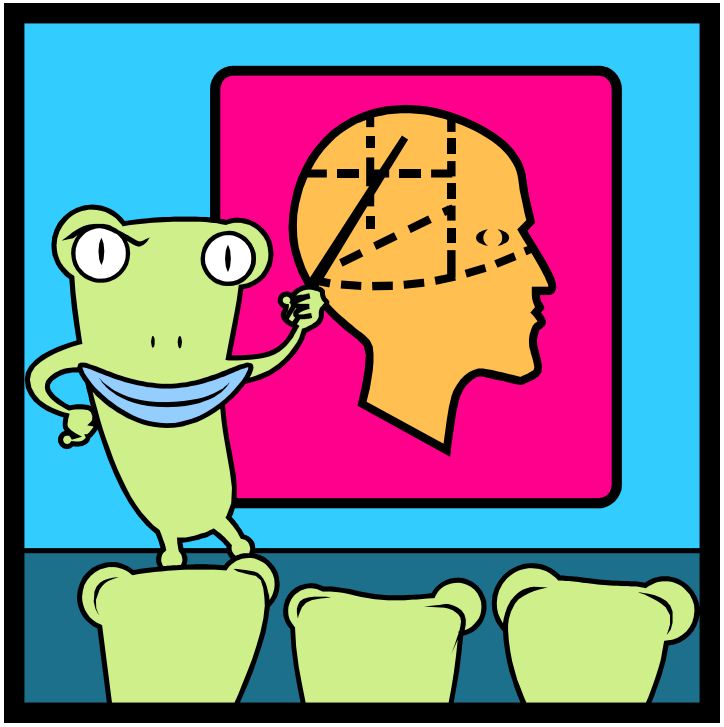
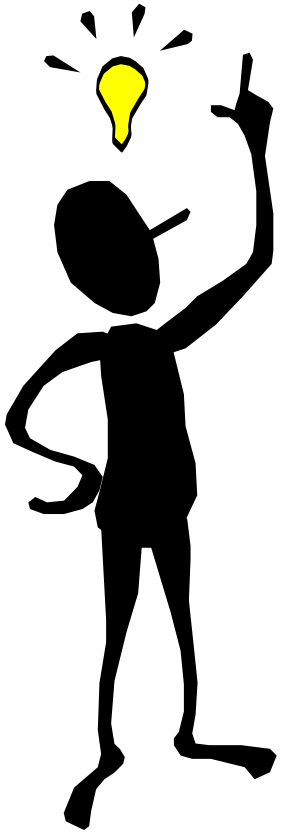
# Brain Based Learning and Teaching



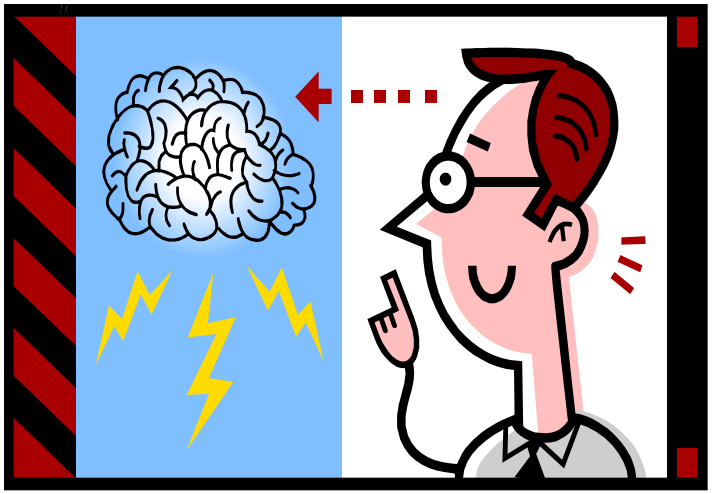
# Before We Get Underway



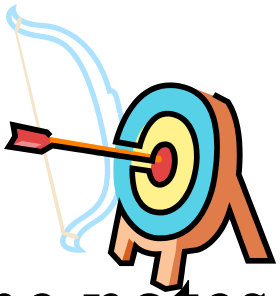
- **Caveat -** ***Nothing is an absolute, but we are learning more and more every day about how the brain functions and how that translates to behavior - including teaching and learning.***
- **WHAT DO YOU THINK?**
  - Can your brain grow new cells?
  - Does what you eat and drink affect your brain?
  - Do colors influence emotion?
  - Can knowledge of "brain- based" learning positively influence learning?
  - How are you already using brain based approaches to learning in your lessons?

