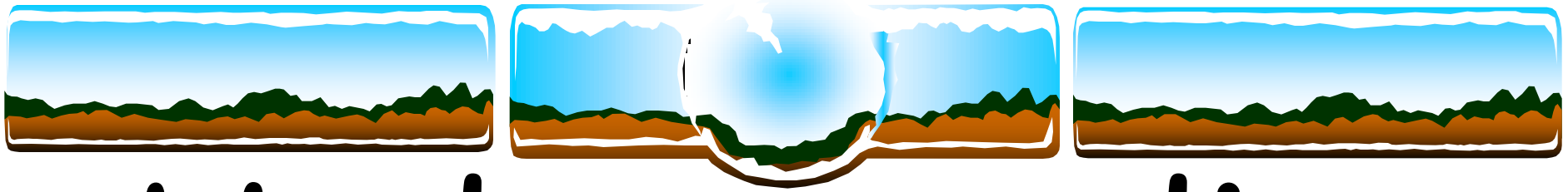
Aldeen Foundation

Professional Development for Teachers

October 11, 2010

How the Brain Learns



Understanding the Brain

Lessons From Neuroscience,
Cognitive Science, Educational Research,
Psychology and Experience
Translated Into Classroom Practice

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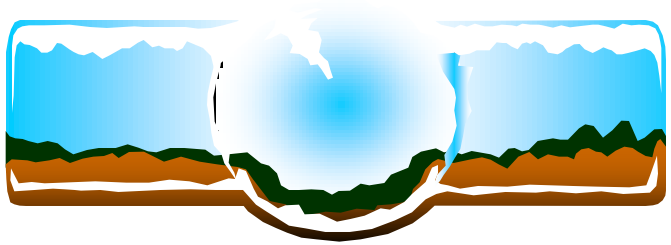
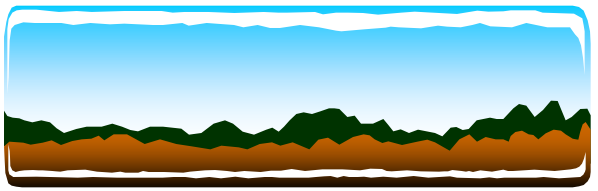
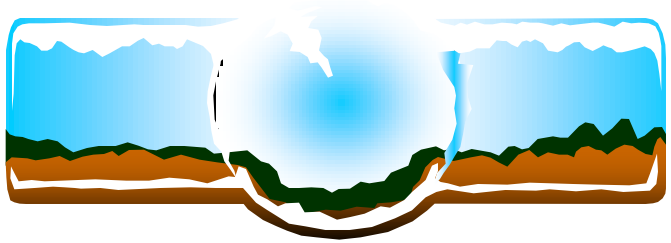




The Brain Makes Connections

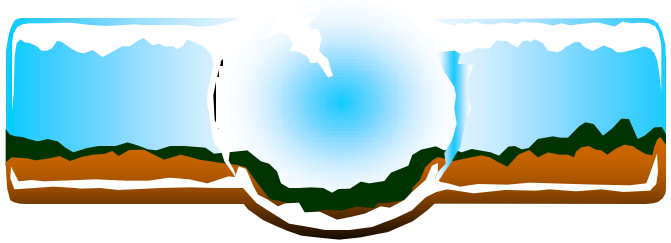
Question

What Could or Should We Do Prior to Formally Beginning to Teach a Lesson?



The Human Brain Is an Emotional Organ

Implications?



The Brain Is Not a Passive Receptacle of Information

Implications?

Every Sensory Pathway Is Different

Implications?

Lobes of the Brain

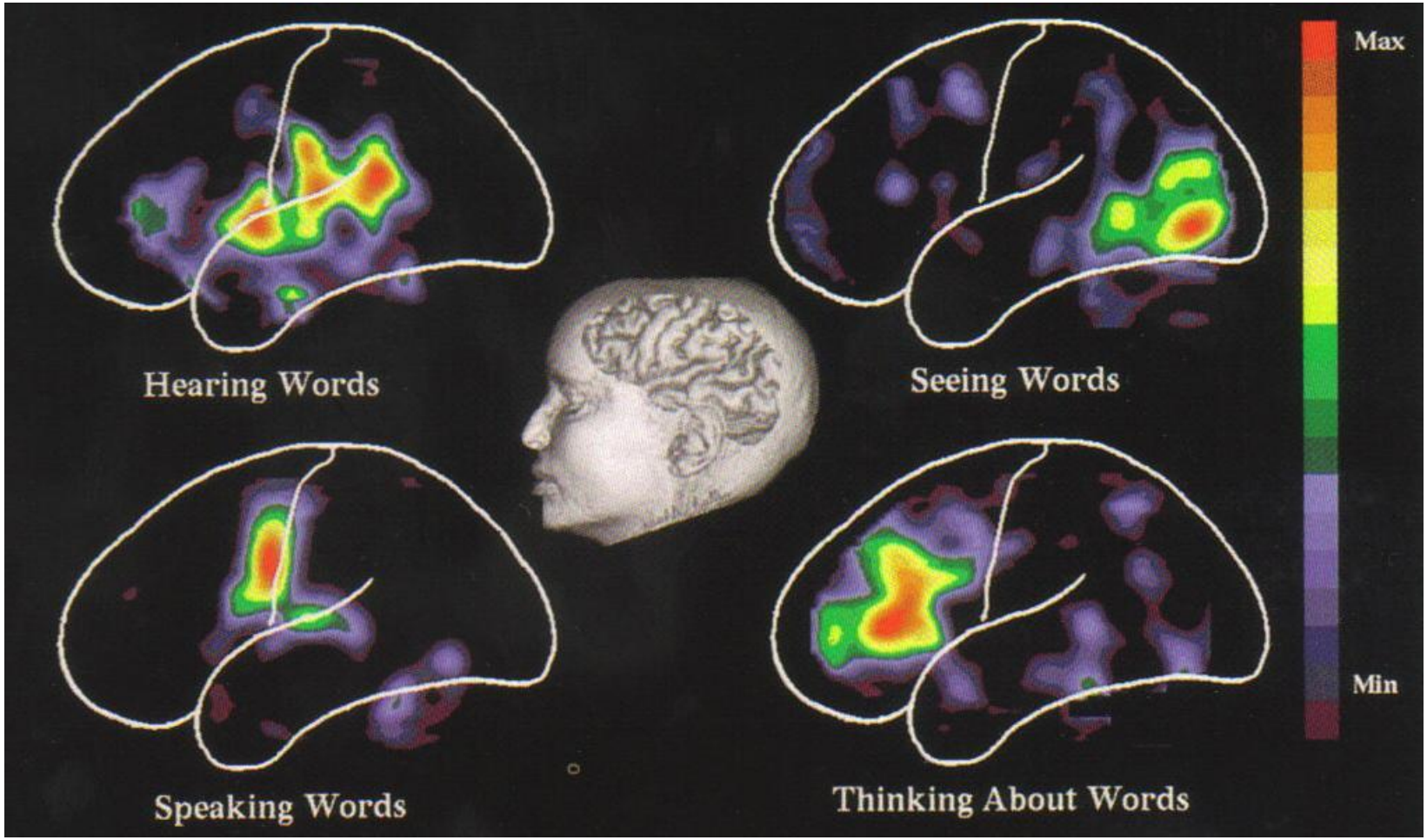
The Brain has Four Lobes:

