Your Brain, Their Brain: What You Need to Know

Workshop Guided Notes

Workshop Goals

- Identify how an FLC might use neuroscience to explore and enhance student learning
- Highlight how faculty brains and student brains differ
- Introduce brain-based teaching strategies that address learning challenges our students encounter

Introduction

Activity: Case Study

Five-Minute Neuroscience Lesson

- Neurons
- Cerebrum
- Frontal Lobe
- Hippocampus
- Amygdala
- Learning & Memory

Discussion of Three Stages of Memory Formation

One: Encoding (Input)

- Attention
- Priming and Prior Knowledge
- Chunking
- Practice

Part Two: Storage

- Repetition and Rehearsal
- Organization (Class and Assignments)
- Modeling and Scaffolding
- Elaboration and Application
- Motivation

Part Three: Retrieval

- What Makes a Difference?
- How Can We Help Students Be Successful?
- What Works? What Doesn't?
- What Teaching Strategies Promote Student Learning?

Conclusion

Activity: Case Study

Next Steps for Brain-Based Learning

- In the space below, jot down some possible topics that you would like to pursue further in a Faculty Learning Community.

Case Study: So Much Content, So Little Time

Dr. Hall teaches a required second-year course in engineering. There is a lot of content to cover.

Faculty who teach more advanced courses in engineering routinely complain that students don't remember the basic information needed for work in their classes. Dr. Hall, a conscientious teacher who wants to support her colleagues, is determined to get through all the background material students will need for their upcoming courses. She carefully plans each lecture so that she can fit in everything that students will need to know.

Dr. Hall tells students to focus on taking good notes as she lectures, and she works problems at the board throughout the class. Though there isn't much time for discussion, she always leaves a few minutes at the end of class for questions. Students, however, rarely have any questions.

The classroom is nice and cool, which helps keep students from falling asleep in this class that takes place right after the lunch hour. Dr. Hall notices that students often wear heavy sweaters, even in the warmer months.

Dr. Hall also notices that she is usually missing about 1/3 of the students in every class. She doesn't take attendance. She believes that if students can learn what they need from the book, then whether they attend class should be up to them.

Dr. Hall doesn't have a policy on using technology during class. She notices that most students have their laptops open, and some of the students are taking notes. Students also use their computers to check email and Facebook. Some students start working on their upcoming assignment.

Students rarely come to office hours to ask Dr. Hall questions about the homework, which she doesn't collect. (She posts the solutions so students can spot problems they may be having.) However, just before exams when students are anxiously preparing for the upcoming test, they pack into Dr. Hall's office hours and seek her help.

The exam grades are low, but Dr. Hall figures this is common in her field. After applying a curve, she has a decent enough pass rate. All in all, she feels good about how the course is going.

Use what you understand about how memory works and the ideas you learned about the neuroscience of learning to critique this teaching example.

What changes would you make in order to better support how students learn?

Brain-Based Learning Resources

Getting Started

Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make It Stick: The Science of Successful Learning*. Cambridge, MA: Harvard University Press.

General Resources

Ambrose, S. A., Bridges, M.W., DiPietro, M., Lovette, M. C. & Norman, M.K. (2010). *How Learning Works: Seven Research-Based Principles for Smart Teaching*. San Francisco: Jossey-Bass.

Carey, B. (2014). *How We Learn: The Surprising Truth About When, Where, and Why It Happens*. New York: Random House.

Doyle, T. & Zakrajsek, T. (2013). *The New Science of Learning: How to Learn in Harmony with Your Brain*. Sterling, VA: Stylus.

Eyler, J. R. (2018) *How Humans Learn: The Science and Stories Behind Effective College Teaching*. Morganton: West Virginia University Press.

Lang, J. M. (2016). *Small Teaching: Everyday Lessons from the Science of Learning*. San Francisco: Jossey-Bass, 2016.

Langer, E. (1997). *The Power of Mindful Learning*. Cambridge, MA: DaCapo.

Special Focus Resources

<u>Attention:</u>

- Neisser, U (1967). *Cognitive Psychology.* New York, NY: Appleton-Century-Crofts.
- McDowd, J. M. (2007). An overview of attention: behavior and brain. *Journal of Neurological Physical Therapy, 31,* 98-103.
- Posner, M. I. & Dehaene, S. (1994). Attentional networks. *Trends in Neurosciences, 81,* 10-15.

<u>Automatization:</u>

- LaBerge, D. (1975). Acquisition of automatic processing in perceptual and associative learning. In P. M. A. Rabbit & S. Dornic (Eds.), *Attention and performance.* London, UK: Academic Press.

Memory:

- Mulligan, N.W. (2003). Memory: Implicit versus explicit. In L. Nadel (Ed), *Encyclopedia of cognitive science* (Vol 2, pp. 1114-1120). London, UK: Nature Publishing Group.
- Baddeley, A. D. (2000). Short-term and working memory. In E. Tulving & F. I. M. Craik (Eds), *The Oxford handbook of memory* (pp 77-92). New York, NY: Oxford University Press.
- Atkinson, R. C. & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), *The psychology of learning and motivation: Vol 2. Advances in research and theory.* New York, NY: Academic Press.
- Ellenbogen, J. M., Payne, J. D., & Stickgold, R. (2006). The role of sleep in declarative memory consolidation: Passive, permissive, active or none? *Current Opinion in Neurobiology, 16 (6),* 716 – 722.
- Zola-Morgan, S. M., & Squire, L. R. (1990). The primate hippocampal formation: Evidence for a time-limited role in memory storage. *Science. 250,* 288-290.
- Cahill, L., & McGaugh, J. L. (1996). Modulation of memory storage. *Current Opinion in Neurobiology, 6,* 237 – 242.
- Hebb, D. O. (1948) *Organization of Behavior.* New York, NY: Wiley.
- Caroni, P., Chowdhury, A., & Lahr, M. (2014). Synapse rearrangements upon learning: From divergent-sparse connectivity to dedicated sub-circuits. *Trends in Neurosciences.* Doi://10.1016/j.tins.214.08.011.

Brain-based Teaching:

- Bresciani Ludvik (Ed). 2016. The Neuroscience of Learning and Development: Enhancing Creativity, Compassion, Critical Thinking, and Peace in Higher Education. Sterling, VA: Stylus
- Eyler, Joshua R. 2018 How Humans Learn: The Science and Stories Behind Effective College Teaching. West Virginia University Press
- Zull, James E. 2002. The Art of Changing the Brain: Enriching the Practice of Teaching by Exploring the Biology of Learning. Sterling, VA: Stylus