

## Language learning in minority China: reading & writing

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### *Abstract*

*The focus of this paper is on finding the best practices for teaching minority children in remote villages in China who need to be able to read and write the national language (Chinese), a totally unfamiliar language. It discusses how the skills and strategies already acquired through learning to read and write their own minority language together with at least one year of oral language acquisition in Chinese can be used to help these students learn to read and write Chinese. Research already shows that oral language proficiency levels in a second language greatly affect the ability to use reading and writing strategies normally used by native speakers of that language. This paper also discusses recent developments in neuroscience which may help teachers develop particular kinds of learning activities which facilitate the teaching of these reading and writing strategies to second language learners.*

*Keywords:* reading skills and strategies, whole language and phonics, language proficiency, alphabetic and logographic scripts, neuroscience and education

## Language learning in minority China: Reading and writing

### Introduction

During the last forty years or so, China has put a huge effort into ensuring that its citizens are able to speak, read and write the national language. With so many of its population speaking other versions of Chinese (dialects) and minorities speaking other unrelated languages, the aim of Chinese language policy was that standard Chinese<sup>1</sup> would unify the country, provide a standard education for all, and facilitate modernisation and economic development. In the new millennium, China has become a strong nation with a vigorous economy and a well-established, comprehensive system of education across the country. Given this success, it should now be possible to give special attention to improving education for children who are still disadvantaged because of their ethnicity and remoteness. These children often enter primary school without knowing any Chinese at all because the only language they hear in their homes and villages is their own minority language. This language is often strongly associated with ethnic identity which suggests these children are also most suited and most likely to benefit from a bilingual educational program which begins with first language education and is culturally appropriate. A Bai/Chinese bilingual education preschool program was set up in Shilong Village<sup>2</sup>, a remote, mountain village, to demonstrate how this could be done. The two year program for children aged five and six provides first language education in both years while introducing oral Chinese as a second language at the start of the second year. This paper discusses:

1. The skills and strategies that can only be acquired by learning to read and write in a familiar language and how they can be used for learning to read and write a second language.
2. The importance of oral language proficiency in a second language to reading and writing successfully in that language.
3. Recent developments in brain research that may help improve the teaching of such reading and writing strategies.

### Issues affecting reading and writing in first and second languages

Language is the vehicle for communicating meaning. Whether words are spoken or written, they are merely incomprehensible sounds or meaningless squiggles on a page to someone who is not familiar with the language being used. The primary goal of teachers of reading should be for students to be able to decode what is written on the page so they can comprehend the content as they read. However, this is impossible if the student does not understand the language being read. Such students can only know what the content is if someone else reads the text and tells them what it means. The real key to opening the door to comprehension is the link between what is written on the page and the language already spoken and understood by the novice reader. While the mechanics of learning to read and write are important, the primary goal when reading should be comprehension, and when writing, it should be the ability to express one's thoughts clearly.

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<sup>1</sup> Chinese will always refer to 'Hanyu' (or 'Mandarin' to westerners) which is a standardised version of the Chinese language spoken in Beijing.

<sup>2</sup> Shilong Village, Jianchuan County, Dali Bai Prefecture, Yunnan Province, Peoples Republic of China.

### *Reading strategies*

There has been much debate over many years in the public domain about the best way to teach reading, however, most of this debate is associated with reading English and most of it can be summarized in two basic views. The first view is that reading is an ‘exact’ process that involves decoding words and being able to say them. The second view is that reading is a complex process of ‘problem solving’ in which only the amount of visual information needed to grasp the meaning of a text up to a particular point is sampled. (Clay, M. 1991, p.14) Regardless of this debate, reading strategies for character based languages such as Chinese *demand* a problem solving approach. Traditionally, there was no Romanized version of Chinese which could enable students to use a phonics based methodology. Once a student had learned enough characters and memorized enough texts to become familiar with the way texts were constructed, the student could begin to employ more *holistic* strategies to decipher the meaning of a Chinese text for himself.<sup>3</sup> Although there now is a Romanized ‘pinyin’ version of modern Chinese, it has no long-term role in reading. It was originally developed to standardize Chinese pronunciation and ultimately, readers of Chinese *must* learn to read and comprehend Chinese characters without the help of pinyin.

