Reading Multilingual Literature: The Bilingual Brain and Literacy Education

by LYDIA KOKKOLA

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This paper focuses on the child reading the literatures discussed in the other articles in this special issue of Bookbird. *More specifically, it focuses on how the bilingual brain differs from the monolingual brain, and provides a general overview of those areas of difference that relate to reading. I conclude with a brief discussion of the implications of these differences for literacy development and education, paying particular attention to the place for multilingual literatures within literacy development.*

As this special issue of *Bookbird* attests, multilingual literacies and literature are flourishing all around the world. This is hardly surprising: the majority of the world's population uses more than one language in their daily life (van Heuven, Schriefers, Dijkstra, and Hagoort; Crystal). Nevertheless, in discussions of literacy education, the monolingual reader is taken as the norm. Indeed, the assumption of monolingualism is so deeply rooted in the literature and research that children who are able to function in more than one language—for instance, immigrants, the children of first generation immigrants and minority language speakers—are discussed in terms of a *lack* of ability (Gkaintartzi and Tsokalidou). Teachers often focus on how bilingual children are "disadvantaged" by their inability to function on the same level as their monolingual peers in the main language of the school, rather than acknowledging the full breadth of their language abilities (*ibid.*). The article by Teruggi in this issue shows concretely just how much knowledge multilingual children bring to literacy situations. This bizarre situation—as the article by Ghiso and Campano above notes—is partly a legacy of colonialism and partly a result of "melting pot" mentality, which assumes that it is only success in the dominant social language that matters. I would also add that the sheer volume of research into monolinguals learning to read has tended to overshadow research on bilingual readers. As a result, monolinguals—especially those who read in English—have become a yardstick by which bilingual readers are measured, and found wanting. In this paper, I acknowledge that children whose literacy skills in the main language of the country they inhabit do not match those of their monolingual peers will face difficulties to the extent that "educationally disadvantaged" may be an appropriate term, but rather than dwelling on their problems, I wish to celebrate their achievements. I will inevitably continue to use English as a yardstick as it is the only language I can assume all *Bookbird* readers can understand. The majority of this paper provides insight into how the bilingual brain differs from the monolingual brain, and concludes with a brief discussion of the implications of these differences for literacy development, paying particular attention to the place for multilingual literatures within literacy development.

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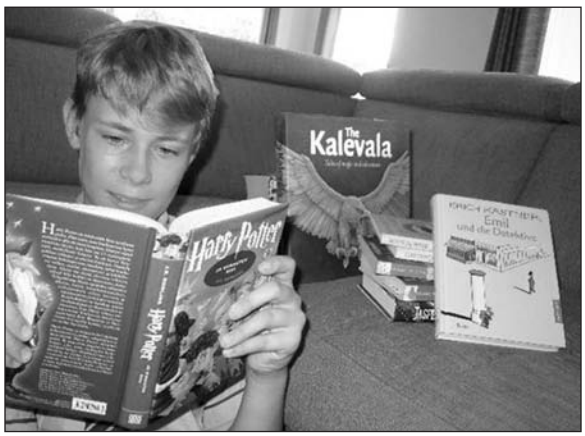
The Bilingual Child: Learning Contexts and Proficiency

The term "bilingual brain" came into general usage following a monograph of the same name produced by two Israeli experts—Albert and Obler—in neurolinguistics in 1978. Their clinical studies of aphasia (a language disorder usually arising from some form of trauma such as a stroke in which the patient has difficulty

remembering words, or may be completely unable to speak, read, or write) were not consistent with the accepted norms. When they recognized that most of the neurological research into the organization of language functions within the brain was conducted in monolingual societies, they wondered whether, since very few Israelis are monolingual, knowledge of more than one language might be the causal factor. In 1978, much of the sophisticated technology that is now used to investigate the brain was simply not available. Nevertheless, they were able to demonstrate that there were good grounds to assume that bilingualism affected brain development, and although not all of the questions they posed have found satisfactory answers even today, many of proposals they put forward, which I shall discuss below, have been supported by clinical research. Unfortunately, most of these studies are published in specialist journals using highly specialist language, and so are inaccessible to the people who most need to know: parents and teachers. The descriptions below are undeniably simplifications, but I hope provide a useful starting point.



