Grammar School Symposium: Introduction to Classical Education and Grammar School Teaching

with Lori Jill Keeler

Lesson 9: Teaching with the Brain in Mind

Outline:

Teaching with the Brain in Mind

Introduction

- **The Goal of this Presentation:** Increase your quality of instruction and increase your pedagogical knowledge by learning more about the brain; help you to enhance student achievement by improving the quality of your teaching.
- The changing environment of our contemporary culture is changing the brains of our students
- We need to know how these changes are affecting the brain and adjust our teaching accordingly

What Makes Great Teaching?

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Pedagogical and content knowledge
Quality of Instruction
Classroom climate
Classroom management
Teacher beliefs
Professional behaviors

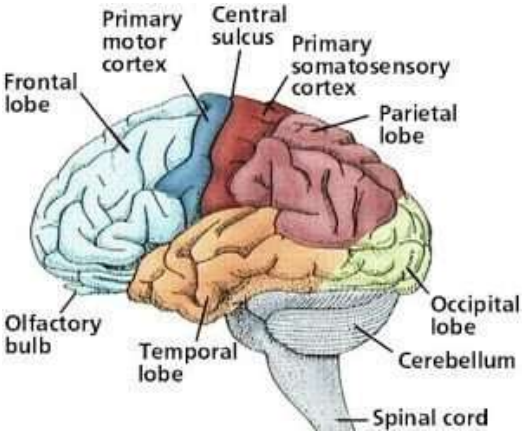
- "Ultimately, for a judgment about whether teaching is effective, to be seen as trustworthy, it must be checked against the progress being made by students." –Coe, Aloisi, Higgins and Major (2014)
- We need to **deepen our knowledge of the content:** we should always be learning more about what we teach

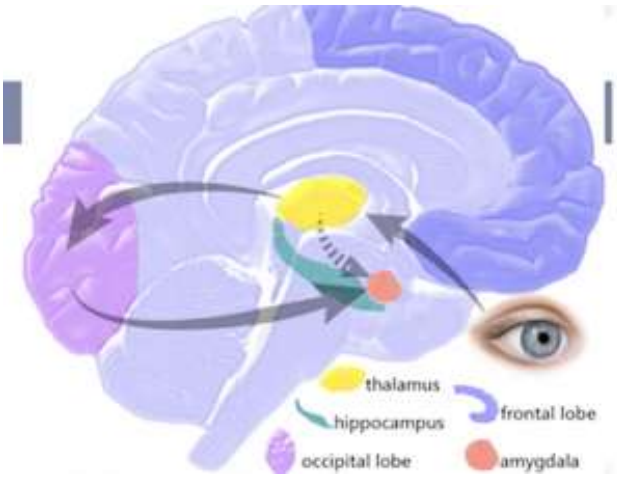
- We need to think about what our students might be thinking, common ways that students might make mistakes
- **Quality of Instruction:** effective questioning, use of assessment, participation techniques, demeanor
- **Classroom Climate:** Interaction between students, teacher expectations (warm-strict, nurturing environment)
- **Classroom Management:** see earlier lecture. Making effective use of lesson time, coordinating resources and space, manage students behavior with clear rules that are consistently enforced.
- **Teacher Beliefs:** A teacher's belief controls why she has adopted certain practices and the purposes they claim to achieve; theories about learning (like classical education, and worldview, etc.).
- **Professional Behaviors:** Reflecting on and developing professional practice; professional development; supporting colleagues, partnering with parents.

How Much Do We Need to Know about the Brain?

- Though we are not neurologists, **we are neuro-architects or brain-builders**. What we do changes our students' brains.
- "We want to lower the barriers to student learning but not the bar." High expectations without barriers.
- We need to know about the brain in relationship to learning.

