrete figures of braille users in Singapore. However, it is possible to approximate numbers of braille users from the figures captured at the Singapore Association of the Visually Handicapped (SAVH), the national register of persons with visual impairments. Clients served at SAVH in 2007-2008 numbered 2919 (SAVH, 2008). Of this number, it is recorded that 1130 are blind. Granted that it is not possible to assume that all blind clients are braille readers, it is also not a foregone conclusion that all clients with partial sight are not braille readers. While braille remains a primary medium of reading and writing for persons with visual impairments, it is also evident that not all persons with visual impairments use braille as their single medium of communication given various available alternatives in communication emerging in recent years. How then are these alternative modalities conveying the information to persons with visual impairments?

**Alternative Access to Information and Assistive Technology**

Where braille meets the needs of persons with severe visual impairments, large print can serve those with low vision. This will involve modification of colours, contrast, size and fonts to achieve optimum reading conditions. In addition, appropriate lighting can also be adjusted to improve conducive reading conditions to avoid glare, shadows and to control adequate lighting (Griffin, Williams, Davis & Engleman, 2002; Kalloniatis & Johnston, 1994). Font sizes of 14 to 16 points were reported to be helpful for elderly persons with mild to moderate visual impairments (Rubin, Feely, Perera, Ekstrom, & Williamson, 2006) while (Russell-Minda, et al., 2007) suggested up to 18 points for general readers with visual impairments who are able to read large print. In determining font size, optimum reading conditions is determined by the ‘critical print size’ (CPS), where beyond a point of increased enlargement, the modification yields no benefit (Rubin, et al., 2006).

A further and significant alternative access to information is through aural means whether pre-recorded, with the help of assistive technology or via a live reader. This is more common today with greater numbers of audio book titles made available commercially. The advancement of
technology has also made it possible for screen readers and optical character reading software to enable electronic texts to be converted to accessible formats for the visually impaired. When all fails, the help of a family member, friend, caregiver, volunteer, fellow human being offers a human touch to otherwise synthetic modes. Reading for the visually impaired, as we begin to understand, may therefore be more befittingly defined ‘as the recognition, interpretation, and assimilation of the ideas that are represented by symbolic material, whether it is displayed visually, tactiley, or aurally’ (Tuttle, cited in Hatlen & Spungin, 2008).

Yet explanations have been put forward to argue how listening, while an important access to information is merely ‘access to information’. Listening alone is not a complete measure of literacy given that someone listening to information is not necessarily reading the information. By contrast, advocates such as Tuttle, ‘Is Listening Literacy?’ and Foulke's series entitled ‘Reading by Listening’ counter argue for the case for reading through listening (Hatlen & Spungin, 2008).

Reading, however, is but one half of the literacy discussion, the other half is writing. If there is to be a demonstration of understanding, there also needs to be evidence of assimilation, commonly expressed through writing. Where visual, tactile and aural channels are critical for reading, it is also equally necessary to have multiple modalities to express writing?

**Improving Literacy: A Multi-Prong Approach**

As the issue of literacy for the visually impaired is examined, developing competent skills in a single, or a combination of the modalities is therefore critical if persons with visual impairments are to achieve literacy. When we then consider the larger question of improvement, there are wider implications such as the methodology to be adopted. The emerging literacy framework advocated here is similar to the literacy campaigns observed throughout the world as reported by the UN Chronicle (1990). The three common phases are: pre-literacy; literacy; post-literacy.

**Pre-literacy phase**

In this phase, the focus is to establish the needs of the population and to analyse motivating factors of potential learners and what incentives might be relevant. Two major areas to be considered for the visually impaired are learning media assessment and family-centered intervention.

*Learning media assessment.* Having established the multi-modalities the visually impaired employ to read and write, it is crucial that persons with visual impairments are assessed to determine the most appropriate and effective medium through which they can maximize their potential for learning. A learning media assessment will determine a student’s potential and current literacy media (McKenzie, 2007). For persons who do not have useful residual sight, braille is the natural choice. For persons with partial sight, a low vision assessment is necessary to determine to what degree the residual vision is suited to use modified print. Large print as a medium is recommended so far as it allows the reader to read comfortably, achieving a reasonable reading speed. When visual reading becomes too cumbersome that it impedes reading speed, evaluation for one, or a combination of alternative modalities, is necessary to ensure that ease of access to information is achieved. The key is to have qualified and competent assessors who can make an evaluation.
Family-centered intervention. Families have a critical role in supporting their children with disabilities. Literature clearly supports that families have a pivotal influence in the long-term success of the family member with disability (Kosciulek, 1994; McCubbin, Balling, Possin, Friedich & Byrne, 2002). For children who have a congenital visual impairment, improved access to literacy for the child with visual impairment means early intervention to nurture the child in ways that will compensate for learning that would otherwise be acquired through observation. Some of these emergent literacies may include concepts of print, alphabetic knowledge, phonological awareness, environments, and motor development related to reading and writing (Erickson et al., 2007).