Whole language strategies (sometimes referred to as ‘global strategies’) are especially concerned with being able to recognize and use information perceived broadly while reading. (Carrell, P, L. 1989) Such strategies include: the perception of the main ideas and subordinate ideas in a text, general text structure, inferring or predicting meaning and familiarity with the text genre. They also include the quick confirmation of words, phrases and commonly used word combinations, and their place and importance in the text. So-called ‘bottom up strategies’ in alphabetic scripts begin with recognizing letters and combinations of letters and their sounds. Bottom up strategies which apply to both alphabetic and non-alphabetic scripts involve dealing with words and their components and the decoding process. They include: the pronunciation of word parts, recognizing common language patterns, and becoming familiar with standard language usage. Nevertheless, in the same way a piano student does not learn to read music until s/he actually tries to play the piano, a person learning to read only acquires the skill of reading through trying to read. The simplest texts introduce words, phrases and familiar language patterns which progressively become easier to recognize and remember. As a result, students gradually build up a set of reading behaviors or habits over time that facilitate the decoding process and help them understand the meaning of the texts they read.

### *Transfer of reading skills and strategies*

There are two main areas that need to be considered in the transfer of reading knowledge and skills across languages. According to Cummins, the first is cognitive/academic development and the other is the ability to use the reading skills and strategies already learned in a first language. He says that first language instruction does not just develop skills that can be used in that language but also develops a ‘conceptual and linguistic proficiency’ that can be applied across languages if appropriate sociolinguistic and educational support is given. (Cummins 2005 pp.4-5) He questions whether they actually transfer, but says that once these skills have been learned in one language, it then becomes possible to apply this knowledge to other languages. While similar languages (e.g. English and French) may have many similar basic language roots and may be able to use more language specific knowledge across those languages, other reading knowledge such as conceptual development, cognitive and linguistic

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<sup>3</sup> Traditionally, learning to read was limited to those wealthy enough to spend time and money on it and was generally limited to males.

ability and the ability to use learning strategies, can be applied to learning to read all languages regardless of the nature of the script. If this is so, it would seem prudent to teach in a way that reminds students to use the knowledge they have already accumulated about the *process* of reading when they learn to read a second language rather than focusing on vocabulary and grammar in the reading lesson. If most new vocabulary and grammar<sup>4</sup> is taught orally first, students can use this knowledge, as well as the knowledge and experience they accumulated while learning to read their first language, and apply both to learning to read a second language. This will enable them to enjoy the ‘story’ content much more as they are not so concerned with the mechanics of reading or the language learning process. Instead, reading is more likely to evoke the appropriate mental imagery that is the normal experience of readers when they read their first language.

In the course of investigating the applicability of Western cognitive theories to comprehending Chinese text amongst grade seven Hong Kong students, Lau and Chan say that there is sufficient evidence to show that spending time deliberately teaching cognitive reading strategies would benefit all Chinese students but be especially helpful for poorer readers. (Lau & Chan, 2003, p.186) The cognitive strategies they identify include: finding and summarizing the main ideas, being able to decode unfamiliar<sup>5</sup> words, recognizing text structure and being able to infer implicit meanings. Lau and Chan’s research shows that there is a strong correlation between self-motivation and the ability to use reading strategies and reading comprehension. (p.183)

### ***Language proficiency levels***

Regardless of the nature of the differences between the writing systems, there is plenty of evidence showing that oral language proficiency in the second language needs to have reached a particular threshold for existing reading knowledge and skills to be applied to a second language successfully. (Clarke, 1980; Carrell, 1991; Cummins 2005; Fukuda, 2011; Fitzgerald and Shanahan, 2000) Nevertheless, language differences and differences in complexity of the reading tasks can sometimes make the task of pinning down such a threshold difficult. (Carrell, 1991; Bernhardt and Kamil, 1995; Lee and Schallert, 1997) Put simply, the kinds of reading strategies discussed above cannot be used if the text being ‘read’ is in an unfamiliar language. In fact, students are not actually *reading* if what they ‘read’ is unintelligible to them even when they are following what the teacher is reading. For example, students may be able to put sounds to Chinese characters, even discuss the structure of a sentence or what the sentence means only because they have learned to recite the text and the teacher has explained what it means in their own minority language.<sup>6</sup> Learning to read their own language first while teaching them oral Chinese would enable students to continue their cognitive development and learn the two *different* sets of skills and strategies required for learning to read and acquiring a second language.

Another important factor affecting the application of first language reading skills and knowledge to reading a second language is how well this knowledge was learned and used when students learned to read their first language. Evidence seems to show that *both* oral language proficiency in the second language and reading skill in the first language affect the application of former reading skills to a second language, *but* that language proficiency is the stronger influence. (Bernhardt and Kamil, 1995) Without oral language proficiency in the

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<sup>4</sup> Substitute ‘language patterns’ for ‘grammar’ when teaching very young children.