The first problem researchers face is with the term "bilingual." How well does a person have to know both languages in order to be declared bilingual? Are there any differences between those who have learned their languages at the same time as a child and those who learned a foreign language at school but became very proficient? Much research has conducted in these areas since Albert and Obler published their study. For some of the questions, it looks as though we may be approaching answers, but not all, for the simple reason that it depends on why you want to know the answer. I start with the first question, which implies a whole series of other questions: What does it mean to "know" a language? Does that mean you have to be able to read and write in it or is it enough to be able to speak in it? If you mean the former, then the children quoted in Teruggi's article below cannot be classed as bilingual despite their obvious proficiency in the dominant language of Italian and their varying degrees of familiarity with a host of other languages! And what does it mean to say that someone speaks "well"? In practice, what most people mean by "well" is taken to mean "is able to use the standard grammatical forms, intonation and pronunciation of a highly privileged minority," academic English, for instance. Speakers of less appreciated forms (e.g. African American English, East London English and EFL speakers) are often treated as though they were not speaking "well," even though they are fully able to communicate their ideas. I could continue, but suffice it to note that whenever researchers use the expression "bilingual," they have to define the term.

In this paper, I am interested in the children who will be reading the multilingual literature discussed in the other papers in this special issue of *Bookbird.* Although I do not know quite how well, the children Teruggi clearly are used to communicating in a language other than Italian. The fictional characters in *Before You Were Here* (2009) by Samantha Vamos and Santiago Cohen and *Subway Sparrow* (1993) by Leyla Torres and the readers of these two picture books discussed in the article by Ghiso and Campano are used to shifting between languages. They do not find this remarkable or threatening; this just is how the majority of the world's population functions.

Children who have learnt both languages from their environment (in the home, in community or both) are known as *simultaneous bilinguals,* and for my purposes it is of little interest whether

they learned their languages because they were raised in a family where more than one language is spoken or whether they speak one language at home and another at school, because the impact on brain development and implications for reading education are far more similar than different. There are slight differences for *sequential bilinguals*, i.e., people who learn one language first and then a second, typically as a result of migration, depending on when the move takes place. Significant changes in the brain at about six, nine, and puberty will affect the child's ability to take in certain kinds of information which affects literacy development. In terms of how well the individual needs to speak the languages concerned, I am not interested in whether or not they are "balanced bilinguals," i.e., equally proficient on both languages. For this paper, it suffices that the child needs both languages to function in his or her environment, as is implied by the reading of a text written in more than one language or reading different language books at different times.

Early Language Learning: The First Five Years

A newborn infant's brain is "plastic," i.e., it can mold itself easily to fit its surroundings. Already in the womb, the fetus has learned to recognize certain features of the language of her environment and can distinguish the mother's voice (and often other familiar voices). In the early years of their life, the brain of infants is particularly attuned to identifying patterns in the language and in language use. So although newborns are capable of recognizing all possible speech forms, fairly quickly, they start to pay selective attention to those features of the language(s) in their environment. This means, for example, that infants rapidly distinguish between the limited set of phonemes (identifiably distinct sounds) used by any particular language, and the full range of possible phonemes that exist in human language. The same is true in speech production: early babbling shows that infants can produce the full range of sounds used in all human languages, but fairly quickly become selective about which phonemes they use (Locke *Phonological, Babbling;* De Boysson-Bardies, Halle, and Durand).

The connections between speech and meaning follow slightly later. Intonation is one of the first features they will identify and use productively (Locke *Phonological*). For instance, infants surrounded by English speakers, quickly learn that rising intonation is used to mark the question form and so will use this intonation pattern to initiate contact with others long before they are able to use words. Word recognition is a decidedly more difficult task as, unlike the written form, spoken languages often run words together or use truncated forms. Consider, for instance, the forms "couldn't," "wanna," and "could've" as perfectly acceptable spoken variants of "could not," "want to," and "could have." These reductions of word boundaries are so common that we have found ways to express them in the written form, although their use in formal texts is still frowned upon. But these are only a small part of the way in which word boundaries are blurred in speech. For instance, English—especially British English—makes extensive use of what is known as the "intrusive R" to link words together when the first word ends in a vowel sound and the second one starts with a vowel sound, so "Grandma and Grandpa" is pronounced with the sound [r] in between the first and second word: "Grandma-**r**and Grandpa" and also when the vowel sound is not written with a vowel, e.g. "Law**r**and order." This linking of words may make the recognition of word boundaries more difficult for the infant, but are vital to later fluency. When native speakers claim that a speaker "sounds foreign" but cannot identify any errors that might mark the speaker as a non-native, the problem is very often that the speaker is marking word boundaries too clearly and this has affected the rhythm of her speech in ways that mark it as "foreign."