A support structure to prepare parents to nurture their children with visual impairment is then necessary for parents who are new to parenting a child with visual impairment, let alone parenthood (Dunst, 2002). The role of the family throughout the developing years of the child, into their adolescence also has implications in furthering literacy and language skills. Where communication is a key function of literacy, opportunities to build upon and foster communication through the various modalities strengthens mastery and familiarity of modalities.

Literacy phase
In this learning phase, the implementation of instruction needs to be built on a sound curriculum and pedagogy. Two areas of literacy are critical for persons with visual impairments, Braille literacy and AT literacy.

Braille literacy: establishing a strong foundation for braille instruction and services. Building a strong foundation of braille services effectively has three parts. (1) Learning of braille; (2) Teaching of braille; (3) Production and promulgation of braille. This third part will be considered in the Post-Literacy phase.

Learning of braille. Where braille has been determined as the appropriate medium of communication, the acquisition of braille skills is essential if persons with visual impairments are to participate in education. As in acquiring a new language, the ease of learning a new language is often optimized through an early start. By contrast, acquiring a new language later presents other challenges. In a similar vein, children who have a congenital visual impairment needing to use braille from their early years will develop and acquire skills more naturally than those who acquire their visual impairments adventitiously. With age, senior learners will have additional challenges to overcome.

Teaching of braille. The instruction of braille requires effective pedagogical methods for students who may not be initially receptive in learning a foreign skill, particularly to persons who have acquired their visual impairment suddenly or when the deterioration of the visual condition is precipitated. Identifying relevant strategies to effectively offer instruction to the students is important if the skill is to be nurtured. At the same time, teachers of braille need to be familiar with the various braille codes and impart up-to-date knowledge to meet the needs of the students.

Fostering assistive technology literacy. Parallel to the teaching of braille is the fostering of information technology, especially assistive technology (AT) for the visually impaired. With the
pervasive use of IT in schools, daily lives and throughout society, it is critical that students and adults with visual impairments are able to access and work adeptly with electronic information. Likewise, advancements in assistive technology have been made and persons with visual impairments need to be able to use these devices in order to access IT as well as to enjoy the benefits with increased accessibility. Exposure to and training in using assistive technologies will be critical in building literacy.

**Post-Literacy phase**

This phase is concerned with the progression of literacy skills. Once basic literacy skills are acquired, availability, access and affordability of materials are imperative if literacy skills are to be developed and advanced to unlock opportunities. If braille is the primary medium of communication, access to braille materials is necessary. Likewise, acquisition and access to AT knowledge is critical if opportunities are to be expanded. Two major areas are:

*Production and promulgation of braille.* The use of braille is only effective if the users of braille have access to materials in Braille. The production, transcription, and promotion of braille usage as an equal medium to print need to be championed for the system to have a widespread influence. Timely delivery of transcribed braille textbooks to students remain a universal problem. Delays in meeting curricular material will impact access to education. With increasing technological intervention available to transcribe print to braille, negotiating with publishers to secure electronic versions of printed texts is one way to expedite the production process.

*Access to materials.* If multi modality is to meet the needs of the visually impaired, access to a diversity of materials, through a variety of modalities is critical to nurture literacy. Where one medium fails to offer the necessary accessibility, another medium will offer an alternative choice. This involves partnerships with libraries, databases, and information providers that can offer a conglomerate of information. The post-literacy phase needs also to go beyond the mere provision of accessible materials in terms of braille, large print books, audio books, digitized and electronic books. The provision of bridges to information via assistive technology such as screen readers, OCR and CCTVs in schools and public libraries is critical in creating a conducive literacy-friendly environment.

**Discussion**

With SAVH being the primary association serving the visually impaired and Lighthouse School the single school serving primary education to children with visual impairments in Singapore, together, these primary agencies have a critical role in meeting the literacy needs of the visually impaired. This means for pre-literacy needs, the learning media assessment as well as the family-centred interventions for children and adults with visual impairments need to be led by the primary service providers. Where specialist services are required, the Singapore National Eye Centre with their optometry services for example offers a further resource for low vision assessments to better inform learning media assessments.

The teaching of literacy, particularly braille literacy is a function that both SAVH and Lighthouse School has offered since the association and the school had been set up some 50 years ago. To ensure that knowledge is current, staff and teachers need to be updated with trends in effective teaching techniques and braille codes to both young and senior students. At the same
time, balance in instruction in Braille and alternative formats must be offered to avoid an overemphasis on a single medium resulting in underemphasis on alternative formats. Where dual media programmes refer to braille and print, the literature suggests that teachers of the visually impaired favour alternative formats such as technology (Lusk & Corn, 2006).