Diagram of the Brain

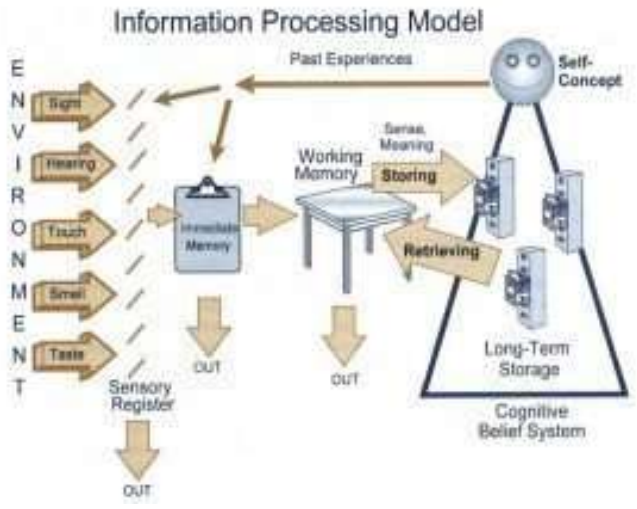




- **Frontal Lobe:** Controls executive function, which is not fully-developed until students are 25 years old. This is why some students have trouble with organization and management—not seeing long-term effects to their short-term actions.
- **Temporal Lobes:** Language, speech, reading, writing. See the amygdala: the emotional center of the brain (joy, sorrow, sadness). Right next to the hippocampus: the memory center of the brain. Note close relationship: emotions affect what students are able to put into long-term memory.
- **Parietal Lobe:** Sensory processing center (pain, touch, balance, eye-hand coordination, spatial relationships): kinesthetic learning.
- **Occipital Lobe:** Visual center of the brain.
- We need to have students **"lighting up"** all of these areas of the brain. See functional MRIs that show brains light up. The more areas light up the deeper the learning is. As much multi-sensory learning as possible: sing, move, hear, doing, saying… this will deepen their neural pathways and increase the chance that learning will go into long-term memory.
- When students have emotional ties to learning, learning is more permanent. Books with emotional content: Courage of Sarah Noble; Hiding Place, Roll of Thunder Hear My Cry. Think about ways you can attach meaning and emotion to your teaching.
- **Brain Plasticity:** The brain has the capacity to change and grow; increasing the synapses in their brain.

Key Concepts

- Light up as many of the brain as possible. **Movement is important.** Movement brings blood and oxygen to the brain.
- Uses **mnemonic devices**
- **Embrace desirability difficulty.** The right degree of challenge increases brain activity.
- **Practice elaboration:** repeat learning activities. **Myelin** develops on synapses with repeated activity. Reviewing chants and jingles, math facts, etc.



Information Processing Model

- **Environment:** all the data in the environment is filtered through a kind of Venetian Blind that allows only some

data into our brains to be processed.

- **Immediate Memory:** The symbol is a **clipboard.** Memory that is only retained briefly and then expelled from memory
- **Working Memory:** The symbol for working memory is a **table.** Memory from the clipboard (immediate memory) or the **filing cabinets** (long term memory) can both be put "on the table" for analysis, thus "working memory." Example: When we ask a student to compare Charles the Great (just learned) to Alexander the Great (from last year's study). Working memory is limited—only so much can be put "on the table." We can work to help with these limits by using chunking and other "retrieval systems" but we should recognize that some students will have more difficulties or limits with their working memory than other students.
- Goal as educators: to get as much as we can off the table and into long-term memory. Students are not at school to just get a report card—they are there to learn.
- Storing and Retrieving
- Self-Concept
- Long-Term Storage
- Cognitive Belief System

Three Steps of Learning

- Encoding
- Consolidation
- Retrieval
- The brain converts your perception into chemical and electric charges that form mental representations of the patterns you have observed. We call this process encoding and the new representations in your brain memory traces.
- The process of strengthening those mental representations for long-term memory is called consolidation.
- New learning is not easily formed and therefore is easily altered.
- In consolidation, your brain is re-organizing and stabilizing the memory traces.
- Compare **Note-taking:** the brain remembers better when the student re-organizes and writes notes in his own words. Therefore, just rotely repeating back what we say does not help as much to make learning permanent.
- "The brain rehearses the learning, giving it meaning, filling it blank spots, and making connections to past experience and other knowledge already stored in long-term memory."
- Compare connecting new knowledge to prior knowledge. We should, therefore, build on prior, background knowledge, and make connections to other subjects. Classical learning is reinforced by brain research.
- **Retrieval:** what we do when we bring back what we have already learned. The more often we try to retrieve learned knowledge, the easier it will be to

retrieve. Why? Because we are myelinating the synapses. Therefore, it is import to repeat things over and over.