<sup>5</sup> These are words and expressions not previously seen *when reading*.

<sup>6</sup> This situation was observed in Xizhong Village preschool in 2003 and in this paper is referred to as ‘teaching texts’.

second language, teachers are usually reduced to ‘teaching texts’. This explains why primary school minority students who have little or no knowledge of oral Chinese often resort to memorizing texts and relying on teachers’ explanations of content in their own minority language.

### ***Learning to read Bai, Chinese and English***

The Bai minority writing system devised by Chinese linguists during the early 1950s is alphabetic.<sup>7</sup> Its spelling system is designed to mimic the Hanyu pinyin Romanized version of Chinese which was developed to standardize pronunciation across the country. However, the Bai language has some sounds that do not exist in the Chinese language and Chinese has some sounds not used in Bai. Despite these differences, teaching Bai students to read and write their own language introduces them to most of the Roman letters used in Hanyu Pinyin. More importantly, these students are able to learn many useful skills, strategies and knowledge associated with learning to read a language they already understand. As a result, they are familiar with both top down and bottom up reading strategies and their comprehension skills when reading Bai are developing well by the time they finish preschool.

### ***Bai and Chinese***

The ability to use these skills and knowledge to read their own language can be adapted to suit Chinese if they are taught how to read Chinese using the cognitive/academic skills mentioned above and similar reading strategies as those used for reading Bai. Because these students have gained some confidence in oral Chinese during preschool, they were also able learn to read Chinese with understanding from the very beginning. Nevertheless, there is still room for improvement if their Chinese reading materials also used words and expressions repeatedly in different contexts to give students more practice with building up their word knowledge and reading skill systematically.

The Shilong Village Bai/Chinese bilingual preschool education deliberately teaches the Chinese-style of Bai phonics (pinyin) during writing lessons rather than during reading lessons. Nevertheless, students are able to use this method of breaking down the sounds of words into letter combinations to help them read an unfamiliar Bai word if necessary. The strong emphasis on developing top down reading strategies where units of meaning are more important than individual letters or combinations of letters, means students should be able to adapt to using the kinds of top down strategies required for reading Chinese if they are taught to do so. For example, students can learn to recognize individual characters if they are not bombarded with too many at once and if teachers use activities such as: showing flash<sup>8</sup> cards, finding matching cards, putting characters in order to make a word or phrase, reading simple texts which are designed to include repetition of words and phrases, and finding specific words on the page etc.

While the above kinds of activities will help develop familiar top down strategies for reading Chinese, they can still use traditional ways to help them remember characters, such as

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<sup>7</sup> This script is officially regarded as an experimental script. The spelling scheme has since been regularized and standardised to eliminate the confusion occurring over spelling words according to a speaker’s local village accent so it can be used anywhere in the Jianchuan dialect region and to make it workable in an educational setting. The standard for the spelling of words is based on pronunciation in the county centre, Jinhua Town. This was carried out under the authority of the Yunnan Minority Languages Committee and the Jianchuan Education Bureau 2004-2006.

<sup>8</sup> Flash cards are word or character cards which are shown one at a time to give students practice recognising them quickly.

thinking through the stroke order of a character to jog their memories. However, they will not be able to sound out letters and combinations of letters which they can do in alphabetic Bai text. Though it is sometimes possible to guess the sound of a word from part of a character it is not a reliable tactic, but given the context of the character, it may be enough to jog their memories if students also have reasonable oral language skills in Chinese. It would be useful if they are also taught cognitive strategies when reading Chinese, such as using context to predict meaning, being aware of structural information including main ideas and subordinate ideas, and how ideas are developed, and the text genre. These aspects of reading are important when reading all languages.

### *Bai and English*

If students already have reasonable oral proficiency in English, they should be able to decode and understand texts when they start learning to read English. Not only do Shilong Village's Bai/Chinese bilingual preschool graduates already have experience with an alphabet-based writing system but also a good knowledge and understanding of how letters represent sounds and together, form words, groups of words and sentences. They can also use 'top-down' reading strategies learned when reading Bai such as recognizing the length and shape of words, regular letter patterns and the position of key letters in words. The above strategies are usually develop naturally in capable readers and are key to developing fluency. These Bai students are also familiar with the pinyin style of separating the word parts into onset (shengmu) and rhyme (yunmu) so it may be useful to show students that this can also be done for English before introducing them to the English style of phonics and breaking these two word parts down into even smaller sound units. It is important, however, that the process of learning to read English does bog down with the bottom up decoding process.

