

Brain-based Research on the Benefits of Bilingualism and Second Language Instruction



Introduction

The invention of the microscope in the early 1900's and of MRI technology in the 1990's have made possible the study of the brain and its functions. Brain-based research has proven the benefits of bilingualism and has also provided insight as to the most effective instructional strategies for learning.

Research to Support the Benefits of Bilingualism

The benefits of second language instruction are referenced in [The Ontario Curriculum: French as a Second Language: Core French, Grades 4-8; Extended French, Grades 4-8; French Immersion, Grades 1-8, \(revised\) 2013](#), and [The Ontario Curriculum: French as a Second Language: Core French, Extended French and French Immersion, Grades 9-12, \(revised\) 2014](#), hereafter referred to as the Revised 2013-2014 FSL Curricula. "Knowledge of an additional language strengthens first-language skills. The ability to speak two or more languages generally enhances cognitive development, as well as reasoning and creative-thinking skills. It also enhances the student's confidence as a learner, facilitates the learning of additional languages, and contributes to academic achievement. As their strengths develop, French language learners become more flexible and adaptable in new and unforeseen situations. For example, second-language learners tend to be more divergent thinkers, with improved memory and attention span." (p. 7)

The following articles support the benefits of second language learning. These have been categorized as follows:

- Transferable skills to promote literacy;
- Cognitive development;
- Neuroplasticity and its benefits.

Transferable Skills to Promote Literacy

The LNS monograph [French Immersion in Ontario](#) is based on the research of Dr. Jim Cummins (OISE) which supports the notion of knowledge transfer. Studies of dual language programs in Canada and elsewhere suggest that students' literacy skills in a first language provide the schemata for literacy learning (e.g., phonological and phonemic awareness, thinking/processing skills, comprehension strategies) which will transfer from a first language to a second and, vice versa, from a second language to a first.

In Jim Cummins' study entitled *Immersion education for the millennium: What we have learned from 30 years of research on second language immersion* (1998), he speaks to the 'linguistic interdependence principle' which maintains that the common underlying proficiency in two languages makes possible the transfer of cognitive/academic or literacy-related skills between the two languages.

Dr. Rachel Hawkes in her blog series entitled ["How Foreign language Literacy Supports English"](#) explains that bilingual students develop transferable knowledge and skills such as strategies for accurate spelling, memorizing and retention of new vocabulary and making connections.

Cognitive Development

["Cognitive Benefits of Learning a Language" \(2007\)](#) Several experts affirm that second language education enhances the cognitive development of the brain and results in higher academic achievement.

[“Learning Languages Triggers Brain Growth” \(2012\)](#)

is a study that shows that second language stimulates the growth of the hippocampus and causes changes in other structures of the brain such as increased density of the cerebral cortex in the lower part of the parietal lobe. In short, second language learning increases brain power.

[“Neuroscience and the Bilingual Brain” \(2012\)](#)

The executive control system, which promotes multitasking, turns out to be the most important cognitive system we have. Also, executive functions affect working (short-term) memory strength. Higher performance in nonverbal cognition suggests that “holding” information in their working memory also benefits their early and frequent executive function exercise of paying attention to and evaluating language.

[“Bilingual Children Better at Problem-solving Skills” \(2012\)](#)

The mental alertness required to switch between languages could develop skills useful in other types of thinking e.g. demonstrable benefits, not only in language but in arithmetic, problem solving and enabling children to think creatively. Bilingual children show an aptitude for selective attention and an ability to filter and focus on information which is important.

[“Being Bilingual Boosts Brain Power” \(2012\)](#)

Second language acquisition develops an auditory system that is highly efficient, flexible and focused in its automatic sound processing, especially in challenging or novel listening conditions.

Neuroplasticity and its Benefits

[“Cognitive Benefits of Lifelong Bilingualism” \(2013\)](#)

Bilingual brains display a different pattern of neural functioning in bilingual versus monolingual individuals. Bilingual seniors use their brains more efficiently than monolingual seniors. Together, these results suggest that lifelong bilingualism may exert its strongest benefits on the functioning of frontal brain regions in aging.

[“Being Bilingual, the Neuroplasticity Workout” \(2013\)](#)

Being bilingual increases the neuroplasticity in brains of all ages. Neuroplasticity is characterized by focus, intensity, duration, constraint, imitation and visualization.

[“Second Language can Help Delay Alzheimer’s, study finds” \(2011\)](#)

Bilingual seniors have additional mental capacity so that they don’t immediately show signs of decline.

Many articles have been written that discuss the impact of effective instruction on students. The following chart will outline the implications of this research on the teaching of French as a second language.



