The Learning Brain

This organ we call our adult brain is about the size of a cantaloupe. It's wrinkled like a walnut, feels like a ripe avocado, and is pink in color because of the blood flowing through it. 1 It is also a multi-function, multi-tasking wonder, and among its most important functions is learning.

Important to the work of ESL tutors is the symbiotic relationship between learning and memory. For example, you learn a language by studying it, but you then speak and write by using memory to retrieve what you have learned. Sounds simple, but anyone who has attempted to acquire a second language has felt the pain and frustration of long hours of study, boring repetition, confusing rules and their exceptions. As tutors, we share in our students' pain and frustration. Why, we may wonder, is it so difficult for our students to learn to hear, speak and write in English? Research into how our brain functions has offered some intriguing insights.

A generation ago visibility into the inner workings of this complex and mysterious organ was limited. Conventional scientific research and wisdom said the human brain, once formed, remained static. The adult brain was believed to be hard-wired and doomed to slowly deteriorate with age.

Today, advances in imaging and other research technologies are expanding what we know and changing how we think about our brains. Imaging technologies such as fMRI and PET scanning 2 are helping scientists peer into the living, functioning human brain. By charting which regions of the brain experience increased blood flow, metabolism or electromagnetic activity, researchers are able to identify relationships between particular types of mental activities and particular parts of the brain They are exploring an organ made up of billions of interconnected neurons designed to exchange information in support of mental and physical tasks.

Advanced research technologies are enabling scientists to study the formation of new synapses 3 and neural networks within the brain, follow sense inputs along neural networks and pinpoint where higher cognitive processes such as memory occur. Important discoveries about how the brain works are being made. One of these discoveries is that we now know that the brain has the ability

to rewire itself in what is generally referred to as brain plasticity, or neural plasticity. This means the adult brain is a flexible rather than a static, hard-wired organ. It is capable of creating new networks to facilitate learning and memory and has the ability to adapt and change throughout an individual's lifetime depending upon what it experiences and learns.

Scientists can now show that the brain uses neural networks to recall and assemble learned information from memories scattered throughout the brain. New technology has also enabled research focused on determining which types of learning are most conducive to building new networks and enhanced synaptic efficiency. For example, The Center for Research on Language, Mind and Brain is studying changes occurring in the brains of individuals learning a second language in adulthood. Their research shows that fact-based and motor-skill learning involved in acquiring a second language combined with the required involvement of both declarative and non-declarative memory systems 4 are positive indicators for building new neural networks in the human brain. Their research also suggests a link between word processing and rule-based learning, such as grammar rules, and the expansion of neural networks. 5

ESL students are unlikely to consider creating new neural networks and rapidly firing synapses as among the benefits of learning English; but the implications for educators may be nothing short of revolutionary. Consider how the advent of the computer and the Internet has radically changed the way educators teach and their students study and learn. The electronic age was born when researchers discovered how to imbed a single working transistor onto a silicon substrate. Today we may be on the cusp of a brain age.

Brain plasticity has significant implications for our future. Can we really build more highly developed, longer-lasting brains by finding better ways to stimulate the creation of additional neural networks and enhanced synapses? Scientific research to date indicates we can. In fact, they are only confirming what the brain has been doing throughout human evolution. What has changed is that we may be able to influence the pace of brain evolution because research suggests that certain forms of learning, such as the acquisition of a

second language, are more effective than others in causing the brain to develop new neural networks.

Brain plasticity also helps us to understand why our ESL students struggle. They are involved in the process of forcing their brains to create new neural networks and, at the same time, are having to cope with existing, often conflicting, network wiring embedded by their native language. If we wanted to compare the mental workout involved in learning a second language to a physical exercise such as jogging, we might say it is similar to “feeling the burn” of strenuous physical effort. The good news is that it appears this strenuous mental effort expended over long periods of time does to the brain what physical effort does to muscle – it builds “mass”.

Moving from the realm of brain research, theory and speculation into practical information ESL tutors can use today, here are some suggestions:

1. Consider the norms of your student’s primary language structure and writing styles. Look for clues that may suggest existing neural networks are hindering your student’s ability to absorb English. For example parts of speech not used in a student’s native language, such as articles, may be more difficult to learn; and an activity we would call plagiarism may be considered an acceptable form of sharing in another culture.

2. Develop a variety of teaching strategies that include the liberal use of recognized memory aids such as mnemonics. Other memory enhancing techniques include association, visualization, verbalization, simulation and repetition.

3. Model learning skills that aid retention. For example, interest, attentiveness, concentration.

4. Be patient with your tutee and with yourself. Becoming fluent in a second language will take more than one semester.

5. Be compassionate.

The concept of brain plasticity suggests some answers about why it is difficult to learn a second language, however, we are only beginning to understand how the brain learns, stores memories,

constructs associations, modifies its own structure and makes us who we are.

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1. Interesting Facts about the Brain. www.mamashealth.com/organs/brain2.asp

2. fMRI: functional magnetic resonance imaging. PET: positron-emission tomography.

3. Synapses: specialized neuronal junctions which connect neurons.

4. The declarative memory system, located in the hippocampus of the brain, supports conscious, explicit memory for prior events and facts, whereas non-declarative memory is involved in a number of different forms of learning. www.crimb.ca/08symposium/2008/03/scientific-back.html

5. Ibid

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