Where SAVH and Lighthouse School remain the natural platform where braille and instruction in assistive technology can be introduced, the Infocomm Accessibility Centre and the Society for the Physically Disabled are alternative centres offering IT and AT courses and a Assistive Technology Loan Library including programmes designed for the visually impaired.

Beyond teaching and learning of braille, timely production, distribution and cataloguing of braille materials have been challenges confronting centres of Braille production in the literature (Emerson, Corn & Siller, 2006). As the Braille Production Unit at SAVH is responsible for braille production in the nation, up-to-date production techniques and equipment are critical to meet the demands as a national braille production centre.

Closely linked to the production of Braille for use is the post-literacy phase where advocacy will drive the availability of braille and alternative accessible formats in the public space. Leadership must come from SAVH being the primary association representing the visually impaired in Singapore to drive literacy needs beyond the immediate community of the visually impaired to include widespread availability throughout society. One obvious partner is the National Library Board and the networks of community library branches. Libraries of academic institutions are also critical partners if literacy is to open doors to education.

Finally, the task of bringing together the three phases of literacy while daunting can be supported with the involvement of related voluntary welfare organizations supporting the visually impaired such as the Macular Degeneration Society, Retinitis Pigmentosa Society (Singapore), Glaucoma Society, Glaucoma Patients Association of Singapore, Beyond Vision as well as other related voluntary welfare organizations supporting the visually impaired. Consultation, collaboration and networking will help to advance the cause through collective effort and shared vision.

Conclusion
Establishing pre, post and in-between literacy needs for the visually impaired is critical if persons with visual impairments are to have a chance to access mainstream literacy programmes. Reading and writing are fundamental building blocks to access the education system and in turn, creates opportunity to participate in community as a contributing member of society. As visual impairment can be acquired congenitally or adventitiously, literacy for the visually impaired is a need that extends to both young and old. Effort must go on to achieve seamless integration of these three pillars of literacy if Singapore is to prepare to include persons with visual impairments in society.

References


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**The Influence of Bilingualism on Cognitive Development**

Chien-Hui YANG
Assistant Professor
Abstract
The influences of bilingualism on cognitive development have been a topic of interest in the field of bilingualism and bilingual education for almost a century (Bialystok, 2007). Researchers have investigated the influences of bilingualism on cognitive development from different perspectives in order to understand the bilingual language acquisition and the connection between language and cognition. Research has shown that bilingual children have slower speed in processing the second language (L2), the first language (L1), and smaller processing capability in short-term memory (STM) or working memory. However, bilingual children are also privileged with many cognitive advantages such as cognitive flexibility, metalinguistic awareness, theory of mind development, and cross language transfer. Advantages and disadvantages in bilingual children’s cognitive development are two sides of a coin. The cognitive advantages such as metalinguistic awareness are gained at the expense of the slower speed of language processing. This paper intents to review research evidences supporting the cognitive advantages and disadvantages of bilingual children; its implications on education are also discussed.

Introduction
While bilingualism has often been linked to immigration in the United States, many Asian and European countries simply embrace bilingualism or multilingualism as the norm. Globally, there are more individuals who speak two or more languages, than individuals who speak one language. Singapore has become a unique multilingual nation since the Singapore government established a bilingual education policy in 1966 (Chua, 2004; Kuo, 1980). While English is the official language, major home languages (or mother tongues) include Mandarin Chinese, Malay, and Tamil. The bilingual policy assisted Singapore to be competitive in the industrial sectors and she soon became the top 20 richest countries in the world (Mee, 1998). The bilingual policy in Singapore skillfully sustains two purposes, namely enhancing its competitiveness in the global economics, and maintaining Asian cultural roots and values. While language and literacy development (of English particularly) is closed tied to the pursuit of the economic leverages, language and literacy development (of home language specifically) also maintains traditional Asian heritage and values (Chua, 2004). Throughout the primary and secondary school, English is medium of instruction and children take mother tongue as a subject (Dixon, 2005).

The influences of bilingualism on cognitive development have been a topic of interest in the field of bilingualism and bilingual education for almost a century (Bialystok, 2007). Researchers have investigated the influences of bilingualism on cognitive development from different perspectives in order to understand the bilingual language acquisition and the connection between language and cognition. Due to Singapore’s unique bilingual/multilingual nature, this topic is significant and may offer valuable insights and implications on education.
This paper aims to discuss the influence of bilingualism on children’s cognitive development and its implications on education. This paper first introduces the definition of bilingualism and the connection between language and cognition. The research findings supporting cognitive disadvantages and advantages of bilingual children are reviewed. Lastly, implications of research findings on education are discussed.

