Neuroangradogy in Online Education

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Abstract: The purpose of this perspective in practice essay is to address the effectiveness of online learning based on adult brain-based education. This essay attempts to answer the question: Do what we know about the brain (neurology) and adult teaching methods (andragogy) play a key role in learning in online courses?

Adult education has followed educational research rooted in more than 60 years of psychological research in education and learning and has resisted paradigm shifts from the traditional lecture model. This approach, based on psychology, may be problematic, as it is disconnected from neuroscience, a study of what we know about the brain. Research in the field of psychology consist of soft data, while neuroscience research provides hard biological data and explanations that should help educators design courses.

It is important that this relatively new field of online education be given special consideration. Because online education is delivered to individuals who are not physically present (on site) with the instructor, technology is a central part of such delivery (Suarez-Brown, Grice, Turner, & Hankins, 2012). Thus, how the brain stores and analyzes data must be at the forefront of the conversion from the physical classroom to the virtual classroom. The lack of non-verbal feedback to the instructor may be grounds for forecasting the learning experience; therefore, designing learning units based on how the brain functions should help address questions that may arise.

In essence, efforts by educators should find roots in how the brain works. Therefore, principles of neuroandragogy (the art of teaching adults rooted in neuroscience) must be the basis for the delivery of courses in universities throughout the world. Some universities may be adhering to neuroandragogy while others persist on pedagogical approaches more appropriate for primary and secondary education. This discussion on neuroandragogy is believed to transcend to all educational fields and provides limitations and recommendations in order to promote future research. The intent of this essay is to address the challenges of online education and provide possible solutions based on neuroscience.

The Literature

With advances in an increasing acceptance of online education, more adults from all different backgrounds turn to higher education to seek the promise and the possibility of professional, intellectual advancement. These working adults are not the traditional 18 to 24 year old full-time students with scholarships, grants, and parental support. These individuals have families to support, jobs, and a myriad of societal responsibilities. The online environment presents formidable implications for the learning that needs to take place in the higher education arena.

An argument can be made for different education methodological processes that take into consideration students' present situations and maturity level. What does the knowledge about the brain and adult learning prescribe? Gura (2005) suggested that any teaching method used should be complemented by the natural development of the brain in order to obtain the greatest benefit from the learning situation.

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Pedagogy vs. Andragogy

Researchers appear to agree that the need of individuals to mature and meet certain learning and life necessities is evident. In fact, Bloom's taxonomy (Bloom, 1956), Knowles's (1972) taxonomy of competency development model (the basis for andragogy), and Maslow's hierarchy of needs (Maslow, 1954; Urwiler & Frolick, 2008) support the idea that more mature individuals require a learning methodology different from the methodology employed with children.

Forrest and Peterson (2006) made a case that pedagogy "refers specifically to children and assumptions for teaching children" while andragogy "focuses on the adult learner and creation of an independent, adaptable individual" (p. 113). Knowles (1989) compared pedagogy and andragogy to six key assumptions: (a) learner's need to know, (b) experience, (c) self-concept, (d) readiness to learn, (e) orientation to learning, and (f) motivation. An argument can be made that in education this means pedagogy applies to 18-23 year old students, and andragogy applies more to students 24 years and older (Bale & Dudney, 2000). Nonetheless, Bale and Dudney emphasized "the learning style of Generation X and teaching strategies of college educators" (p. 217) might correspond better to the andragogy teaching philosophy.

Knowles (1970) argued that pedagogy, according to its etymology, literally means the art of teaching children; in Greek the word *paid* means child and *agogous* means educator or to teach. On the same token, Knowles argued that the word andragogy derives from the Greek words *aner (andros)*, which means adult male, and *agogous*, which means the art of teaching adult males (as cited in Mohring, 1990). Although Knowles's (1970) literal definition for andragogy excludes the word women (Mohring, 1990), it is used by Knowles to mean both men and women.

Neuroscience

Recently, clinical and molecular neurologists suggest that advancements in neuroscience research have included brain rules (Ecker, 2010; Medina, 2008) not previously known by educational theorists. Specifically, it is now known that synapses in the brain, or where data is stored, do change (Ecker, 2010). Furthermore, the term neurogenesis has begun to surface amongst brain scientists (Medina, 2008).