Ultimately, the main activity in any reading lesson should always be about students reading and not about the teacher always reading, asking questions about comprehension or teaching grammar, vocabulary and reading strategies. (Williams, R., 1986, p.42) Reading fluency can only develop by actually reading and reading often. Problematic, however, is finding appropriate reading materials which take account of various levels of linguistic proficiency, are topically relevant, interesting and relatively easy to read. Fluency does not develop if texts have too many new words or are too structurally complex for a beginning reader. Teachers of young children learning to read English as their first language, often use small books, each book having one story accompanied by pictures. These booklets are organized into sets of books at different reading levels. Even so, a single book containing a number of stories is better than not having any stories for children to read on their own. This kind of reading activity will encourage individual children to develop reading fluency and skill and ultimately make reading pleasurable.

### *Writing Chinese*

The Chinese Character writing system presents a range of issues not faced by students using alphabetic writing systems. While five and six year old students in schools whose languages use an alphabetic script are encouraged to write words, phrases and simple sentences very early in their education, young Chinese students spend considerable time practicing writing characters. The average age when they start is three years. The emphasis of this early tuition is mainly concerned with learning to write the strokes correctly and in the right order. Writing them like this every time not only helps to give the character the proper balance within a square, but becomes a mnemonic aid for remembering how they are written and what they mean. The strokes are no more difficult than the letters of the Roman alphabet and there are

not too many different strokes to remember. Neither is remembering the stroke order difficult. However, the number of characters is vast. By the age of 15 (usually year 10 – the end of compulsory education) students may know how to write around 3,000 characters.<sup>9</sup> (CC-CEDICT, 2008)

Parents worry if their children do not begin learning to write Chinese characters early. The biggest stumbling block to introducing more modern teaching methods and making preschool and primary education more child centered, is the pressure from parents for a traditional Chinese education. Although current educational policy affecting kindergartens has moved away from the early introduction of Chinese character writing, most preschools and kindergartens in rural areas and some in urban areas still continue the practice. Pressure from primary schools and parents, teachers own beliefs and the lack of training in more modern teaching methods all inhibit change. (Hui Li, 2011, pp.19-20) There has to be compelling evidence to show that students will do better in a modernized education system using more child centered teaching methods. It is not easy convincing parents of minority students that bilingual education is worth delaying the start of their children's Chinese education so they can acquire a good foundation in reading and writing their mother tongue. This is despite the evidence of research showing that children learn much more quickly in their mother tongue than they do in an unfamiliar language, and that much of what they learn in their own language can be applied to learning a new language, even when the writing systems are different. (Huang Xing, 2003, p.4; Blanchford, D.R. 1999, p.298; Krashen, S. 2010)

### ***Basic writing skills and strategies***

There are several writing skills and strategies which once learned, can be applied when learning to write another language. They can be categorized as: manipulative, cognitive and strategic. Manipulative skills include small muscle development, eye-hand coordination and the ability to manipulate small tools. Cognitive skills include visual perception, an ability to focus attention, use one's imagination, order one's thoughts and use logic and memory skills. (Marr, D. et al, 2001, p.3) Strategic skills include being able to plan, organize ideas, and review and edit work. (Karim, K & Nassaji, H. 2013, p.129) Not surprisingly, all these skills need practice if they are to develop well enough for all the demands of writing well in all languages. Babies and small children take some time to learn to control their movements and progress from gross motor movement to developing small muscle control. While all children develop manipulative skills at home, all children do not all have the same opportunities for development. Preschools, kindergartens and junior primary classes need to provide other opportunities through doing art and craft activities and using appropriate manipulative equipment in subjects like mathematics. Physical education will also give them training in eye-hand coordination during ball and bean-bag activities and handling other equipment. Furthermore, mother tongue oral language lesson times give children plenty of practice in all of the cognitive areas mentioned earlier as children retell events, talk about something brought from home, listen to other children talk, or interact with the teacher. Children can first start learning strategic skills before they are able to write by drawing pictures. The teacher can introduce the idea of planning and organizing the contents of a picture by asking a child what s/he is going to draw and what s/he will include in the picture. Minority children

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<sup>9</sup> Around 2,500 characters comprise 98% of the most used characters. Another 1,000 of less commonly known characters comprise 1.5%. There are a further 3,500 characters which are not so well-known which are also in general use. (CC-CEDICT, 2008)

living in the more remote villages of rural China usually have little experience with books in their own language and few opportunities to play with educational toys. By reading stories to children and asking questions about pictures teachers can help young children develop skills in comprehension and provide a foundation for writing.