**Bilingualism: What is it?**

The definition of bilingualism involves complex factors. The term *bilingual* represents a wide spectrum of individuals who speak two or more languages, with varied degrees of fluency, competencies, and age of acquiring languages.

Hakuta (1990) has asserted that “No single definition of individual bilingualism is broad enough to cover all instances of individuals who are called bilingual. The range can be from native-like control of two or more language to possessing minimal communicative skills in a second or foreign language” (p.1). Due to the complex nature of bilingual language exposure and acquisition, the challenge in defining *bilingual* or *bilingualism* illustrates the complexity of issues involved in the study of bilingualism, which may include social, cultural, educational, cognitive, developmental, biological, psychological, and linguistic factors (Altarribe & Heredia, 2008). While Romaine (1995) has used “the alternate use of two or more languages” (p.12) as the definition of bilingualism, other researchers have defined bilingualism according to age of onset, such as simultaneous versus successive bilingualism (Genesee, 1993; McLaughlin, 1984). McLaughlin and Genesee propose that if a child is a simultaneous bilingual, both languages are acquired in the way the child acquires the first language. If the child acquires a language after the first language, he or she is a successive bilingual. Although McLaughlin (1984) and Genesee (1993) both intended to use age of onset to define bilingualism, they had different cutoff points in mind. McLaughlin considered a child who was introduced to another language before 3 years of age as a simultaneous bilingual, whereas Genesee considered one before 5 years of age as a simultaneous bilingual.

This paper adopts Romaine’s definition, “alternate use of two or more language” as the definition of bilingualism. The emphasis of this paper is not to define bilingualism, but rather, to discuss the influence of bilingual language acquisition on cognitive development for young children, including those who grow up in Asian and European countries.

**Language and Cognition**

Cognitive development certainly shapes a child’s ability and learning style to acquire a language. The language experiences may in turn expand and advance the child’s cognition. After all, children later use languages to acquire knowledge and communicate what they learn. Many processes and skills in literacy development are also closely related to cognitive processing. For example, metalinguistic skills are strongly correlated to literacy development (Adams, 1990; Bialystok, 2001).

In terms of first language acquisition, Genesee (1993) has asserted that a child’s cognitive maturity restricts his or her language development. Genesee thinks that Chomsky’s universal grammar is restrained by the child’s cognitive and perceptual-motor immaturity since universal
grammar is available in the beginning in very young child - “With cognitive development, the child’s manifest language performance will change to reflect more and more innate, underlying linguistic competence or universal grammar” (Genesee, 1993, p.67).

For bilingual children, researchers have been concerned with whether two language systems are too complex for children to handle due to their cognitive constraints. At the earlier stage of bilingual research, researchers were concerned with the negative impacts of learning two or more languages (Magiste, 1979). Policy makers and educators encountered the challenge of shaping language policies (or bilingual policies) to support the overall development of bilingual children as literature presented conflicting information. Parents also faced the dilemma of whether to raise their children bilingually or simply concentrate on one language first.

With the attempt to correct methodological biases and errors from previous studies (such as the lack of considerations of the socioeconomic status and language environments), Peal and Lambert (1962) opened a new chapter in bilingual research. Since Peal and Lambert found that bilingual children out-performed monolingual children in verbal and non-verbal intelligence tasks, researchers have placed more emphases on cognitive development of bilingual children growing up in the additive bilingual environments, which support their acquisitions of both languages rather than suppressing their native language (Genese, Paradis, & Crago, 2004). Researchers have found bilingual children, while they have disadvantages in the speed of language processing and storage of short term memory, are also privileged with many cognitive advantages such as cognitive flexibility, metalinguistic awareness, theory of mind development, and cross language transfer.

Cognitive Disadvantages
Some research findings indicated that bilingualism caused slower speed in processing the second language (L2), the first language (L1), and smaller processing capability in short-term memory (STM) or working memory.

Language Processing
Magiste (1979) found that bilinguals processed their first language (L1) and second language (L2) at a slower speed than monolinguals did. Magiste conducted a longitude study to investigate German-Swedish bilingual adolescents’ performance on object naming tasks. Magiste compared the reaction time required to accomplish tasks in German and in Swedish among monolingual group, bilingual group, and trilingual group. After learning Swedish (L2) for 5 to 6 years, bilingual students performed the naming tasks at the same speed in their two languages and even gradually performed faster in Swedish. However, it still took longer for bilingual group to name objects in Swedish (L2) compared to Swedish monolingual group. Moreover, Magiste found that when bilingual students were asked to perform in German (L1), the bilingual group still took longer to respond than German monolingual group did. The finding in Magiste’s study indicated that learning two languages resulted in the slower speed of processing not only in the second language, but in the first language as well. Based on Magiste’s study, having to work with two or more language systems seemed to impact the processing of first language.