Medina (2008), a developmental molecular biologist, teaches the common adult 9 to 5 workday schedule is opposite to what the brain's natural inclination wants to do. Therefore, the class schedule of traditional universities may be counterproductive to learning. For the adult learner, the adult brain is forced to attend a synchronous class at midday when his or her brain wants to "go to sleep"--the midday tiredness most everyone experiences. The following list edifies research conducted by Medina (2008) about the brain:

- Exercise boosts brain power.
- The human brain evolved, too.
- Every brain is wired differently.
- We don't pay attention to boring things.
- Repeat to remember.
- Remember to repeat.
- Sleep well, think well.
- Stressed brains don't learn the same way.
- Stimulate more of the senses.
- Vision trumps all other senses.
- Male and female brains are different.

- We are powerful and natural explorers. (p. 3)

These rules may be appropriate, given what is known about the brain, to endure an educational reform based on these brain rules and experimental research with new models aimed at allowing the brain to do what it wants to do naturally. An asynchronous online course allows the innate disposition of the brain to takes its course. As an example, the concept of a "siesta" is practiced by many cultures, such as the one in Spain, and may be necessary during the afternoon sleepies in order for the brain to assess everything that had happened thus far during the day. Why attend an afternoon class or meeting when the brain travels to an alternate place looking to regroup? Why go to work or school from 8:00 to 3:00 PM? Why not 7:00 PM? Many variables, much scientific data, and an insatiable refusal to accept a true paradigm shift in education may be preventing the maximizing of an educational system.

Wein (2010) suggested that resting may boost memory. Tambini and Davachi (as cited by Wein, 2010) explained that "rest is important for memory and cognitive function" (para.8). Their research studied whether consolidation of ideas in the brain happens while at rest but not necessarily asleep. If Medina (2008) suggested the brain wants to rest during the 2:00 to 3:00 PM hour and Wein (2010) suggested that rest is important for cognitive functions, why not provide the brain with what it needs in order to increase cognition? Grant the brain a siesta! Another variable to consider regarding such rest is "scientists believe that memories are replayed, with the brain reactivating the same patterns of activity as during the experience itself" (Wein, 2010, para. 2).

Scientists continue to make strides in learning research by suggesting that long-term memory happens through a chemical process where synthesized proteins travel to the hippocampus synapses in order to hold it as a memory (Weis, 2008). Long-term memory is held by specific synapses promoting learning. Thus, the Director of the National Institute of Mental Health in 2008, Dr. Insel, stated that "[We] are actually learning the molecular basis of learning and memory" (Weis, 2008, para. 9). Rest promotes such chemical synthesis, and online education presents the opportunity to maximize learning!

Online Education

One of the best tools resulting from the evolution of technology since the 1980s is the advent of the Internet to the public. Online education, as a means to obtain knowledge through a formal educational institution, also emerged during this time. "The best practice in education is the most efficient (least amount of effort) and effective (best results) way by which society transmits its accumulated knowledge and skills from one generation to another" (Baghdadi, 2011, p. 109). The online environment provides efficiency and effectiveness for the adult learner.

Online education provides the remarkable benefit of "working without the confines of time and location" (Baghdadi, 2011, p. 109), although within deadlines. Today's economic and social changes, coupled with globalization, have made online education a true effective and efficient vehicle for the transfer of knowledge, especially for the adult learner who is most likely inundated with additional obligations.

A comparison between a traditional classroom and an online classroom reveals several interesting points. Initially, the traditional classroom can be divided into two groups: an auditorium based with up to several hundred students and a smaller classroom with up to about 50 students. In an auditorium, there is no time for a question and answer period, which necessitates office hours tightly held and limited to a block of time. All students compete for time with the instructor and there is the chance that no time will be available. A smaller group in a classroom has the advantage of questions and answers and instant gratification, although not

every student is required to ask or answer questions and/or discuss the material offered by the professor due to time constraints. In essence, people can hide behind the answers and discussions given by others.