Mindset

- **Growth Mindset vs Fixed Mindset** (see lecture on Growth Mindset)
- Moving from can't to yet (students can't do something now just can't do it yet)
- Growth Mindset thinking should be passed on to students who should see that challenges and difficulties are good for the brain and strengthens the brain—especially in getting learning to stick.

Practicing What Students

- There is a direct relationship between the hours of practice and achievement
- **Grit:** having tenacity and perseverance
- The harder students work, the deeper the neuropathways.
- Students should **self-test:** Students should not merely read through their notes; they need to practice getting information out of their long-term memory by simulating a test in which they must recall information.

Key Concepts

- **Learning is deeper and more durable when it is effortful.** A challenge that does not lead to death, but a challenge that leads to growth.
- **Distributed practice** challenges the brain: when students practice and use several strategies while studying (addition and subtraction, rather than just addition).
- Rereading text and massed practice are among the least productive study strategies.

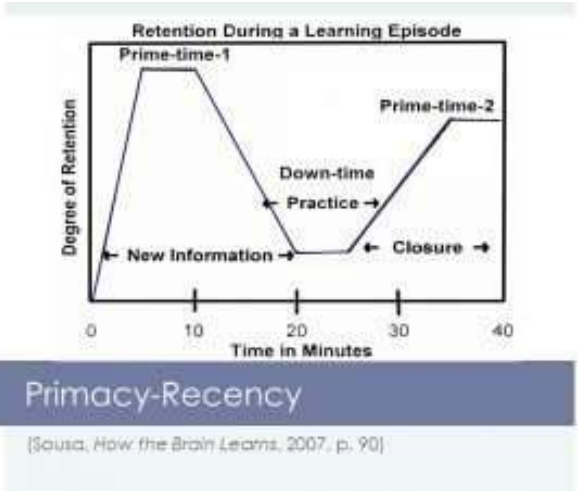
- **Self-testing is among the most productive study strategies.** Students should practice taking tests, using flashcards, practice writing essays (for an essay test).

Memory + Attention + Engagement = Learning

Memory + Attention + Engagement = Learning
Prior Knowledge
Spacing
Interleaving (distributed practice)
Testing
Primacy-Recency Effect
Arts Integration

- Engagement is necessary for students to reorganize information and learn.
- We need to activate their background knowledge
- We should space out learning to leave time for reflection and absorption. Vary the kind of problems we give them; vary testing.
- Primacy-Recency: Students learn more at the beginning and end of a learning session than in the middle. The first five minutes are therefore very important.
- Arts Integration: Music, poetry, beautiful images
- Students are always "paying attention;" we must learn how to direct them to pay attention to what we seek to teach them.

Primacy-Recency



- Retention of learning is greatest at the beginning of a learning episode: **therefore, plan important instruction during the first part of a lesson with correct information** (don't correct homework).

- The next best time for instruction is the last part of the lesson, the closure.
- It is best, therefore, to present new information during the first 20 minutes, then practice for about 5-10 minutes (checking homework collect papers, make announcements), then close during the last 15 minutes with review and making sense of what was presented.
- Perfect practice makes perfect: make sure students don't practice errors
- See Sousa, *How the Brain Learns*, 2007

Key Concepts

- Retrieval practice is key
- Avoid multitasking while learning
- Take advantage of the primacy-recency effect
- Plan for spaced learning periods and distributed practice sessions
- No such thing as multitasking; we only task switch. When we switch a task, there is brain cost.

Cognitive Engagement: Summary

- Work to make sure students feel heard, listened to, and known.
- Design your curriculum with meaning, and emotional connections (stimulating the amygdala).
- Train your students that effort matters and teach them the growth mindset iterations (see lecture on developing a growth mindset).
- Provide students with specific learning objectives (see lecture on more effective lesson planning).
- Used total participation techniques (see lecture on total participation teaching).
- Teach and assess in multiple modalities.
- Return work quickly and provide scaffolding feedback.
- Allow students to correct their own answers when possible.
- Build in moments for reflection and metacognition.
- Use play constructively.
- Make sure the emotional gateway is open.

Conclusion

- Learning how the brain works should help you craft better lesson and become a more effective teacher