In addition, Magiste found that the monolingual group had the shortest reaction time in all tasks than that of the bilingual and trilingual groups. The bilingual group also responded faster than
the trilingual group did. It seemed that the more languages one child acquired, the longer reaction time the child needed to name objects. Thus Magiste concluded, “the longer reaction times of trilinguals might also be explained as an effect of interference of the competing language systems” (p.87). Magiste’s research supported the interdependence hypothesis that bilingual children stored two language systems in the same memory system, instead of using two memory systems for two languages. Additional time needed to process both L1 and L2 was attributed to bilinguals’ resistance of interference between different language systems.

**Memory Processing**

Research has shown that bilinguals have cognitive deficits in short-term memory/working memory. Miller’s (as cited in Daehler & Bukatko, 1985) “the magic number seven, plus or minus two” has indicated that human processing is able to deal within the range of five to nine chunk of information in the short-term memory at one time. Since then researchers have suggested that “seven plus or minus two” items represent the capability of the short-term memory and they refer to it as digit span (Brown & Hulme, 1992; Cook, 1997). Cook (1997) reported her finding that bilinguals had shorter digit spans in their second language (L2). Cook compared the digit span in English secondary school children learning French between age 12 and 14. She found that although the digit span improved in both languages by 0.7 digit, bilingual children had a shortfall of 2.8 digits in French at both ages.

Some researchers proposed that phonological short term memory was especially important for the language processing, and that second language learners’ reliance on the phonological system was the reason they had shorter digit span (Brown & Hulme, 1992; Cook, 1997). Brown and Hulme (1992) have claimed that “phonological short-term memory is important both in the processing of fluent language, and in the acquisition of both a first and second language” (p. 117). They further proposed that bilinguals’ reduced capability in the short-term memory, especially in digit span, was due to the lack of phonological representation of L2 words in the long-term memory.

Harrington (1992) provided another explanation. Harrington has argued that working memory is a constraint for L2 development because of the larger load on L2 learner’s working memory. He found that working memory played a more important role for second language acquisition than it did in first language acquisition, because L2 learners tended to spend more time on the “bottom-up” processing instead of top-down processing. In this case, second language learners’ working memory capability restrains how well they acquired a second language. Also, second language learners’ working memory capability might be smaller because their working memory has to process larger loads than that of monolinguals. As Cook (1997) pointed out, “the L2 research on working memory is mostly concerned with how the different elements contribute to L2 learning rather than with deficiencies in the L2 processing itself” (p.286). Researches on bilinguals’ memory tended to provide explanations rather than reporting deficits.

**Cognitive Advantages**
Though the bilingualism research seems to posit certain cognitive disadvantages, research has also shown that bilinguals are privileged with certain cognitive advantages such as cognitive flexibility, metalinguistic awareness, theory of mind, and cross language/linguistic transfer.

**Cognitive Flexibility**

Bilingual children have been found to have higher cognitive flexibilities and abilities to differentiate similarities and differences than monolingual children.

Ben-Zeev (1977) found that bilingual children outperformed monolingual peers in tasks that required cognitive flexibility. Ben-Zeev (1977) compared the performances of two groups of Hebrew-English bilingual children with two groups of monolingual children on symbol substitution, verbal transformation, and matrix dimension tasks. The symbol substitution task asked children to substitute words in a sentence according to the instructions without altering other elements in the sentences. Ben-Zeev (1977) found bilingual children outperformed monolingual children in the symbol substitution task even though the bilingual children’s vocabulary level was lower than that of the monolinguals. Ben-Zeev (1977) then used Warren and Warren’s (as cited in Ben-Zeev, 1977) verbal transformation task to test bilingual and monolingual children. When a spoken nonsense word was presented repeatedly to children, children older than 6 year of age tended to guess and frequently change what the word appeared to say to make sense of the word in their language. This verbal transformation served to facilitate the perception of ongoing speech. Ben-Zeev (1977) found that bilingual children made more verbal transformations to make sense of the nonsense word, and began hearing the nonsense word earlier than monolingual children. In another matrix dimension task, children were asked to describe in what way two cylinders in a set of cylinder matrix were the same to or different from each other (e.g. they were the same at height, different in diameter). Bilingual children were found to do better in isolating and specifying the underlying structure or dimension of the matrix than monolingual children did.