Older students are less likely to have problems with manipulative skills but some may still struggle with some of the cognitive or strategic skills when writing in their own language, let alone a second language. Secondary students will still need some directed tuition or revision to make sure that they overcome any deficiencies in these areas. As with the transfer of reading strategies from a first language to a second language, writing strategies will not be available for transfer to a second language if students have not been taught any strategies in their first language. Furthermore, because students are less familiar with a second language, they will need to be reminded and shown *how to use* writing skills and strategies learned during their first language education as they are likely to be distracted by their own language limitations in their second language.

### *The importance of language proficiency to writing*

Poor oral language proficiency in a second language impacts the students' ability to express themselves in writing at all levels of the writing process. While a first language can be used to plan, organize their thoughts and decide on the structure of what they want to write, students will be limited by any lack of vocabulary, grammar knowledge or practice in using appropriate language expressions in their second language. These students tend to let the limited language they know direct both the planning and the writing processes. (Fukuda, E., 2011, p.17) Of those who may choose to use direct translation as a strategy for writing, only students with a reasonable proficiency in the language are likely to have the appropriate vocabulary, grammar and expressions needed to do it well. Even then, first language grammar and sentence structure may still influence the outcome.

Students who have had a good oral introduction to their second language are more likely to have a better appreciation of the rhythm and flow of the language and have learned some commonly used expressions and language structures which can help them express their ideas in writing. If in the very early stages of learning to write, while language is still relatively simple, young students are encouraged to write simply, beginning with titles for pictures then progressing to short phrases or sentences related to pictures, they will become more confident writers sooner than if writing was left until later. A lack of experience in writing is likely to result in undue nervousness about the whole writing process, especially if it is mostly associated with assessment. Some direct tuition in useful expressions and sentence structures, along with relevant vocabulary, can also be given to help students plan what they will write. This may also encourage them to be more confident when writing. Producing class booklets where each student contributes a page encourages all the students to read other student contributions as well as seeing their own work displayed. These booklets can be very popular with students and a strong motivator for improving both reading and writing. Displaying students' own short stories or poems with their drawings also encourages other students to read them. All of the above activities are suitable for use in Bai, Chinese and English language lessons.

### **Issues affecting reading and writing in first and second languages**

The advent of neuroscience has enabled neuroscientists to study brain activity in minute detail using brain imaging or placing tiny electrodes in animal brains which can detect the activity of individual neurons. With the more recent development of functional imaging, the



brain can be mapped during the performance of various tasks so that scientists are able to study which parts of the brain are used when performing these tasks. Scientists have also learned that a different part of the brain can be trained to take over some tasks previously performed by a part of the brain which has suffered trauma. As a result, new therapies have been developed in which the brain is re-educated as part of treatments for a large number of problems. Success in this area has led to a better understanding and new ways of rehabilitating stroke victims (Doidge, N., 2010, pp.132-163), treating post-traumatic stress, training autistic children (pp.74-84), helping children and adults with learning disabilities. (pp.35-41) and so on. The aging population is now advised not only to keep active but also to learn a new language, take up painting, even go back to school or university. This advice follows research which shows that learning *new* things generates *new* brain cells and *new* connections and pathways in the brain regardless of one's age. (pp.88-91, 253-254)

### ***Brain science and education***

Research has shown that the brain continues to reproduce new brain stem cells in people of all ages which can develop into neurons in 'cognitively enriched' environments. The reproduction of stem cells and development of new neurons is usually associated with learning something new rather than exercising skills already learned. (Doidge, pp.252) However, physical exercise together with participating in mentally stimulating activities can also help extend the life of neurons already developed (pp.250-254), while repetitive learning strengthens signals along the neuron pathways causing neurons to fire faster and work together more efficiently. (p.68) Thus, it is possible through the process of education to stimulate the production of brain stem cells, produce new neurons, make neurons fire faster and work together more efficiently, extend the life of existing neurons, cause neurons to develop more branches and bring about an increase in the thickness and volume of the brain. (pp.43, 253) The brain will do this throughout the whole of life if people keep learning new things, practicing skills and staying interested and involved socially. In addition to its 'building activities', the brain is constantly reorganizing itself, pruning away unused or little used neurons to maintain efficiency. (p.253) Brain mapping has also shown that the brain also shifts functions from one lobe to another as people age and that older people generally use different lobes when performing the same functions as younger people. (p.253) As a result, the idea that the brain stops producing new neurons at a certain age bringing about a gradual decline in brain function as people age, is no longer true for those who keeps their brains active for the whole of their lives.

