

NeuroELT Theories and Practices for Improved Language Learning

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Introduction

What is NeuroELT? Traditional methods of language teaching involve lots of input, and more recently with the communicative approach there has been more emphasis on output as well, but according to findings in neuroscience (Sousa, 2010), there are so many more ways we can take advantage of the way the brain works and create many more opportunities to learn as well as use the brain and language to learn more effectively. In the latter half of the 20th century, thanks to research in the fields of psychology and neuroscience, educators became aware of an ever-growing accumulation of knowledge about how the mind and brain work. This amalgamation of research between psychology (the study of mental processes responsible for cognition and behavior, a.k.a. *the mind*), neuroscience (the study of the brain's development, structure and functions, a.k.a. *the brain*), and pedagogy (the study of the art and science of teaching, a.k.a. *education*) has been termed *Educational Neuroscience* (Sousa, 2010). NeuroELT is the application of findings in Educational Neuroscience to the more specific field of English language teaching, although this scope may also be expanded to include the teaching of any language as a second or foreign language.

The aim of this paper is to cover several concepts of how the mind works and phenomena of the brain, and then describe some implications for teaching languages. It will also include several classroom applications of these concepts with both practical classroom activities and advice for better teaching practice.

(1) Mirror Neurons

Mirror Neurons were first discovered in the 1990's by neurophysiologists at Parma University in Italy (Rizzolatti et al., 1996). They discovered that when a monkey observed another monkey performing an action such as gripping something, the observing monkey's brain fired the same neurons as the acting monkey's brain. This has implications for language learning in that when a person observes and hears language in use, they can pick up on physical clues to help them understand and learn. This might not seem to be new. However, while this may have been obvious in the past, it is only recently that the science has been able to explain why this happens on a neurological level. Gazzola et al (2006) and

Keysers & Gazzol (2009) described experiments on auditory empathy, the term used to describe the phenomenon of sharing an experience with another by hearing a sound which in turn activates the same brain structures associated with the making of that sound. For example, when a person hears a sound associated with a particular action, such as kissing, the same area in the pre-motor cortex becomes activated just as if that person was actually kissing someone. This idea of *empathy* connects back to observational mirror neurons as mentioned above. Viewing another person's actions, either done *by* or done *to* them, can activate the same neural structures in the brain as if the observer was actually doing the action himself. As an example of one of these empathic experiences, many a man has observed damage being done to another man's genitals and cringed with painful thought. The significance of this is that many actions and events are universally understood, and so the integration of gestures and other visual stimuli with language can help to scaffold language learning. Interesting to note is that our brains can distinguish between biological and non-biological actions, such as the difference between an action performed by another living creature or a tool (Restak, 2006). Regarding language, it has been shown that infants older than nine months can learn new speech sounds that they have never heard before, but these are limited to those sounds which have been produced by a real person (Restak, 2006).

(2) The Verb-Behaviour Link

The Verb-Behaviour Link is a term used by neuropsychologists to describe the phenomenon that when one speaks an action word, the same parts of the brain used when physically performing that action light up with neural activity. It seems plausible that this may explain the success of the TPR (Total Physical Response) method for language learning at lower levels. In the TPR method, the role of the teacher is to be the director of all student behavior, and the students are imitators. The teacher begins by speaking and acting at the same time, thereby giving the students both a linguistic *and* physical example of the target language. The observers (students) are given an opportunity to imitate the target language and actions, and eventually produce original utterances themselves by combining the vocabulary learned. This author is of the opinion that this demonstration of ability and understanding is achieved by strengthening the neural connections between the target language vocabulary and the physical actions themselves. Students are able to hear the lexical representation of the action, see the physical action itself, do the action, and eventually say it. This is a wonderful representation of the verb-behavior link and mirror neurons working together.

(3) Visualization and Mirror Neurons

Thanks to mirror neurons, it is possible to visualize things in our minds. Sports coaches often tell their athletes to visualize their goals and successes. Examples of this include having a baseball player

imagine swinging more from the hips, a sprinter pumping his arms faster, or a weightlifter lifting the bar with an extra 2.5kg on it. Once an action is learned, if you later mentally rehearse it, you can increase your muscle strength as though you actually did the action itself, and in fact your heart rate and breathing will increase proportionately to the imagined effort (Restak, 2006).

These findings from neuroscience can be connected to research in psychology and language education research. Research undertaken into second language (L2) selves and motivation has shown a link between visualization and language learning motivation and success (Dornyei and Ushioda, 2009). It has been posited that the visualization of one's language learning goals and successes can act as guide to the formulation of strategies to help one achieve those successes. For example, visualizing what level one wants to achieve in a second language, the role of the language in one's life, and the functions one wishes to perform in it can act as a catalyst to compel a language learner to utilize learning strategies and study habits that will enable him to realize those goals. Dornyei (2009) describes the ideal self and feared self as potential future selves to which a language learner will try to orient himself either towards or away from, and which can have a great impact on a learner's motivation and language learning success. This conjuring of one's ideal and feared self in one's mind is a form of visualization, and so it can be seen that visualization can and does have a very real and significant impact on a language learner's development.

Classroom applications of (1), (2), and (3):

The following are activities which, regardless of how long they have been used in the classroom, are still relevant as quality activities that have a solid grounding in the principles outlined above. It is up to the reader to decide to what extent the activities can be used in his or her own teaching context, and whether they can be used as a simple warm-up activity, an entire lesson, or the basis for assessment.

1 . Charades

a. One person or team chooses a card with a word or phrase in the target language on it and acts it out. The other person or team observes the action and tries to guess it out.

