“The Brain as a Gateway to Learning”

JOINING MINDS
MIDWEST INSTITUTE FOR STUDENTS AND TEACHERS
Saturday, February 22, 2014
College of DuPage

GLENBROOK SOUTH HIGH SCHOOL
GLENVIEW, IL

HILARY ROSENTHAL
PETER MASCIOPINTO
What do we mean by Mind?

- The physical brain and nervous system
- Intangible contents and processes
  - Motives
  - Ideas
  - Memory
  - Emotion
  - Judgment
  - Curiosity
  - Creativity
  - Social Connections
OVERVIEW Parts of the Brain

- Reticular Formation
- Cerebellum
- Limbic System
- Prefrontal Cortex

http://www.csus.edu/indiv/w/wickelgren/psyc001/brain3.gif
What do we mean by Learning?

- **Beyond rote memorization**
  - Long term retention
  - Availability for later use in novel ways

- **Constructivist**

- **Higher level functions of content**
  - Connections among and between ideas
  - Ability to apply information to new contexts
  - Ability to formulate new questions
RETICULAR FORMATION

BRAIN STEM

Arousal
Sleep-Wake
Alertness
Attention

RAS Recticular Activating System

http://blog.lib.umn.edu/vanm0049/psy1001section08spring2012/reticular.jpg
Attention

- Focus
- Mindfulness
- Repetition
- Automaticity
- Distractions
- Multitasking
LIMBIC SYSTEM

Limbic System: Emotion Center

Hypothalamus: Fight or Flight

Hippocampus: Memory

Amygdala: Negative Emotions

http://www.macalester.edu/academics/psychology/whathap/uburp/dopahypowebo4/limbicsystem.jpg
Metacognition

Teaching students to think about how they think and learn

Study strategies

Knowing what you know and what you don’t
Executive Branch of the Brain

Decision Maker
Problem Solver
Long Term Memory
Dorsolateral Prefrontal Cortex

http://en.es-static.us/upl/2012/02/prefrontal_cortex.jpeg
Cognitive load

- Relates to demands on students’ working memory
- Three types of cognitive load
  - Intrinsic: The nature of the material to be learned. How difficult is it to grasp and conceptualize?
  - Extrinsic: The other factors which are part of the lesson. How distracting is the method of presentation? Instructional design
  - Germane: What are the cognitive resources available to the student in constructing knowledge?

Instructional design should aim to balance these factors. The higher the intrinsic load, or the lower the germane load, the simpler the presentation should be.
FACTORS IN LEARNING

- Memory
- Attention
- Flexibility
- Problem Solving
- Speed
- Working Memory

http://images.sciencedaily.com/2008/08/080827163810-large.jpg
Non-cognitive factors

- Grit/resilience
- Impulse control
- Environmental resources
- Optimal performance (Yerkes-Dodson)
- Attribution styles/optimism
- Practice opportunities
- Stress
The social context

- Learning within a social and cultural context
  - Vygotsky

- Student to student/teacher to student relationships
  - Warmth or threat

- Social facilitation/social inhibition/social loafing
  - Dependent on nature of and familiarity with tasks
Tomcho and Foels, 2012 (ToP), group work and learning goals:

- What makes a positive difference: brief project duration (1-3 classes) and participant interdependence for task (debate, problem solving, vignettes).
- What made little or no difference: group size, pre-activity preparation, task complexity, individual measures of accountability (e.g., requiring a paper from each group member).
The learning outcomes were *negatively* affected by the following common practices:

- Peer assessment
- Group accountability (major presentations)
Four Pillars of Learning in the Brain

Gathering
Analyzing
Creativity
Acting

Motor Cortex
Sensory Cortex

http://cognitrn.psych.indiana.edu/busey/Q301/JPEGS/Brain.JPG
Trends and questions

How might the following affect education?

- More technology in and out of the classroom
- Social networks replacing face-to-face, realtime interactions
- Increasingly 24/7 access to information, reducing the need for remembering
- Multiplying demands on time and attention for teachers as well as students
- Need to teach for increased flexibility and adaptability to accommodate new post-education realities
Technology poll

- Log in to m.socrative.com, use room number 373383

- How do you see the widespread use of technology in the classroom?
  - A. Transformative – a boon to education
  - B. Tool (means to an end) – just another piece of the educational repertoire
  - C. Threat – it gets in the way of our real aims