# Why Are You Here?

- ***What do you want to gain from this seminar?***
- ***Why?***
- ***What do you already know about brain based learning?***



# OBJECTIVES



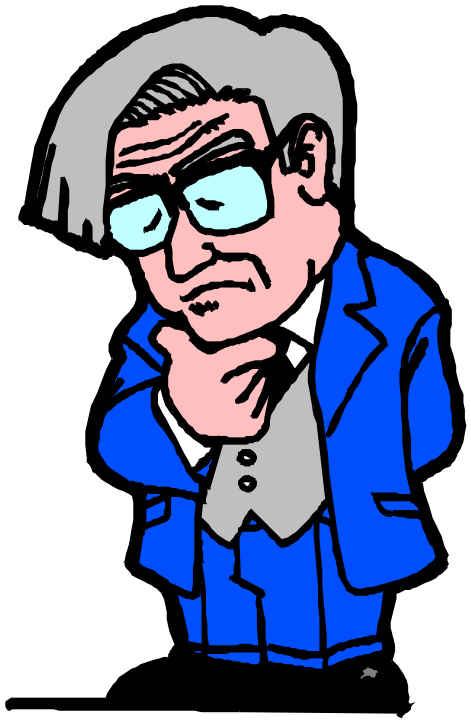
- You may read and review some of the notes on research of brain-based learning and teaching.
- You will see a definition of the term “brain based learning.”
- You will discuss practical implications of brain based learning.
- You will have some physiological information on the brain.

# What is Brain Based Learning?

- **Taking what we know about the brain, about development and about learning and combining those factors in intelligent ways to connect and excite students' desire to learn.**
- **Combining emotional, factual and skill knowledge into a cognitive tool.**

# How is your brain like(?)

- A cabbage
- A raisin
- A pillowcase
- A grapefruit
- String cheese
- A walnut

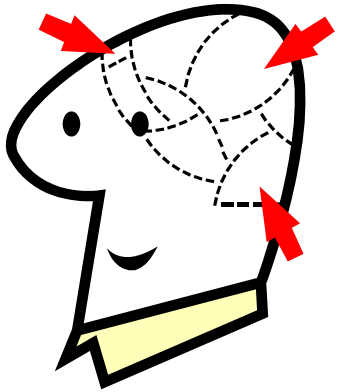


# Our Brains

- **Are like a "jungle"- nothing "runs" the jungle**
- **All parts of the brain participate with each other, while each has its own function**
- **There is natural pruning or neural pruning that occurs when parts are not used (this may be why sounds not heard or used atrophy over time)**
- **"LEARNING IS A DELICATE, BUT IS A POWERFUL DIALOGUE BETWEEN GENETICS AND THE ENVIRONMENT…"** **Robert Sylwester, *A Celebration of Neurons***

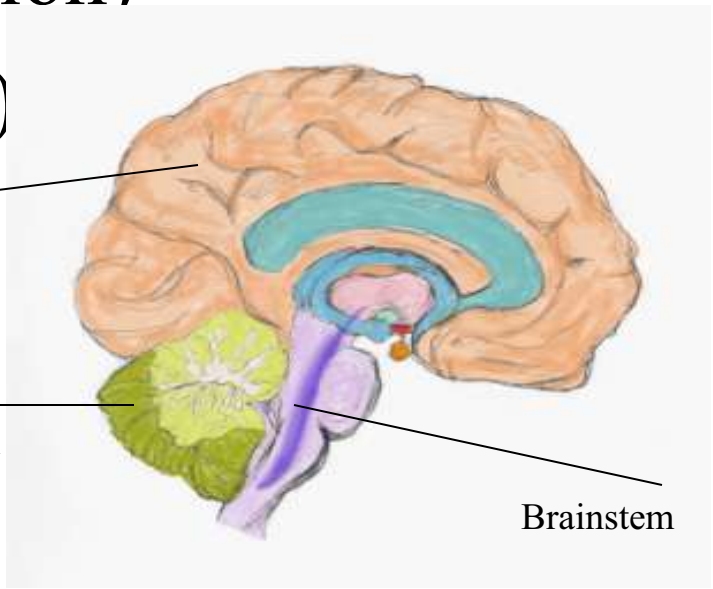
# Brain's Complexity

- **Cellular level - three pints of liquid, three pounds of mass, tens of billions of nerve cells (or neurons), ten times more numerous glial cells that support, insulate and nourish the neurons**
- **Brain cells - 30 thousand neurons (300,000 glial cells) fit into the space of a pinhead.**