Ben-Zeev (1977) concluded that throughout the study bilingual children seemed to approach the tasks in an analytic way: “Two strategies characterized the thinking pattern of the bilinguals in relation to verbal materials: Readiness to impute structure and readiness to reorganize. The pattern they seek are primarily linguistic, but this process also operates with visual patterns, as in their aptness at isolating the dimensions of a matrix” (p. 1017). Ben-Zeev (1977) further argued that in order to avoid interference between bilinguals’ two languages, bilingual children needed to have a keen awareness of the similarities and differences of the structures between their two languages. Consistent with Ben-Zeev’s (1977) finding, Lambert and Tucker (1972) also found bilingual children in their St. Lambert project showed impressive linguistic ability when comparing similarities and differences between their two languages.

A recent study has shown that bilingual infants as young as 7-month old demonstrated cognitive advantages over monolingual infants (Kovacs & Mehler, 2009). In Kovacs and Mehler’s (2009) study, while both monolingual and bilingual infants learned to predict a pattern that linked a speech cue with the specific location of a visual reward, only bilingual infants learned to adopt a different set of rules once the pattern (e.g., the location of the visual reward) had changed. In other words, bilingual infants were able to disregard a previously learned rule and update their
predictions according to the changing patterns presented. This study illustrated bilingual infants had better cognitive flexibility than monolingual infants.

**Metalinguistic Awareness**
In addition to cognitive flexibility, the most significant cognitive advantage is the bilingual’s metalinguistic awareness, which enables bilinguals to control and monitor the use of language objectively (Bialystok, 1986, 1991; Cook, 1997; Cummins, 1987; Diaz, 1983; Diaz & Klingler, 1991).

Cummins (1987) refers to metalinguistic awareness as “both the development of children’s awareness of certain properties of language and their ability to analyze linguistic input” (p.57). Vygotsky (1962) was the first person to note bilingual children’s advantages in metalinguistic awareness. Vygotsky (1962) argued that since a bilingual child used two languages to express their thoughts and learn about the world, a bilingual child “learns to see his language as one particular system among many, to view its phenomena under more general categories, and this leads to awareness of his linguistic operations.” (p.110).

**Analysis and Control**
Bialystok (1991) provided two dimensions, namely “analysis of linguistic knowledge” (representation of linguistic knowledge) and “control of linguistic processing” (selective attention), to explain the metalinguistic awareness (p.116). The analysis dimension can be seen as collections of books that are set out on shelves according to a scheme in a library, and control dimension can be seen as the specific procedures readers followed to obtain a particular book. In Bialystok’s model, metalinguistic awareness requires high control as well as high analysis, while daily conversations belong to low control and low analysis. Bialystok (1999) conducted a study to investigate Chinese-English bilingual preschool children’s performance on control tasks based on his model. He asked children to perform two nonverbal control based tasks, the dimensional sort card task and the moving word task. In the dimensional sort card task, children were asked to sort cards according to a specific feature of cards and then switch to another feature (e.g. first sort by color and then shape). The moving word task required children’s ability to selectively attend to the relevant information and ignore the irrelevant information. Bialystok found that bilingual children outperformed monolingual children on those nonverbal problem-solving tasks requiring high level of control.

**Word Awareness.**
Other researchers focus on another aspect of metalinguistic awareness in relation to the arbitrary nature of meanings and form (name-object relationships). Vygotsky (1962) claims that a child at first “uses verbal forms and meanings without being conscious of them as separate” (p.128) and thus it is difficult for a child to separate the name of an object from its attributes/meanings. However, it is important for a child to separate attributes/meanings from form because “a child’s ability to communicate through language is directly related to the differentiation of word meanings in his speech and consciousness” (p.129).

Lanco-Worrall (1972) employed Vygotsky’s (1962) interviewing technique with Afrikaans-English bilingual and monolingual children at grade 2 and 3 to test if they could separate meanings from form. First Lanco-Worrall (1972) asked children a series of questions such as
“Why is a dog called ‘dog’?” and “Suppose you were making up names for things, could you then all a cow ‘dog’ and a dog ‘cow’?” Then Lanco-Worral asked children: ”Let us play a game. Let us call a dog ‘cow’. Does this ‘cow’ have horns? Does this ‘cow’ get milk?” Lanco-Worral (1972) found that the majority of monolingual children replied that names of the objects could not be interchanged, whereas the majority of bilingual children agreed that names of objects could be interchanged in principle. Also, Lanco-Worral (1972) found that bilinguals did better in separating meaning of words from form and realizing the arbitrary nature of name-object relationships than monolingual children did. Consistent with Lanco-Worral’s (1972) finding, Bialystok (1986) tested children on whether the big objects had big (long) names (e.g. If ‘train’ is bigger than ‘caterpillar’), and found that bilingual children did better in keeping the word size distinct from the object size. Bialystok (1992) thought that the bilingual children’s advanced level of selective attention as well as metalinguistic awareness could be attributed to their early exposure to two languages.