For the child growing up in an environment in which more than one language is spoken, the task will be that much greater. The palette of sounds to which she needs to pay attention will be that much larger as she needs to recognize all the phonemes used in each of the languages in her environment. Before she can get started

with word recognition issues, she will need to figure out which language is being spoken. For this reason, children growing up in multilingual homes often do not start speaking as early as their monolingual peers, and when they do start speaking, they may not receive quite as much support as it may not be clear which language they are trying to use. This is not the same thing as *speech delay*, which means that the child has difficulty in both understanding and communicating (Steiner and Hayes). Already at this point, well-intentioned but ill-informed monolingual "experts" may become anxious and diagnose the child in terms of "lack" or "problem." In extreme cases, teachers, health workers and social workers have even suggested that the child is suffering from some kind of speech disorder and propose that the home should become monolingual thereby depriving the child of access to a second home language—along with the rich culture that belongs with that language—not to mention the strain on parent-child relationships as the parent loses access to his or her language of choice. Perhaps there would be less pressure to adopt a monolingual model as the norm, if there was better understanding of how differently the bilingual brain develops.

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In the monolingual child, language functions usually start to become localized in the left hemisphere of the brain from the age of 36 months. This process is called lateralization; it simply means that certain parts of the brain become specialized in performing particular functions. Right-handed and left-handed people show slightly different lateralization patterns, so in the research literature you will find that the dominant hand of the individuals who were tested will be mentioned. By the age of five, nearly all the language functions are there. As the functions become fixed and honed to a particular language, the harder it is to learn a new language. So, since phoneme (individual sound) recognition and production is one of the earliest aspects of language an infant learns, a child who moves to another country after the age of six may overuse certain phonemes from their first language and/or have difficulty distinguishing between phonemes or other sound qualities that are central in the other language. For instance, as English is not particularly strict about phoneme length, an English speaker learning Finnish may have difficulty distinguishing between and producing words like "tapaa" (meet) and "tappaa" (kill), which differ only in terms of the length of the "p" sound in the center of the word (a plosive sound which is difficult for many non-Finnish speakers to either lengthen or distinguish the length). The inability to distinguish key phonemes can result in confusion, irritation, or mirth depending on the situation. Subsequent bilinguals who learn their second language after the main lateralization of language functions has taken place may also retain other features such

the word order or other early grammatical features of the first language even though they are highly proficient in their new language. So, in this sense, it does make a difference when and how one learns another language.

Language Learning and the Brain: What Happens Where?

By the end of puberty, different areas of the brain have developed specialist functions for different aspects of language processing. These areas work together to enable the individual to understand and produce language. The earliest area to be identified is Broca's area, a small area near the left temple that is central to the production of speech. If this area is damaged (e.g. through a stroke), the patient will understand what he is she is being told, but is unlikely to be able to reply. Wernicke's area is located in the left temporal lobe (roughly in line with the top of the ear) and is central to the comprehension of language. Broca's and Wernicke's areas work together all the time, but their slightly different roles are visible when fMRI techniques are used to identify areas of brain activity.

Functional magnetic resonance imaging (fMRI) is used to detect blood flow. When the neurons in the brain are active, they require more oxygen and so fluctuations in blood flow can be used to identify which areas of the brain are working. Because fMRI is more sensitive to the presence of oxygen rich blood than traditional MRI, it is able to provide a more dynamic view of the brain and identify smaller neurological connections without harming the subject being studied. Using this technique, Dapretto and Bookheimer were able to show that Broca's area was primarily responsible for helping speakers recognize that "The policeman arrested the thief" and "The thief was arrested by the policeman" mean the same despite the change in syntax, but Wernicke's area was primarily responsible for recognizing that "The car is in the garage" and "The automobile is in the garage" mean the same despite the lexical change (427).