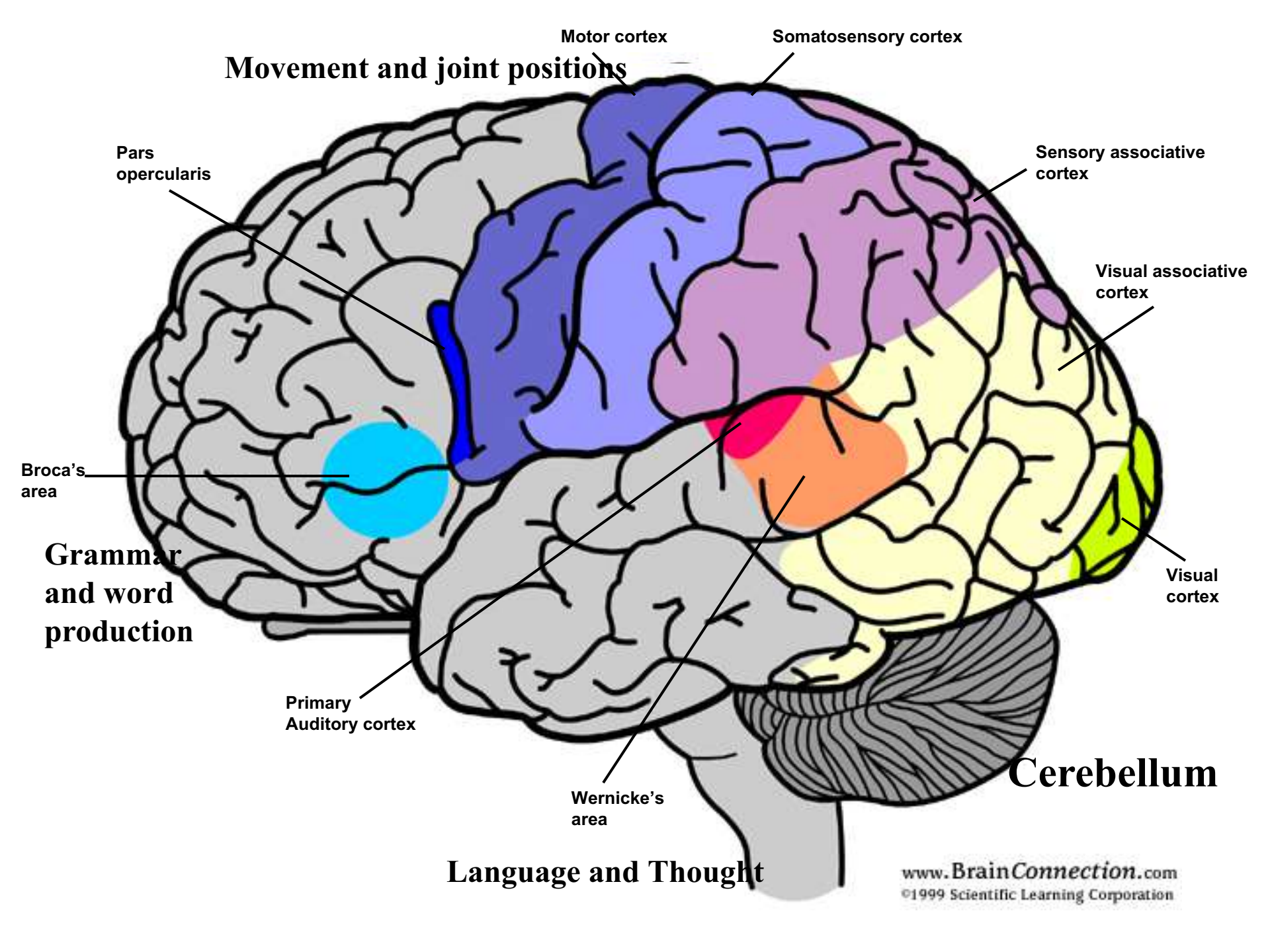


# Parts of the Brain

- **Brainstem** (survival )
- **Cerebellum** ( autonomic nervous system)
- **Limbic system** (emotion)
- **Cortex** ( reason/logic)