(Theories incorporated: Mirror neurons — creating empathy in the mind of the observer activates the same neural structures as the actor, which then pushes the observer to find the lexical representation of the action.)

2 . Audio Stimulus activity

a. Play a sound and have students create stories and situations based around that sound. They then can tell a partner or group their story or write it down. There are smart phone applications which are free and include plenty of interesting sounds. (*Fun Sounds* or *MegaSFX* are recommended.)

b. Play *only the audio* from a YouTube video, movie or TV show several times. Have students listen, visualize the situation, and then act it out.

(Theories incorporated: Auditory empathy — hearing a sound allows a person to visualize the origin of the sound in his or her mind, and establishes opportunities for creative language production. Because the language produced is original, it is also personally relevant, allowing for more engagement with the task and better learning.)

3. Visual Stimulus activity

a. Play a short video clip (ex. from YouTube) *without the audio* that is long enough to provide context but not so long as to be overwhelming. Have students create stories or dialogues to go along with the clip. They can add information about the situation, place, characters, relationships and events.

(Theories incorporated: Mirror neurons and visual empathy, as outlined in activities (1) and (2) above.)

4. Closed Eyes Story Chains

a. Divide students into pairs (Student A 1 and A 2, Student B 1 and B 2, etc). Have students close their eyes and have all the Student 1's tell a story to Student 2's. The listening students must visualize the story in their minds and try to remember it. Next, mix the partners, and this time have Student 2's repeat the story to their new partner.

(Theories incorporated: Verb-behavior Link, Visualization — As students are told stories, the language used allows them to not only visualize the stories as they are told, but also experience them through the phenomenon of the verb-behavior link. In addition, the stories are student-generated and therefore personally relevant.)

(4) Emotions and learning

Emotions are not only important for learning, they are the key to it. Why does a language learner study that language? The motivation could be from something as simple and intrinsic as loving the feeling of learning and improving, to getting a good grade, getting into a good university or getting a good job, impressing his teacher or parents, or even to avoid ridicule and punishment, all of which have robust emotional components (Immordino-Yang and Damasio, 2007). Emotions not only have commanding influence on learning motivation, but on the the learning experience in the classroom itself, and they manifest themselves in various ways. For example, toxic stress, such as overly negative critical feedback, impedes learning (Schwabe & Wolf, 2010), and affects brain structures such as the hippocampus (the part of the brain responsible for the formation of new memories about past experiences) and the amygdala (the part of the brain responsible for learning on the basis of reward

and punishment). This in turn can impact negatively on executive functions such as planning and decision making in the pre-motor cortex (McEwen & Sapolsky, 1995; Shonkoff, Boyce, & McEwen, 2009). In fact, Willis (2010, p.50) reported, “During fear, sadness or anger, neural activity is evident in the lower brain, and the reflective, cognitive brain (pre-frontal cortex) does not receive the sensory input of important items, such as the content of the day’s lesson.”

On the other hand, positive emotions have been shown to increase subjects’ scope of attention, global thinking, and thought-action responses (Fredrickson & Branigan, 2005). This means that a positive learning environment leads to students paying more attention, organizing their thoughts better, and making better decisions about their learning.

Hardiman (2012), outlined nine important points about emotions to keep in mind as educators and emotional custodians of our students in our classrooms. They include the following:

1. The need for predictability—we need to create safe routines for our students. Unexpected changes can cause stress and a negative learning environment.
2. The need for a personal connection between the teacher and student.
3. The need for a personal connection between the content and student—personal relevance helps cultivate positive emotions towards the lesson’s content, thereby opening students’ minds and priming them for learning.
4. The need for trust and acceptance—We must accept that some students would rather be somewhere else, and make them trust us and our goals for them.
5. The need for a warm and supportive environment—no stress learns best!
6. The need for control and choice—more control and choice for students means more personal relevance. Even limited choices have a more positive impact than zero choices.
7. The need for humor—Humor obviously creates positive emotions and enjoyment for students (and for teachers too!)
8. The need for music, art, dance, and drama—giving students different outlets for their creative minds and different ways to use the language they are learning.
9. The need for celebration—We need to celebrate our students’ achievements, no matter how small, and let them know their efforts are noticed and appreciated.

Conclusion

The primary concern of educators is not simply to teach, but to nurture learning. Research has shown that the human brain works in a complex way, with experiences, senses, and emotions that collaborate to produce learning that are unpredictable. Hart (1983) argues that teaching without an awareness of how the brain learns is akin to designing a glove without knowledge of the hand. This means that in this

era of open access to information, keeping up with trends in research fields which inform education policies and pedagogic practices is a responsibility of educators. As a sub-set, the field of language education is no different. With more knowledge about how to help our students learn better and achieve higher levels of language competence, it behooves us to learn about and attempt to incorporate these concepts into our classrooms and professional practice.

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【Abstract】

新たな言語学習のための NeuroELT（ニューロ英語学習法） 理論と実践

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急速な発展を見せている NeuroELT（ニューロ英語学習法）という分野は、言語教育者に言語教育の方法や活動についての理論提供を行い、古いやり方を変え、生徒の授業経験や学習意欲を高める新しいやり方を見出してくれる。

この論文では、NeuroELT に応用されている神経科学や心理学、それに教育学における注目すべき考え方を簡単に述べている。

こうした考えには、Rizzolatti 等（1996）が発見したミラー神経細胞現象、可視化やモチベーションへの影響（Dornyei, 1996）、動詞-行動の関連性（Restak 2006）、感情が学習にとっていかに重要か（Immordino-Yang & Damasio, 2007）が含まれている。さらに、本研究にしっかりとした基礎をおいている言語授業活動についても、そのいくつかを紹介している。