Both Broca's and Wernicke's areas were identified over 150 years ago, but as investigative technology has improved, it has been possible to identify more precisely areas within Broca's area that are used for processing vocabulary, syntax and certain aspects of grammar, whilst areas within Wernicke's area are used for gauging emotional content—the kinds of things we mean when we say "reading between the lines"—such as politeness and intention. It is physically structured in a very different way (with longer interconnecting fibers or *axons* which are spaced further apart than the same area in the right hemisphere). As Sousa notes, "The implication is that the practice of language during early human development results in longer and more intricately connected neurons in the Wernicke region, allowing for greater sensitivity to meaning" (*ELL Brain* 21).

The more sophisticated research techniques have also revealed that different neural networks are used to process nouns from those used to

process verbs. PET scans have even revealed that different strands are used for processing words that are semantically similar take place in slightly different parts of the brain (words for animals are processed in a slightly different place from words for tools) (Chouinard and Goodale). They have also revealed that areas of the brain that were not thought to be involved in language processing are also used. These include areas within the right hemisphere, which are used for processing very complex sentences. For instance, the area that corresponds to Wernicke's area in the right hemisphere is involved in disambiguating words that may hold a wide variety of meanings (e.g. "stand") (Harpaz, Levkovitz and Lavidor). More unexpectedly, areas of the cerebellum (located at the back of the brain, close to the top of the spine), which are associated with motor control, are also used in language processing as this part of the brain also organizes symbolic information sequentially and is involved in aspects of thought modulation and the emotions. In fact, the cerebellum is so important to speech production that children who suffer trauma in this area (e.g. tumors) are likely to suffer from mutism until other areas of the brain take over those functions (Riva and Girogi).

A complete understanding of how the brain comprehends and produces language is not yet available, but already we know enough to identify potential areas of difficulty for language learners, and to relate those to implications for literacy education. For instance, we now know that tonal processing and visual processing take place in discrete areas of the brain. So speakers of tonal languages (such as Punjabi and Vietnamese) will be making much more use of this area than speakers of non-tonal languages, such as Finnish. Visual processing mostly takes place within the right hemisphere, and so reading will involve not only those parts of the brain that are associated with language processing, but also those parts of the brain associated with vision. This use of right hemisphere processing is particularly evident in languages that use logographs (e.g. Chinese). In a brain imaging study by Buchweitz *et al*, Japanese speakers' brain activity when reading the older, logographic Japanese script (*kanji*) was compared with their brain activity when they read the same text in the modern syllabic form (*hirangana*). When reading the logographs, the subjects used parts of the right hemisphere used for visual processing, but when they read the syllabic form, they used parts of the left brain that are associated with phoneme processing. Kümmerling-Meibauer explains how the images in picturebooks and texts also form a kind of bilingual processing, as text and image function as different languages. The implication of Buchweitz et al's study is that picturebook reading would demand even greater crossing between the hemispheres than text alone.

There is also some evidence to suggest that women are more likely to use the right hemisphere for language processing than men (see Sousa *ELL Brain* 11-12 for a summary). There is considerable debate about the implications of this finding. What we do know is that the connective strands in the *corpus callosum* (the area between the two hemispheres which enables the two halves of the brain to communicate with one another) are larger and thicker in the female brain. This has been used to explain why girls tend to speak a little earlier than boys and tend to find foreign language learning slightly easier. This difference is likely to be a blend of genetic

and environmental factors, and determining precisely which factors would be difficult and not particularly useful. For teachers working with bilingual children, it will suffice to assume that tasks involving hemisphere switching are likely to be somewhat more difficult for boys and so more educational support will be needed for such skills. The studies of bilinguals' brains reveal that right hemisphere language processing and therefore hemisphere switching is more common than it is for monolinguals.

The Bilingual Brain and Hemisphere Dominance

Children growing up in a bi- or multilingual environment, the research shows, develop slightly differently from their monolingual peers. Brain lateralization can take longer, but more interestingly, more of the language functions are placed in the right hemisphere. As François Grosjean famously pointed out: "The bilingual is not two monolinguals in one person" (3). Albert and Obler worked this out by noticing that their bilingual aphasics could often recover from trauma to the brain in the left hemisphere in ways that monolinguals could not. Now with brain imaging techniques, it is possible to plot more precisely what kinds of functions are situated where, but the rules are not absolute. For the classroom teacher, however, the findings are sufficiently clear to draw some conclusions about what kinds of teaching techniques are most likely to prove successful with bilingual children.