- **Frontal lobe - Cortex**
  - Creativity - Judgment - Optimism - Context
  - Planning- Problem solving - Pattern making
- **Upper temporal lobe -** Wernicke's Area
  - Comprehension - Relevancy - Link to past (experience) - Hearing - Memory - Meaning
- **Lower frontal lobe** - Cortex
  - Speaking/language - Broca's area
- **Occipital lobe** - Spatial order
  - Visual processing - Patterns - Discovery
- **Parietal lobe**
  - Motor - Primary Sensory Area - Insights - Language functions
- **Cerebellum**
  - Motor/motion - Novelty learning - cognition - balance - posture


Motor cortex
Somatosensory cortex
Movement and joint positions
Pars opercularis
Sensory associative cortex
Visual associative cortex
Broca's area
Grammar and word production
Visual cortex
Primary Auditory cortex
Wernicke's area
Cerebellum
Language and Thought
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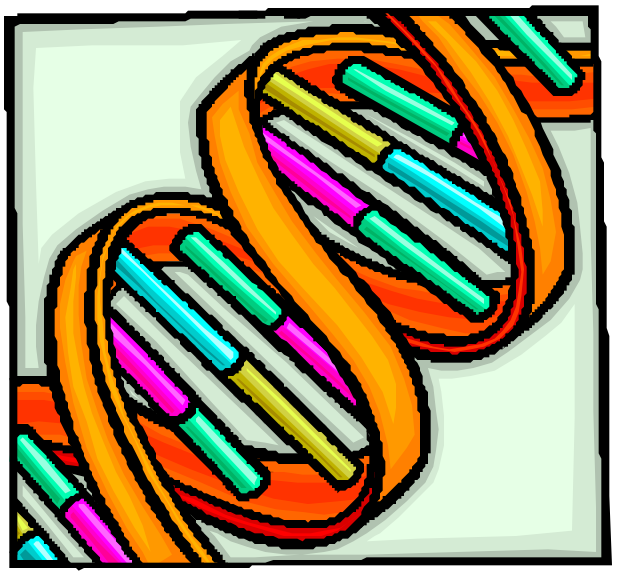
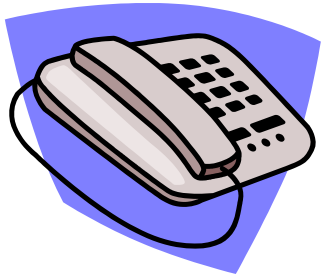
# Neurons



- **Connect to other neurons,**

  **to muscles, or glands**
- **Send and receive chemical information (messages) for behaviors**
- **Can be a millimeter in length or as long as a meter**
- **Cells nucleus contains DNA (As long a meter)**

- Neurons contain tubular extensions that are designed to communicate quickly with specific cells in the body network - this is a transportation system, much like a phone system.



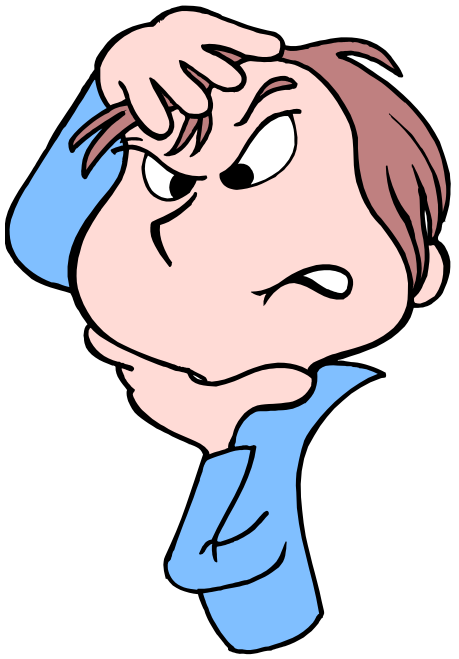
- The brain has both **nerve cells** and **glial cells**. The neurons are cellular agents of cognition; the glial cells act as a scaffolding or insulation for impulses. (The insulation increases the speed of the neural (electrical) messages.)