### ***Developing language competencies***

This paper has already discussed issues associated with reading and writing including the importance of oral language development to both first language development and second language learning. One of the interesting things neuroscience has discovered is that young children and more mature people process language differently, in part because young children have fifty percent more connections between neurons or synapses. During adolescence a pruning process begins in the brain in which connections which have not been used or have been underused are cut back considerably to make the brain more efficient. (p.42) This could explain why there is a more 'language sensitive' time in which young children rapidly develop language skills. It is an especially good time to continue developing their first language skills to capitalize on what they already know and to build up strength during this special window of opportunity. It is also a very good time to be introducing a second language, but not if their first language is ignored. Children can continue to build up language competence in their first language in all subjects without having to wait until they know

enough of the second language. Delay in building up these competencies will disadvantage children whose mother tongue is ignored because it will delay brain development and their skills in processing language, which once developed, can be used for learning a second language. It especially disadvantages rural minority children whose second language is a national language and the mother tongue for the majority of children of the same age.

### *The Shilong Bai/Chinese bilingual preschool*

The first year of the Shilong Village Bai/Chinese bilingual preschool program begins with mother tongue education exclusively. These rural, village children usually do not have the same kinds of opportunities as town and city children for oral language development before they begin their Chinese education.<sup>10</sup> The first year of the Bai preschool program for children aged five years has ten mother tongue oral language lessons per week. Each day begins and finishes with an oral language lesson which has specific goals and activities. These lessons provide opportunities for various theme-based experiences, the retelling of experiences or events or retelling stories, answering questions, singing songs, doing experiments and predicting what the result might be, talking about health issues and so on. The aim is to promote vocabulary development, encourage recall and retelling skills, increase confidence, encourage good listening skills and appropriate behavior, promote facility in conversation and the ability to think, as well as strengthen their ability to construct language and express ideas. These oral language lessons also exercise and promote growth and development in various parts of the brain which control the movement of the tongue, lip muscles (Doidege p.38) and vocalization. They also build up the working memory, auditory memory, visual memory, reasoning abilities, and the capacity to focus attention (p. 80). They help to extend vocabulary and develop the ability to construct sentences. Furthermore, the development of good oral language skills will facilitate their development in reading and in expressing their thoughts in writing. Oral language development affects a child's phonological development because the ability to discern phonemes (small units of sound) are essential when reading. Studies of Chinese children reading Chinese show that... "reading achievements are strongly related to children's phonological skills in understanding speech structure and manipulating phonemes and lexical tones." (Meng Xiangzhi et al. 2005, p.295)

### *Language learning*

When children move into the second year of the Bai preschool program, they still have ten oral language lessons each week but five of these lessons are dedicated to learning oral Chinese. These six year old children are already 'switched on' to oral learning which means it is a good time to start learning oral Chinese. Brain research has shown that brain space is given over to the skills which are practiced most and dominate a particular place in brain maps. From adolescence onwards, a first language will dominate and compete for all the space in the linguistic brain map when starting to learn a second language at a later stage. It will take much more motivated, focused attention and practice to establish a new language then. On the other hand, young children's linguistic brain maps show there is little competition for brain space because they are still in the process of building up their linguistic skills in their first language as well as being within the 'language sensitive' period of their

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<sup>10</sup> Their parents and grandparents do not have access to advice about how to help children build up oral language strength in their own language. In addition, while their parents are keen for their children to be able to speak the Bai language, they do not see it as having any relevance to their Chinese education. Moreover, because Chinese is the language of power, status, opportunity and education, they want their children to learn it as soon as possible. The main reason for speaking Bai is that it is the language of identity, culture and is the first choice in this region for communication amongst themselves.

brain development. Brain maps of bilingual children who learned both languages at the same time while they were still very young show that *all* the sounds of both languages share the same linguistic map. (Doige pp.59-60)

The Bai preschool program provides a variety of learning experiences for practicing listening to and speaking Chinese language. Games and activities which introduce new vocabulary and expressions begin very simply with listening and doing, listening and answering, asking a question of the game leader and responding to the answer and so on. These activities motivate the children to learn and give them a lot of practice without the boredom or lack of focus that usually comes with rote learning. Their auditory memories are being built up in their brains and the sounds of the new language are gradually being added. They are also adding new ways of using their tongues and lips to vocalize the new sounds and gradually extending their vocabularies. New connections are being built in the brain and becoming automatic through purpose filled repetition. Furthermore, the children's confidence and enjoyment when learning Chinese in this way has already been shown to last through primary school even when language instruction is traditional.<sup>11</sup>

### *Alphabetic and logographic scripts*

Neuroscience is revealing much that is useful about how the brain processes language during reading or writing that can help teachers design more effective reading programs and pre-reading activities for preschoolers. This emerging information is especially useful for bilingual education programs where children learn to read both alphabetic and logographic scripts. The Shilong Bai/Chinese bilingual education program is an example of a minority language where the alphabetic Bai script is followed by Chinese which is logographic. The reading methodology used for learning to read Bai in this program encourages the development of vision-spatial areas in the right side of the brain and the motor memory in the left side of the brain which are especially important for reading Chinese. It also encourages development in the left-brain areas used when reading both alphabetic and logographic scripts.