In the online environment, every student must answer every question the professor poses. In addition, with today's technology, the instances of plagiarized work are usually detected and often deterred. This is not necessarily true in the traditional environment. Moreover, in the online course, every student must demonstrate comprehension of the concepts posted in the courseroom by one means or another, such as discussion threads or the submission of an assignment. Students cannot hide behind a classmate's answer; everyone must participate. Another vital point is that online students, unlike their traditional counterparts, must prepare different modes of written communication (e.g., e-mail, texts, essays, letters, etc.) almost daily. Online students practice professional writing throughout their programs, necessary in today's global environment.

An argument can be made that online adult education has the potential to better adhere to what the brain wants to do naturally, increasing both learning and memory. If differences between children's and adult's education, how the brain learns best, and the efficiency and effectiveness of information transfer that online education affords is known, then neuroandragogy through online education appears to provide the appropriate and necessary paradigm shift in adult education.

Neuroandragogy

Limited research and publications on neuroandragogy weakens the point of this essay except for the work of Wilson (2006). Thus, the mixing of neurology and andragogy, as a new field, must be rigorously studied. To maximize learning, what is known about the brain,(Medina's (2008) 12 Brain Rules, must be integrated with adult teaching methods, Knowles' (1970) Andragogy. Figure 1 presents the framework for neuroandragogy. Learning outcomes, especially in online education, draw upon the strengths of neuroandragogy by, for example, taking a fact from neurology, stimulate more of the senses, combined with Knowles assumptions of learning through others' experiences. A discussion and assignment draw on the experiences of others through different forums of written and multimedia formats; thus, the visual and auditory senses are stimulated. This gives way to two other neurology rules: repeat to remember and remember to repeat.

The online environment appears to be ripe for neuroandragogy. Course designers and instructors are well advised to take into consideration what we know about the brain (Medina, 2008) with andragogy (Knowles, 1970) to strengthen the best practices in online adult education. Discarding differences in adult and childhood education or dismissing Medina's brain rules may delimit true and proficient learning.

Implications and Recommendations

To adopt neuroandragogy in online higher education signifies being aware of individual differences in learning styles and the fact that learning adults have other responsibilities besides being full time students. Online courses must be designed differently than brick and mortar courses and delivered in a way to capture the theoretical underpinnings of neurology and andragogy. Thus the online instructor must possess a different set of competencies than those in the face-to-face environment.

An example of how neurology may suggest ways to enhance the adult online education experience and effectiveness is necessary. Through an assignment the student must read, analyze and interpret directions without immediate feedback and must rely mainly on written

directions by the instructor. For both online and face-to-face students this suggests that in order to understand the assignment and apply the highest levels of Bloom's taxonomy (1956), the cognitive domains of analyzing, synthesizing and evaluating commences while reading the assignment. It can be argued that as a rule (but not always), students in a face-to-face environment dedicate all their time to studying and can evaluate each assignment at a time convenient to learning according to the brain rules delineated by Medina (2008). Online students, due to professional and family responsibilities, as a rule, may have limited time during the day to choose. In this situation if the brain wants to go into standby mode in order to reboot while it is the only time the online student has to undertake the assignment, a biological conflict ensues that may decrease true learning. A question must be asked as to the timing, content, and methodology of such hindrance to learning.

Other than the evident need for further research and discussions through refereed publications, education focused on neuroandragogy for online instructors is needed. It may be necessary to design a post-graduate certification in neuroandragogy that addresses both sciences, though there may be a resistance to change from more seasoned educators but a welcomed start for new and prospective ones.

Although controversial, no all practitioners know how to, or can, promote learning. An educator must receive certain training to learn how to teach other than providing a lecture (e.g., to follow Medina's (2008) brain rule #4). The simple solution to such problem is through education by expanding the body of knowledge in adult learning.

Conclusions

Neuroandragogy as a science is in its infancy. Understanding that change is hard to accept may fuel a most needed debate about a paradigm shift in online adult education. Understanding the brain and how it learns is important for all educators, but in the distance environment, the lack of such knowledge is detrimental to students and the service graduates are expected to provide society.

This paper attempts to initiate a debate regarding the theory of neuroandragogy and suggests that online adult education must continue to evolve, such as the brain has (Medina, 2008) to be able to capture the science of the brain and the science of teaching adults.