**Syntax Awareness**
Syntax awareness is crucial in literacy development. Galambos and Hakuta (1988) found that bilingual children had advantages in syntax awareness. They asked bilingual and monolingual children to solve two metalinguistic tasks. One task was to ask children to judge and correct the syntactic structure of sentences. The other was to ask children to paraphrase various interpretations of sentences in which ambiguity was presented. The study showed that bilingual children had better performances on syntax structure tasks (first task) than monolingual children. However, only when bilingual children grew older did they perform better in the second ambiguity tasks. These findings supported that language proficiency and maturity influence the metalinguistic awareness in bilingual children. Galambos and Goldin-Meadow (1990) noted that bilingual children across ages out-performed monolingual children in detecting and correcting syntactic errors, but not in explaining errors. The researchers proposed that bilingual children were more advanced in moving from a content-based to a structure-based understanding of language. Bialystok (2004) further interpreted the findings of this study by referring to her analysis and control dimension (1991, 2001). She commented that perhaps explaining syntactic errors (which related to analysis of linguistic knowledge) might require different skills than detecting and correcting syntactic errors (which relates to control of linguistic processing).

**Theory of Mind**
Researchers often use a false belief task to evaluate children’s theory of mind (Nicoladis, 2008; Perner, Leekam, & Wimmer, 1987). The researchers show children a Smarties box and ask what is inside. Children are likely to say Smarties. Then researchers open the box to show something else (i.e., pencil) and ask children to predict what other people (who have not seen the inside of the box) would say. If children are able to answer Smarties, then children have the development of theory of mind because they can differentiate their own thinking from others. They are aware that other people might think differently without seeing the inside of the box. In Perner, Leekam, and Wimmer’s (1987) study, three-year-old children usually said pencils while four-year-old children were more likely to say Smarties, which indicated that four-year-old children had better development of theory of mind. Research has shown that Mandarin-English bilingual children were more likely to pass the false belief task than monolingual children (Goetz, 2003). In another study (Bialystock & Senman, 2004), the advantage on the development of theory of
mind only held true after controlling vocabulary ability. Research has supported that bilingual children have advantages in developing theory of mind than monolingual children.

**Cross-language/linguistic Transfer**

Bilingual children were found to be able to transfer academic and linguistic skills from one language to the other.

Lambert and Tucker (1972) educated a group of English-speaking Canadian children with French as the only language of instruction from Kindergarten through grade 1, and then mainly with French except two hours English in language art each day from Grade 2 through Grade 4. They found that children who were taught in French in school achieved the same academic level as English monolingual control group and fell above the 80th percentile on national norms. When compared to French monolingual group, bilingual children’s French proficiency achieved the same level as French monolingual children in overall performance (e.g., vocabulary, phonemes, and reading) except oral expression and intonation. Moreover, Lambert and Tucker (1972) found that although children were taught in French, they were able to transfer skills from French to English in very short period of time, including reading and calculating skills.

Phonological awareness has been empirically proved to play a crucial role in literacy development (Snowling, 2000). Comeau, Cormier, Grandmaison, and Lacroix (1999) have shown that exposing children to more than one language can potentially equip them with two sets of phonological awareness skills. Veil and Everatt (2005) investigated 116 Herero-English bilingual children in Namibia and found that phonological skills were reliable predictors of literacy skills in both languages. Moreover, children’s phonological awareness in L2 was a better predictor (than that in L1) of the first and second language literacy. Phonological awareness in L1 played a crucial role in L1 reading proficiency. For bilingual children, phonological awareness in L2 was proven to be a better predictor for L1 and L2 reading and literacy. This finding supported cross-linguistic transfer of phonological awareness from L1 to L2 reading. Their findings are supported by Gholamain and Geva’s study (1999), which has shown that L2 linguistic-cognitive skills can be predictive of L1 literacy skills.

**Bilingualism and Perception**

Another set of interesting research findings are related to evidence suggesting that bilingualism influences perceptions (Caskey-Simmons & Hickerson, 1977; Luria, 1976; O’Mahony & Muhiudeen, 1977). Researchers found that exposures to different languages also change the perception of bilinguals. Caskey-Simmons and Hickerson’s (1977) investigated the influences of bilingualism on color categorization with English bilingual speakers of Korean, Japanese, Hindi, Cantonese, and Chinese who lived in the United States less than two years. They found that monolingual speakers of Korean used the word *paran sekj* (*blue*) to mean something greener and less purple than bilingual Koreans who learned English. After Korean speakers were exposed to English, their perception of color perception changed. This phenomenon supported the Sapir-Whorf hypothesis that different language systems influence individuals’ perception (Luria, 1976).