The language functions are still primarily situated within the left hemisphere, but the role of the right hemisphere is somewhat greater, especially when the speaker is "code-switching" (shifting between languages) (Crinion *et al*.). An activity that is required in the reading of the picture books praised by Ghiso and Campano in their article below, where the texts shifts between Spanish and English (*Before You Were Here*) or between multiple languages (*Subway Sparrow*). Kovelman, Baker, and Petitto found that bilingual children demonstrated almost exactly the same patterns of brain activity when they were thinking in just one language as were their monolingual peers, but when they were asked to perform tasks involving code-switching, they accessed the equivalent of Broca's area in the right hemisphere. So when the children who were cited in Teruggi's study recognized their home language in the pre-school setting, there would have been a shift taking place in the way they processed the information. This pattern is not usually found in either foreign language learners or subsequent bilinguals learning their second language after the age of nine (Sousa *ELL Brain* 24-5), although Perani *et al* did find it in highly proficient subsequent bilinguals, which led them to conclude that "at least for pairs of L1 and L2 languages that are fairly close, attained proficiency is more important than age of acquisition as a determinant of cortical representation of L2 [brain activity]" (1841). Children reading the books discussed in other articles in the special issue of *Bookbird* are more likely than not to use their right hemisphere more actively as they process the materials.

The right hemisphere is typically where the emotions and visual stimuli are processed. If a person is right brain dominant, they are likely to process information holistically, gaining the big picture fairly easily, but possibly struggling to see the details or be able to process them in a linear fashion (as is more typical of left brain dominants). The right brain dominant individual is also likely to be more intuitive than logical, better equipped to process non-verbal information than their left-brain peers, but need concrete information rather than symbolic input. Right-brain dominants are also more likely to find it easier to "think outside the box" and come up with creative solutions, where left-brain dominants require solutions that are firmly tied to reality. One side is not "better" than the other; on the contrary, the best learning results are achieved when both sides of the brain collaborate. For bilingual learners, it is particularly important to ensure that the teaching techniques access both sides of the brain. Kümmerling-Meibauer's comments on how images and text function as parallel code systems implies that picturebooks might be particularly valuable for bilingual readers.

In the context of reading, let us take the "holistic vs. linear" right-left opposition. The right brain is primarily responsible for making sense of the whole: the sense of the story for instance. Teaching approaches such as the "Apprenticeship Approach" promoted by Liz Waterland in the mid-1980s celebrate this processing style as they encourage children to think "top-down" rather than "bottom-up": "*reading is not a series of small skills fluently used; it is a process of getting meaning*" (11: italics original). This was the approach to reading evident in the pre-school setting in which Teruggi recorded the bilingual children and their teachers. If we take her first conversation (p. 38), Jasmine proposes that they should "Try looking at the photo," a technique that clearly works for Altea and Zaudi who produce reasonable narratives based on the pictures.

The left side of the brain struggles to work this way, and is much better at processing small pieces of information in a logical sequence. Teaching approaches that focus on sound-grapheme associations (also known as "phonics" teaching), as is common in the Finnish school system, are excellent for encouraging left-brain processing. Later in the example from Teruggi, the children start looking at the letters and, in another conversation, the children start looking for the letters with which their name begins. All readers need to draw on the strengths of both sides of the brain, and ideally will receive additional support for those kinds of skills for which they show less natural aptitude. Bilingual children are even less likely to flourish in a system that focuses on just one side of the brain than monolinguals when taken as a group, because at least some of the monolinguals in any given class will have the brain hemisphere dominance that matches the teaching system and so will thrive, albeit to the detriment of skills associated with the other side of the brain. (See Williams for a fuller discussion of top-down and bottom-up processing in the context of bilingual reading.) Teruggi's teachers began with top-down processing, but supported the children as they moved to bottom-up processing. They managed this despite the variety of languages spoken by the children in the group, and presumably without the ability to speak the children's languages themselves. Honoring a child's bilingualism does not require teachers to be proficient in all the languages their pupils speak!

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Teaching Bilingual Children: Implications for Literacy Education

There are obviously more implications for the literacy education of bilinguals than can be covered in the scope of an article. I have limited myself to just three topics: the processing of sounds and their connection to writing systems (referred to as "grapheme-phoneme correspondence" or GPC) where the bilingual brain has an advantage over the monolingual brain, vocabulary (where bilinguals are typically disadvantaged) and the place of code-switching in reading education, such as the use

of multilingual literature in the classroom. But before I examine these issues, I wish to clarify a point that is occasionally blurred in discussions of literacy education.

