FAB 9 Study Sheet #2 – Neuromyths

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Topic 1: Countering "neuromyths"

The term "neuromyth" is used to explain mistaken ideas teachers have about the brain. Calling a belief a "myth" has a tinge of condescension, especially since many of these notions were based on sound science at the time they emerged. Nonetheless, a number of papers have been written on this topic and indeed, there are some seriously outdated ideas that teachers still subscribe to. A recent survey in the UK, Turkey, Holland, Greece and China (Howard-Jones et al, 2009) found that most teachers still believe a few key neuromyths. This is no surprise, since neuroscience is advancing so rapidly, but it is nonetheless a problem teacher trainers need to attend to. The most important neuromyths are as follows:

1) There are right-brained/left-brained people (believed by 70% of the surveyed teachers)

There is no evidence that a person is right-brained, and thus better in the arts, or left-brained, and better at logic. Make no mistake, different people have different strengths in arts or logic, and the brain hemispheres have areas with different functions, but no evidence exists showing that we use one side or the other for these skills. We use both sides all the time. Nonetheless, hemispheric differences do exist. According to neuroscientist Bud Craig, (Campbell, 2015a) animal research suggests the left side is connected to calm, energy-saving, affiliative behavior, and routine things. The right side is more connected to the sudden, excitatory, such as change, novelty, and predator evasion. Since the right side must be ever vigilant, it takes over whenever a "What's that?" encounter occurs, especially those stimulating an emotional response. You can see it in action when a late student walks in the door (sudden & novel) in the middle of your lecture (routine & calm). Everyone's heads, including yours, turn towards the door. That said, most brain functions, including language, seem to be distributed across both hemispheres. Whereas language is still associated with the left hemisphere, many neuroscientists are questioning to what degree this is true. An emerging view is that processing is less localized and lateralized than we previously thought, and it is more diffuse. The strength of the bias towards modularity seems to be an artifact produced by the limitations of split brain and fMRI studies (Aron et al.,2007; Anderson, 2010). Whatever the degree of specialization between the two hemispheres, it might be good advice to describe people as being "better at this or that," rather than being "right" or "left brained."

2) Students learn better if we teach to their visual, auditory, kinesthetic, or tactile (VAKT) learning styles. (believed by 96% of the surveyed teachers)

The belief that we should use different approaches to teach visual, auditory or kinesthetic learners pervaded education at the beginning of this century, but it has not been borne out by research (Pashler et al, 2008). Indeed, that people perceive themselves as having different skills or study preferences is not disputed, but that alone does not imply that optimal instruction for a student should fit that preference. The notion that educators can optimize learning by matching content delivery to these styles is not supported; in some cases, contrary evidence exists. In a way, that makes sense, since the best means of delivery usually depends on the content itself.

3) We only use 10% of our brains. (believed by about half the teachers surveyed)

It is astounding this notion still persists. It dates back over a hundred years, and was the basis for the silly 2014 Morgan Freeman and Scarlett Johansen movie, "Lucy," but it just does not

fit what is so obvious about the brain. Everything is connected to everything else and processing is distributed all over. I wonder if this notion persists because of the widely published fMRI brain scans that just show a few bright areas in red during a particular mental process, whereas these areas just represent heavier blood flow in some places for operations that generally take place all across the brain.

Other faulty beliefs exist as well. The beliefs described in numbers 1-8 below have already been labeled by others as neuromyths (Tokuhama-Espinosa, 2003; Doidge, 2007; Medina, 2008; Dekker et al, 2012).), and I am adding some of my own: 9-14. The list is simplistic and by no means complete. Also, I must accept that some of *these* claims might also be reclassified as myths a couple years from now:

4) There is no recovery from impairment caused by brain damage. This statement can be considered a myth because the brain is amazingly plastic. While the neural damage is permanent, the resulting impairment, such as paralysis, might not be. Therapies have been developed that teach other areas of the brain to take over, and there is evidence of synaptic neurogenesis in some places.

5) Children are constantly gaining more synapses, which is how we become smarter. Synaptic blooming and pruning happen all the time. After birth, an explosion of new synapses are made, with up to 2 million per second in a healthy toddler, but at about 3, the fine-tuning of synaptic pruning, takes over (S. Robinson, personal communication, January, 2016). Much of this takes place during the brains numerous critical age-like periods.

6) The brain is a separate device from the body. Our brains are embodied and highly connected to our sensory systems, skin, and digestive areas. Science fiction, including the old radio show "Donovan's Brain," with a disembodied, yet functioning brain in a vat could never really happen.

7) Study is more important than sleep. Simply put: No sleep, no learning.

8) Classical music makes you smarter. Classical music might make a person feel classier, but there is no solid evidence that this particular belief is true. Then again, watch some of the clips from *Alive Again* on Youtube for a real surprise.

9) Brain size reflects intelligence. If so, Neanderthals, elephants and whales would be smarter. It is a combination of size and neuronal density that better determines intelligence.

10) A child should learn one language before learning another. Languages do not compete for resources, they share. Extensive research shows that knowing one language aids learning another, and multilingualism is associated with improved cognitive flexibility and other executive functions.

11) Children learn languages faster than adults. Research shows that children do not learn at a faster pace than adults, although children learn certain aspects better, such as the phonetic system.

12) The brain is a big computer. In some ways the brain does work like a computer, but I like to think of it as a pharmacy. The brain produces over 1000 hormones and other behavior-modifying chemicals.

13) Physical education is unrelated to scholarship. Exercise plays a huge role in brain function and learning.

14) Emotion and logic are separate. All emotion is cognition, and all cognition contains emotion.

15) The brain is hardwired. It is unbelievably plastic. Even daydreaming changes the specific neural connections (structure) of the brain.

16) The brain is made of areas that have specific single functions, such as the "pleasure center." Localization of function is a notion losing ground. Small networks with certain skills seem to be recruited for use in multiple higher level networks for more complex processes, such as language. Unlike the rest of our body where each organ has its own function, the brain is a highly interconnected network where many functions are diffuse.

17) Products that claim to be brain-based are superior. In a sense, every educational product is brain-based. Most of those that claim to be designed according to how the brain works, such as Baby Einstein™ and Brain Gym® have little support in the brain sciences. Only a few products, such as Fast ForWord® have been truly created and tested by neuroscientists.

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