### *Transitioning between alphabetic and logographic scripts*

Several studies concerned with transitioning between alphabetic and logographic scripts support the above approach. More recent research involving brain mapping has been done to find out which areas of the brain are used for reading *both* alphabetic and logographic scripts since earlier studies have mainly focused on alphabetic scripts. Studies mapping readers of Chinese and readers of English or French show that they both use the similar parts of the brain when reading but that Chinese readers tend to use more right hemisphere processing associated with visual and spatial areas of the brain<sup>12</sup>. (Liu, Ying and Perfetti, Charles A., 2003, pp.168, 174; Nakamura, Kimihiro et al, 2012, p.1) Studies also suggest that fluent readers of alphabetic scripts use more of the brain regions associated with visual and spatial processing than novice readers. (Booth James R. et al. 2001 p.139) This suggests that the need for quicker recognition of whole strings of words means fluent readers rely more on visual and structural patterns than letters and letter combinations or individual words when they read alphabetic scripts.

<sup>11</sup> This has been the case in the Shilong project with graduates of the preschool being just as enthusiastic about learning Chinese during the final years of primary school as they were in preschool, (Teacher comment, 2012)

<sup>12</sup> To compare Chinese readers with English and French readers under similar conditions, all the alphabetic reading scripts were displayed in a font similar to hand writing (cursive) rather than the usual fonts used for printing Roman letters because standard fonts for printed Chinese are much more like the handwritten form.

Nakamura's brain mapping study has located two 'priming' mechanisms which are important when reading both alphabetic scripts and logographic scripts. They are an 'orthographic decoding system' or 'reading by eye', and a 'kinaesthetic gesture code' (i.e. the gestures or actions involved in writing characters or letters). They say that 'gesturing' is especially important for young children learning to read because writing letters or characters and tracing them with their fingers makes the phonological connection with the orthographic representation of the sounds stronger. (Nakamura et al. 2012, p.174.) This is confirmed further in another study involving testing after using haptic-visual-auditory-meta-phonological exercises which help link the orthographic representation of sounds with the sounds represented. (Bara, Florence et al., 2004, abstract) Amongst Chinese-English bilinguals, some studies show that this connection is generally made more quickly when Chinese bilinguals learn to read Chinese than when they learn to read English. (Liu et al. 2003, p.174) This difference could be accounted for if 'top-down' teaching methods are being used to read Chinese while 'bottom-up' teaching methods are being used amongst those tested for reading English. These students may learn to read English more quickly and efficiently and better understand what they are reading if they were taught to use more 'top-down' reading strategies which enable them to access the already highly developed visual-sound-meaning skills and areas of the brain already developed for reading Chinese. They can learn the various facets of phonics which are especially relevant to learning to write and spell during writing lessons and still be able to use these skills as a back-up for sounding out unrecognized words when reading English. Indeed, the Bai program in Shilong deliberately teaches 'top-down' reading strategies so as to develop the vision-haptic reading strategies which are so essential for reading Chinese, and teaches bottom up strategies using the Chinese method of breaking up the components of words into 'initials' and 'finals' ('onset' and 'rhyme') in writing lessons. Breaking down English words into the already familiar method of representing 'initials' and 'finals' may also be helpful for Chinese students learning to read English and provide a familiar structure for further division into individual phonemes.

The priming mechanisms discussed above fit well with the pattern recognition system of the brain in which the 'occipito-temporal visual word-form system' is sensitive to and able to recognise distinctive "static letter strings" (Nakamura et al, abstract). Pattern recognition is also important to recognizing character structures and strings of characters in logographic scripts. Word shapes and patterns within word shapes, patterns created by common word combinations within strings of words all contribute to the ability to visually recognize patterns in text that have been seen before. The working memories of the brain are seen to 'light up' during imaging when these patterns are recognized as having been seen before. If there is no recognition of a previously seen pattern, these working memories fail to show any activity. Children who have difficulty noticing such patterns in letters (characters), words and sentences may well have difficulty in connecting new information with previously learned information. (Willis, Judy, 2008 p.22) A reading and writing program that encourages the recognition of patterns can only enhance what the brain tends to do naturally and help children who struggle in this area. The brain naturally searches for patterns in the information being referred to it by the senses and sends distinctive patterns to the appropriate brain regions for processing.