Proponents of the apprenticeship approach to reading (also known as the "real books" movement) made many valuable contributions to reading education as the shifted the focus towards meaning making, reading for pleasure and activities associated with right-hemisphere processing. However, they made a fundamental flaw when they claimed that reading could be acquired in the same way as the spoken language (e.g. Waterland, 10). This is simply not true. Humans have been using spoken language for so many thousands of years that our brains have become specially adapted to deal with it. Literacy is a far more recent phenomenon, and has not been an expectation for the majority of any country's population for more than a couple of centuries and even today estimates of the proportion of the world's illiterate adult population range from one fifth to one quarter. As David Sousa explains: "Speaking is a normal, genetically hardwired capability; reading is not. No areas of the brain are specialized for reading. In fact, reading is probably the most difficult task we ask the young brain to undertake" (*ELL Brain* 81; see also Sousa *Learn to Read* 31-3). Nevertheless, reading does build on speaking, and learning to read will require teachers and learners to pay slightly different attention if the learner is bilingual.

As I mentioned above, infants pay selective attention to the sounds (phonemes) in the speech they hear. The child who is born into a bilingual environment will develop slightly different patterns of selective attention from the monolingual as she takes the phonemes from both (or more) languages into account. If we take an English-Finnish bilingual as our example, most of the phonemes will overlap but not all. It is difficult to say exactly how many phonemes a language has because it depends a little on which variety of the language and whether or not one counts loan words (with imported phonemes) and diphthongs (sound blends like the central sound in "si**ng**er") or not. English is generally accepted as having 44+ phonemes and Finnish 27 phonemes, but they are not quite the same sounds. The child growing up in a Finnish-English bilingual environment will pay attention to a greater number of phonemes than a monolingual child of either language, and she will also pay attention to phoneme length more carefully than monolingual English speakers as well as sort out which sounds fit which language. Subsequent bilinguals will have greater difficulties with these tasks than simultaneous bilinguals, especially if they enter the bilingual situation after the age of six. The teaching implications are obvious: bilingual children, especially subsequent bilinguals, will need help learning to identify phonemes that they have learned to ignore and in making discriminations that are not important in their L1. For instance, Finnish speaking children learning to read in English will need help learning to identify the "ʒ" sound in a word like "mea**s**ure" because this sound does not exist in Finnish, and an English speaking child learning to read in Finnish will need to

learn to pay closer attention to aspiration so that they can hear how long a plosive sound like "p" is in a word ("tapaa" or "tappaa"?). Even if the child is a simultaneous bilingual, this focus on areas of difference will be helpful as it supports appropriate selective attention for the language concerned.

This focus on sound is called "phonemic awareness" and, unfortunately, it often gets confused with "phonics." Phonics is a teaching method in which teachers ask children to name the letters; it is based on the alphabetic system and requires children to connect visual symbols with sounds. Although it is closely related to phonemic awareness, it is perfectly possible for children to develop good phonemic awareness and have a poor sense of grapheme-phoneme correspondence and, conversely, children who know their letters do not necessarily manage to distinguish between closely related sounds (Sousa *Learn to Read* 33-36). Bilingual children will obviously need to learn to connect sounds with graphemes, but what I am advocating is not a stronger emphasis on phonics but more language play with rhymes, near rhymes and rhythm patterns that are specific to the language in which the child is learning to read. The Haitian song book described in my postcard, (page 35) *Dis-Moi des Chansons d'Haïti* [Tell Me a Song from Haiti], for instance, contains songs with rhymes and near rhymes in three different languages. The basic ideas in the songs are similar, but the wording has been wrestled around to fit the music and so emphasizes language specific rhyme and rhythm. This kind of pre-reading experience is helpful for any child, but particularly so for bilingual children.