RELEVANCE FOR FRENCH AS A SECOND LANGUAGE INSTRUCTION

Research Findings	Implications for FSL	Source
<p>Effective teaching should include a focus on both the whole and its parts. For example, teaching phonics independently of the meaning of the words and their meaningful use is likely to be less effective than teaching both at the same time.</p>	<p>Authentic tasks based on real-life experiences cannot be taught to the exclusion of vocabulary, syntax and grammar. Conversely, vocabulary, syntax and grammar cannot be taught out of context. The FSL teacher then plans sub-tasks that provide necessary vocabulary and structures for students to practise for the summative or culminating authentic task. Grammar is taught explicitly based on student need with immediate opportunities to apply the grammatical structure in context.</p>	<p><u>Genesee, F (2001). "Brain research, implications for second language learning." University of Minnesota, CARLA (Centre for Advanced Research in Language Acquisition). The ACIE Newsletter, November 2001, Vol. 5, No. 1.</u></p>
<p>Students need time and experience ("practice") to consolidate new skills and knowledge to become fluent and articulated.</p> <ol style="list-style-type: none"> 1. Implicit competence, is governed by the procedural memory, and explicit knowledge, retained in the declarative memory, are two distinct aspects of neuronal functioning; 2. There is no direct connection between the two; 3. Explicit knowledge does not 4. 'transform' into implicit competence; 5. the ability underlying spontaneous; 6. communication. <p>Implicit competence and explicit knowledge are two separate and distinct processes. Implicit competence is required to communicate orally; explicit knowledge is necessary in order to refine communication using the written forms of the language. Both are necessary for the development of communicative competence in a second language. From a neurolinguistic perspective on learning a second language, the equation becomes: implicit competence + explicit knowledge = ability to communicate well.</p>	<p>FSL students experience difficulty applying knowledge of vocabulary, syntax and grammar which is taught explicitly. In planning then, the FSL teacher should plan sub-tasks which provide necessary vocabulary and structures for students as needed.</p>	<p><u>Netten, J. and Germain, Claude (2012). A new paradigm for the learning of a second or foreign language: the neurolinguistic approach. Neuroeducation. Volume 1. Number 1. St. John, Newfoundland & Montreal, Quebec. 2012.</u></p>

<p>To develop implicit competence is to use and re-use structures during multiple opportunities in a variety of contexts. Furthermore, this language use tends to occur effectively when a small number of structures are used and re-used by the learners in many different situations in order for the neuronal pathways to be established.</p>	<p>Students require multiple opportunities in a variety of contexts in order to develop listening, speaking, reading and writing skills.</p>	<p><u>Netten, J. and Germain, Claude (2012). A new paradigm for the learning of a second or foreign language: the neurolinguistic approach. Neuroeducation. Volume 1. Number 1. St. John, Newfoundland & Montreal, Quebec. 2012.</u></p>
<p>The acquisition of oral language precedes the learning of explicit knowledge about the language.</p>	<p>The significance of this finding is that language instruction should begin immediately with using the language orally in spontaneous, authentic oral interaction.</p>	
<p>The brain records data with its context. It is easier to retrieve data in the brain if the context in which it is used is similar to that in which it is learned. This statement holds true both for oral and for written use of the language.</p>	<p>An inappropriate learning strategy is the memorization of verb conjugations. Memorizing a series of verb forms as a block makes it more difficult to locate the appropriate form for a particular sentence.</p> <p>An appropriate strategy is to provide an authentic task that gives context to the use of a verb form. In real conversation, only one appropriate form of the verb is used.</p>	
<p>A normal student's attention span is roughly the equivalent of the student's age, to a maximum of 20 minutes.</p>	<p>Lessons should be chunked according to the age of the students in the class e.g. a grade 6 student is eleven and the lesson should be chunked in eleven minute segments.</p>	<p><u>Tate, Marcia (2003). Worksheets Don't Grow Dendrites: 20 Instructional Strategies That Engage the Brain. Thousand Oaks, California. Corwin Press.</u></p>
<p>The brain can only hold seven isolated bits of information in short term memory simultaneously.</p>	<p>Lesson chunks should not introduce more than seven facts or instructions at a time.</p>	
<p>Students remember best what comes first in a learning segment and remember best what comes last. This is known as the primacy-recency effect.</p>	<p>Ideally, each lesson should begin with an activity to hook the students' attention that introduces the purpose of the lesson. As well, each lesson should provide an opportunity to consolidate learning of lesson.</p>	
<p>The discovery of mirror neurons explains the power of observational learning. When we observe someone carrying out an action, the same neurons in our brains fire as if we were carrying out the action.</p>	<p>The FSL teacher begins a lesson with modeling each activity and providing students with practice time.</p>	<p>Kagan, Dr Spencer and Kagan, Mmiguel (1994). Kagan cooperative learning. San Clemente, California. Kagan Publishing.</p> <p><u>Curriculum Services Canada (2012). A Guide to Reflective Practice for Core French Teachers, Module 2 - Positive Learning Environment.</u></p>

In the center of the limbic system of the brain are the left and right amygdalae. Among other functions, the amygdalae function as threat sensors. When there is a threat in the environment, the amygdalae trigger the release of stress hormones. Stress hormones interfere with hippocampus functioning so that new bits of information are not stored efficiently.

The FSL teacher needs to establish a safe, caring and inclusive classroom. More information on the importance of a positive learning environment may be found in [*A Guide to Reflective Practice for Core French Teachers, Module 2: Positive Learning Environment.*](#)

Conclusion

To sum up, brain research has dispelled myths such as learning a second language delays first language skills and has proven that in fact, learning a second language benefits the learner. In addition, study of the brain's neural pathways has provided the educator with brain-compatible strategies to enhance student engagement. The teacher who teaches a second language and aligns instructional practice with brain research is sure to maximize student learning and engagement.



Resources

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