**Conclusion and Discussion**
In conclusion, researchers have found bilinguals need a longer time to process their two languages and have shorter digit span in short term memory than that of monolinguals. These disadvantages might result from the additional time and work in short term memory required to resist the interference of bilinguals’ two language systems. This explanation is supported by the finding that the trilingual group in Magiste’s (1979) study took a longer time than the bilingual group to react to the naming task.

On the other hand, compared to monolingual children, researchers found that bilinguals have cognitive advantages such as cognitive flexibility, metalinguistic awareness, theory of mind development, and cross language transfer, contributed by their early exposure to and manipulation of two language systems. Experiences with two language systems allow bilingual children to step out of one language and to view it from the perspective of another. While bilingual children obtain the advantage of realizing the arbitrary nature of meanings and form early, bilingual children also develop a keen awareness to compare the similarities and differences between two language systems in order to avoid interference between two languages (Ben-Zeev, 1977; Lambert & Tucker, 1972). Bilingual children are keen to identify the underlying structures even though their representation of linguistic knowledge (such as vocabulary and syntax) might be insufficient. Thus it was not surprising for researchers to find that bilingual children outperformed monolingual children on solving problems requiring high level of control (Bialystok, 1999). Since metalinguistic awareness is crucial to children’s cognitive development according to Vygotsky (1962), learning two languages certainly equip the child with advantages in cognitive development.

Advantages and disadvantages in bilingual children’s cognitive development are two sides of the coin. The advantages bilingual children obtain such as metalinguistic awareness cannot be gained without the disadvantage of the slower speed of language processing and shorter digit span in the short-term memory. These findings not only document the gains and losses of bilingual cognitive development, but further reveal the differences between the first language acquisition and second language acquisition.

Researchers reported that second language acquisition follows similar developmental paths of first language acquisition, and evidences such as overgeneralization of lexical forms and the preference for simple syntactic rules, “seemed to indicate that the process of second language acquisition was similar to first language learning” (McLaughlin, 1984, p.109). Yet, in addition to this general principle, research on bilinguals’ cognitive development has indicated more subtle differences between the second language and the first language acquisition. Indeed, second language learners went through similar developmental paths and demonstrated similar characteristics such as overgeneralization and preference for simple syntactic rules as they acquired their first language (Huang & Hatch, 1969). The differences, however, lied in learners’ awareness of their two different language systems, and efforts and demands in resisting the interference between their two language systems. Besides, Caskey-Sirmons and Hickerson’s (1877) finding in color perception remind us that children who speak two languages are dealing with not only language or linguistic issues, but also qualitative differences in how language experiences change their perception, identity, values, beliefs, and understanding of the world. Language learning involves not only linguistic skills, but also thoughts and values the language intends to convey.
Implications
Research has supported that L1 and L2 is closely related and children are capable of transferring language and linguistic skills across languages. Moreover, managing and controlling two or more language systems allows children to develop higher executive control and metalinguistic awareness at a young age. It should be noted that whether bilingual children have cognitive advantages and/or disadvantages is not an absolute outcome. Rather, the environments play a crucial role. The additive bilingual environments, which support children’s acquisitions of home languages and official language (Genese, Paradis, & Crago, 2004) is highly recommended by the researchers. Given the above research evidences, Singapore’s bilingual policy is highly commendable. The bilingual policy in Singapore provides additive bilingual environments for children to magnify the bilingual cognitive advantages. Children are able to embrace their home languages and cultures, while becoming competent global citizens at the same time.

Educators should understand the bilingual children’s disadvantages and advantages in cognitive development so that instructions can be modified accordingly. While assessing bilingual children, educators should always consider unbiased measurements and assessments in home languages. Test results should be interpretations with caution. In terms of instruction, educators can allow bilingual children more time to process knowledge, memorize knowledge, answer questions, and finish the assignments. They can break down a task into smaller steps to reduce the demands on children’s short-term memory and accommodate their bottom-up processing style. Moreover, teaching bilingual children to apply the top-down processes in reading would facilitate their literacy development.

With regard to bilingual children’s cognitive advantages, educators should help children make use of their cognitive advantages to develop critical thinking, higher order thinking, problem solving, and creativity. They should encourage children to share their language transfer experiences, and strategies that facilitate their learning. They could encourage children to use their cognitive advantages in art, science invention, and strategic problem solving in real life situations. They could help children to link their advantages in theory of mind development to social skills and communication. Moreover, educators should be sensitive to bilingual children’s cultural backgrounds and investigate how the language acquisition and cultural experiences influence their learning styles, behaviors, cognition, beliefs, and values as unique individuals.

References