On a practical level, using more senses than those actually involved in the reading process are also likely to help young children link sounds to their orthographic representation. Different kinds of sensory experiences can be used such as using color to highlight a common feature in a list of words e.g. a common word ending in English or having a common radicle in a Chinese character. Bodily representation of simple character shapes e.g. '大' which

means 'big' may be shown as a body shape, with the feet spread apart and arms outstretched to make oneself as big as possible. In this instance, the activity links the shape and the meaning to the character. Finger tracing sandpaper versions of letters or simple characters can also help link their shapes to their sounds if they are spoken at the same time. Drawing simple pictures next to appropriate words may also link the meaning of the word to the way it is written. A common root word may be highlighted in color in a complex word with a picture of its changed meaning alongside. Adding a different ending to a 'root' word when word building using Chinese characters provides many opportunities to draw pictures of the different meanings produced, e.g. '老' in '老师'(teacher), '老虎'(tiger), '老鼠'(mouse), '老板'(boss, proprietor, shop keeper), '老百姓' (common people, ordinary folk), '老王' (Mr. Wang) etc. The above kinds of activities help children link new information temporarily stored in their short term memories to information already stored in their long term memories. To do this they must be able to process new information and link it to information already categorized by the brain and stored in their long term memories. (Williss, 2008, Judy p.49)

### ***Reading problems***

Some children who have not learned to categorize the information needed to be able to read fluently or who are unable to make distinctions in visual or sound patterns may simply not be 'ready' to read. An important discovery from neuroscience research concerns the inferior parietal lobule in the left hemisphere of the brain which is crucial to the ability to learn to read and process the many facets of language. This includes processing the sounds and visual characteristics of written words as well as their function. (Dubuc, Bruno, Blog) It is also one of the last brain structures to mature in children which suggests that the best age to *begin* learning to read and write is around five or six years of age.<sup>13</sup>

Also important to success in reading is auditory processing<sup>14</sup> and temporal processing<sup>15</sup> of language. Tests involving normal Chinese children with a range of reading abilities showed that reading ability correlated with their performance in auditory and temporal processing tasks and as well as their linguistic abilities such as reading fluency, vocabulary knowledge, phonological awareness and the identification of characters. It seems that deficits in this area affect more than a child's understanding of phonological structure and content but also affects their perception of the whole language system including speech and orthographic structure. (Meng Xiangzhi et al. pp.306-307; Dubuc, Bruno)

Most people have experienced 'having the light go on' when something is understood for the first time and the accompanying pleasure that results from this experience. Brain studies now show that this experience of 'illumination' has a powerful effect on the brain and in the context of the classroom, gives learners of all ages an awareness of how pleasurable learning can be. (OECD/CERI, 2008, p.2) Children who have this kind of learning experience during early childhood education not only become motivated learners, they are more likely to have a strong foundation for building future knowledge.

### ***Final word***

Research in neuroscience is providing a new perspective on education and learning in general that is already beginning to impact educational policy and practice. (OECD/CERI, p.7) This

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<sup>13</sup> Of course children vary in their development which can mean some children mature earlier while others may be slower to mature in this area.

<sup>14</sup> The ability to discriminate between sounds and their qualities e.g. lexical tones.

<sup>15</sup> The time it takes to discriminate between sounds, tones and name characters or letters.

section has explored some of this new information to find out how it might affect current educational practices in language development, language learning, reading and writing. Examples from the Shilong Bai/Chinese bilingual preschool education program have been given to show how some choices about the educational approach used in the program are supported by discoveries in neuroscience research. This education program enables Bai children to begin their early education in the only language in which they have any competence so they can focus exclusively on learning basic educational concepts in their own language. The program outlines *teacher directed activities* which are child-centered, practical and appeal to all the senses, often using physical movement and manipulation of easily available materials to grasp basic concepts. In this way, the children learn to solve simple problems and develop basic reasoning processes, for example: in mathematics. When they turn to their textbooks, it is to practice using what they have already learned through experience. By the time these Bai preschoolers finish preschool they have a good understanding of the concepts and processes used in the standard Chinese Grade one mathematics curriculum. It only remains for them to learn and apply the appropriate Chinese language when they reach grade one. They also have some basic skill in oral Chinese as well as having learned some language learning strategies which will help their knowledge of Chinese continue to grow throughout primary school.

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