This focus on the sound system is just as important for writing systems that are not as obviously phonetically written as Finnish (where GPC is very tight), including Chinese. The basic graphic unit of a Chinese character represents a morpheme as well as a syllable; the written system also contains a direct representation of the sound. In their review of the skills Chinese speakers need in order to learn to read in their native tongue, Li *et al* acknowledge the significant role of visual processing in deciphering a Chinese character, but draw attention to the strong connection between phonological awareness and character recognition. They also report on findings that show that early education in Pinyin (a phonological coding system that works rather like the alphabet) has a positive impact on the reading of Chinese characters. Phonological training is necessary for all forms of literacy education, and primarily takes place in the left hemisphere. Visual skills are primarily located in the right hemisphere, but the attention to detail required for processing graphemes—especially visually complex graphemes like Chinese characters—will also draw on the left hemisphere for logical organization. So simply shifting between the sounds and forms of letters or other characters will not be enough to provide the balance between the sides of the brain I advocated earlier. In order to activate right hemisphere activity through the use of visual stimuli, one would need to do something more holistic, for instance prediction activities based on images.

Images can also be used to enhance vocabulary acquisition. Vocabulary size is the most reliable predictor of how well a child will learn to read (Sousa *Learn to Read* 90-5). For monolinguals, vocabulary size and class are closely related. A fascinating longitudinal study by Hart and Risley

revealed that, at the age of three, children from the poorest homes in their study had a vocabulary of just 525 words, less than half that of the children from the wealthiest homes (who had a vocabulary of 1116 words). So before we jump to the conclusion that vocabulary size is a causal factor, we must note that the other advantages children from wealthy homes often have (e.g. the availability of reading materials, access to adult caregivers as well as more basic advantages such as nutritious food and living arrangements conducive to sleep). Nevertheless, the smaller the vocabulary, the greater difficulties the child will face making sense of a text, especially if the sense needs to be inferred from between the lines rather than being directly stated (Sousa *ELL Brain* 23).

The socioeconomic status of immigrants varies from the wealthiest, who often move country precisely in order to maintain a higher standard of living, to the most impoverished, including those fleeing hunger and war, which will have a decidedly negative impact on the child's ability to learn. One generalization we can make about children growing up in bilingual homes is that—although the combined vocabulary in both or all languages may be greater than a monolingual child from a similar socio-economic background—in the early years, the child's vocabulary in any of the languages s/he uses is likely to be less than that of the monolingual from the same socio-economic background. Since we know that a limited vocabulary usually results in poor reading skills, it is wise to concentrate on vocabulary acquisition. More specifically, Sousa (*ELL Brain* 38-9) suggests, vocabulary teaching should be linked to the right hemisphere processing by making links that are as visual and concrete as possible (his examples include images that might help a child understand the abstract notion of "justice"). The reasoning behind this suggestion is that meaning making and visual processing both take place in the right hemisphere and so activities that can help shift vocabulary use over to the other hemisphere are particularly beneficial for bilingual children. Sousa also concludes that new vocabulary needs to be learned orally (i.e. teachers should not expect novice readers to learn new words from the context of reading). This is somewhat unexpected as, for monolingual children, vocabulary is best learned through reading. Picking up new vocabulary from context (i.e. by reading) requires knowledge of about 90% of the other words in the text (Lightbown and Spada; Nation). This is where connections to the other language, and the larger overall vocabulary can be invaluable. For both sequential bilinguals learning to read for the first time and subsequent bilinguals who are already literate in their dominant language, multilingual literature can provide cross-language support and make efficient use of the way the child's brain is formed (*ELL Brain*: 59-62).

However, as I also noted above, bilinguals tend to use the same areas of the brain as monolinguals when they are thinking exclusively in one language. The use of the right hemisphere in language processing is at its height when the individual is code-switching. This is where multilingual literature has a key role to play. In addition to the social and emotional importance of recognizing the child's other language and culture and the concrete support it can offer to the subsequent bilingual whose knowledge of the language in which she is being educated is limited, code-switching activates the bilingual brain to make greater use of the right hemisphere. Many of the books discussed in other articles in this issue are illustrated. Switching between image recognition and the necessary focus on word forms that reading demands also encourages hemisphere switching (see Kümmerling-Meibauer above).

…multilingual literature can provide cross-language support and make efficient use of the way the child's brain is formed.

There is more to the "bilingual signature" in the brain than the additional access to the right brain, just as there is far more to multilingual literature than the "same" text appearing in two or more languages. The implications for literacy education extend far beyond those briefly listed

above. What I hope is now clear is that the bi- or multilingual readers of the books discussed in this issue of *Bookbird* do not "lack" skills; on the contrary, they have very special skills. Let us hope that more attention will be paid to training teachers to understand how to match the special skills of bilinguals to literacy education.

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