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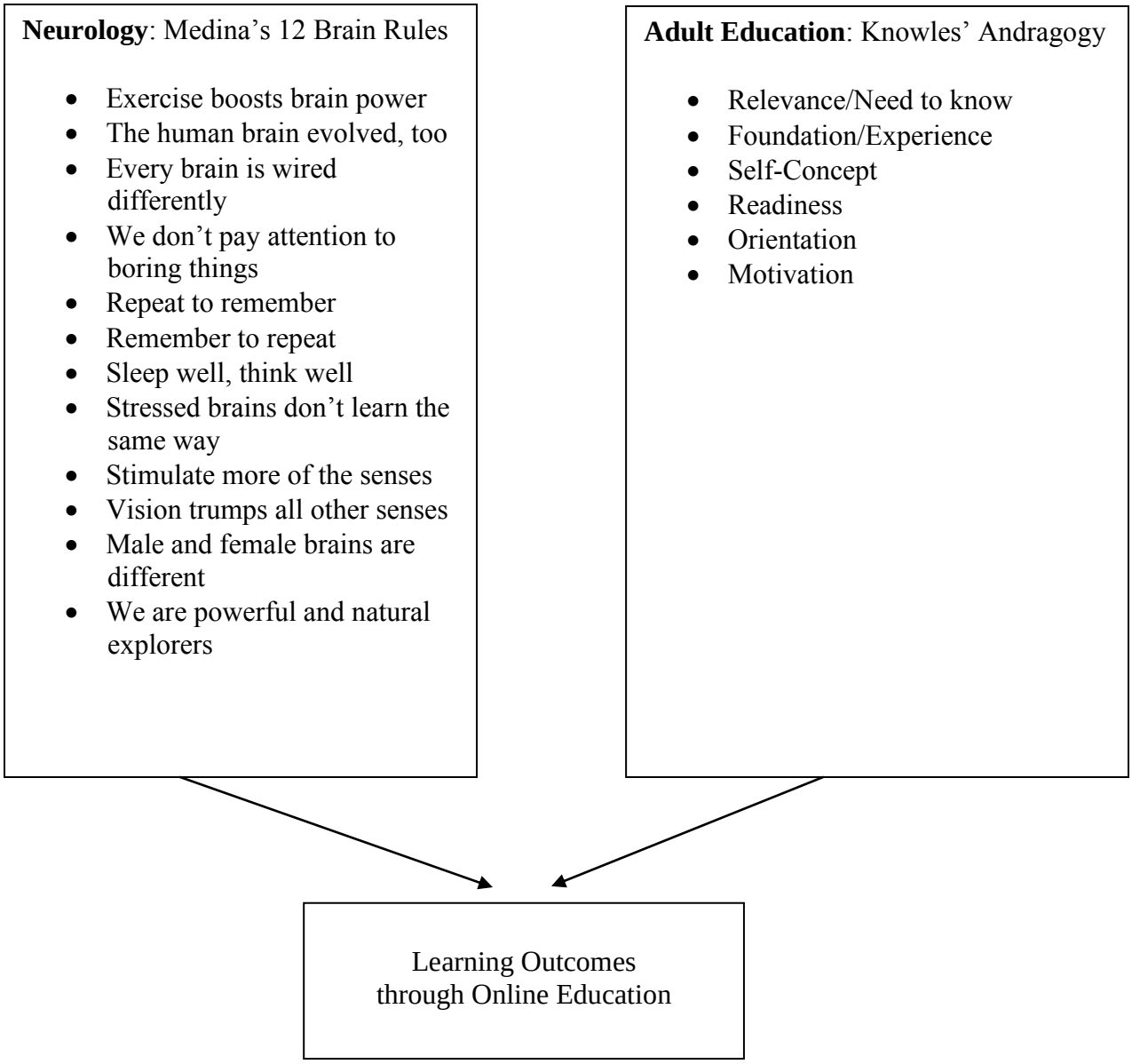

Figure 1: Incorporation of Medina's 12 Brain Rules with Knowles' Andragogy.