# How the Brain Determines What's Important

- **Emotion and attention are the PRINCIPAL processes of the brain**
  - **Primary emotions** - innate responses
    - Assemble life-saving behaviors quickly
  - **Secondary emotions** - also innate reactions
    - Enjoyment, pleasure
- **Students need to talk about their emotions**
  - Games, cooperative learning, field trips, interactive projects, use of humor
- **Limit emotional stress**

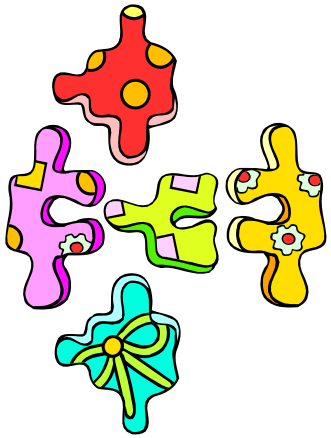
# The Twelve Principles of Brain Based Teaching/Learning

- **What are they?**
- **What do they mean?**
- **What are the *implications* of this information to working with/teaching/ understanding ourselves and others?**

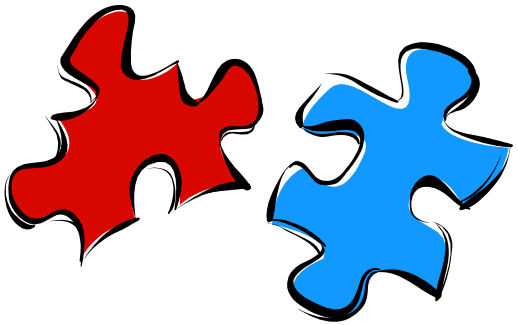


# Twelve Basic Principles Related to Learning

1. Brain is a parallel processor
2. Learning engages the entire physiology
3. Learning is developmental
4. Each brain is unique
5. Every brain perceives and creates parts and wholes simultaneously
6. Learning always involves conscious and unconscious processes

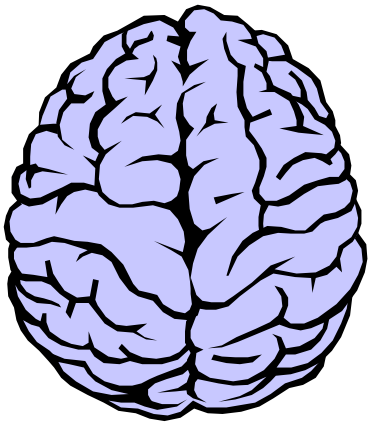


7. The search for meaning is innate
8. Emotions are critical to learning
9. Learning is enhanced by challenge and inhibited by threat
10. The search for meaning occurs through patterning
11. We can organize memory in different ways
12. The brain is a social brain



# The Brain is a Parallel Processor

- Both hemispheres work together
- Many functions occur simultaneously
- Edelman(1994) found when more neurons in the brain were firing at the same time, learning, meaning, and retention were greater for the learner.



# Learning Engages the Entire Physiology

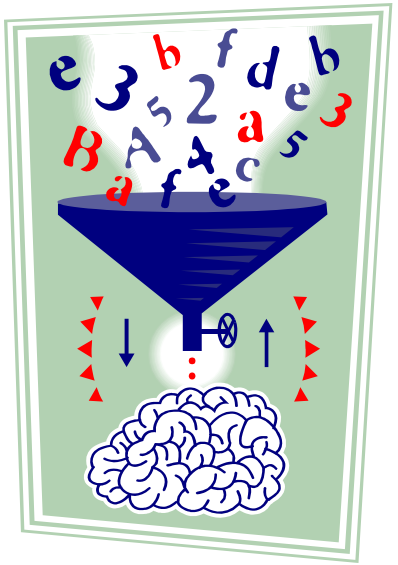
- Food, water, and nutrition are critical components of thinking.
- We are "holistic" learners - the body and mind interact
  - the peptides in the blood are chains of amino acids that become the primary source of information transfer.

# Learning is Developmental

- Depending upon the topic some students can think abstractly, while others have a limited background and are still thinking on a concrete level.
- Building the necessary neural connections by exposure, repetition, and practice is important to the student.

# Each Brain is Unique

- We are products of genetics and experience
- The brain works better when facts and skills are embedded in real experiences



# Each Brain Perceives and Creates Parts and Wholes Simultaneously

- Some think more easily inductively while others find deductive thinking more comfortable - use both
- Shank (1990) Telling stories is one of the most influential techniques because you give the information, ground the meaning in structure, provide for emotion, and make the content meaningful. Our brain loves storytelling.
  - How might you make use of this?

# Learning Involves Conscious and Unconscious Processes

- The brain and body learn physically, mentally, and affectively
- Body language as well as actual language communicate

- How you treat students and how you permit them to treat each other makes a difference in their learning and desire to learn.

- How the physical environment is organized makes a difference.

# The Search for Meaning Is Innate

- Each person seeks to make sense out of what he/she sees or hears
- Capitalize on this quality!
  - Present ideas, experiences that may NOT follow what one expects:
    - Speculate
    - Experiment
    - Question
    - Hypothesize

# Emotions Are Critical to Learning

QuickTime and a TIFF (LZW) decompressor are needed to see this picture.

A common form of communication within our brain is the electrical-chemical-electrical process between neurons.

Emotions trigger the chemicals active in the axon-synapse-dendrite reaction. This permits or inhibits communication between the cells.

90% of the communication is carried out by peptides (which are strings of amino acids that travel the blood stream and permit information transfer. Peptides are the glue that connect the body and the brain.



Learning is affected by emotions.

# Learning is Enhanced by Challenge and Inhibited by Threat

- The brain's priority is always survival - at the expense of higher order thinking
- Stress should be kept to a manageable level
- Provide opportunities to "grow" and to make changes
- Have high, but reasonable expectations

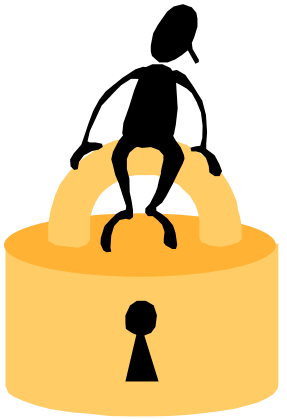


# The Search for Meaning Comes Through Patterning

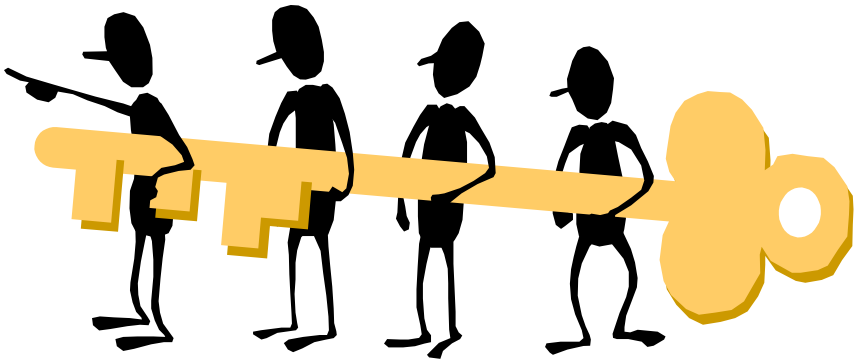
- Tie learning to prior knowledge
- Use Know - Want to know - Learned cycle
- Bain (*What the Best College Teachers Do*) suggests working from "big" questions to be answered.

# Brain Organizes Memory In Different Ways

- Retrieval often depends upon how the information was stored.
- Relevancy is one key to both storage and retrieval
- Connect to what students know, what they are interested in
- Provide and get examples
- Student talk!!!
  - **Of varying types**



# Memory



- **Short-term memory**
  - **TO HELP**:
    - Combine or "**chunk**"
    - Recognition
- **Long-term memory**
  - **Declarative** - Factual
  - **Episodic** - Events or experiences
  - **Semantic -** Words
  - **Procedural** - Step by step

# Memory

- When objects and events are registered by several senses, they can be stored in several interrelated memory networks.
- This type of memory becomes more accessible and powerful.
- Conversation helps us link ideas/thoughts to our own related memories. Students need time for this to happen!!
  - Storytelling - Conversations
  - Debates - Role playing
  - Simulations - Songs
  - Games - Films

# Techniques to Help Memory

- Define the "gist" - **OVERVIEW**
- **Sequence** events
- Plot out **pictorially** the information
- Tell the information to others in own words - TALK
  - Peer teaching/tutoring
- Amplify by giving **examples**
- Use multiple parts of the brain (emotional, factual, physical)
  - Auditory, Visual, Kinesthetic, Talk
  - Combine
- Use **color** effectively
  - Yellow and orange as attention-getters

# The Brain is a Social Brain

- **The brain develops better in concert with others**

  ➢ When students have to talk to others about information, they retain the information longer and more efficiently!

  ➢ Make use of small groups, discussions, teams, pairings, and question and answer situations.

# How Might Brain-Based Research Influence Your Teaching?

- What changes might you make?
- What are you already doing that fits the research?
- What would you like to know more about?