- Occipital
- Temporal
- Parietal
- Frontal

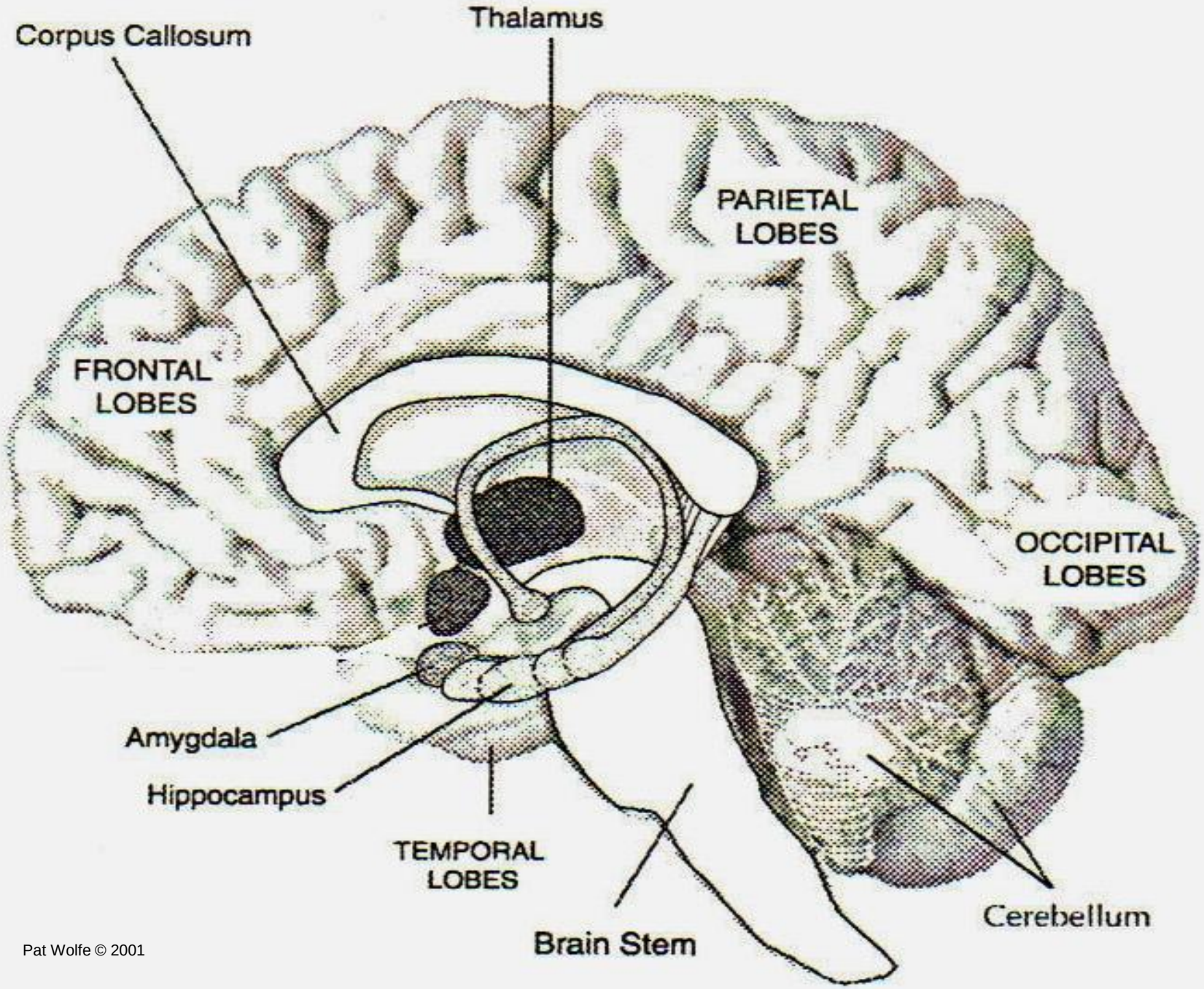
Technology and the Brain

- PET Scans
- fMRI
- MRI
- SPECT
- Other

PET Scans of Brain



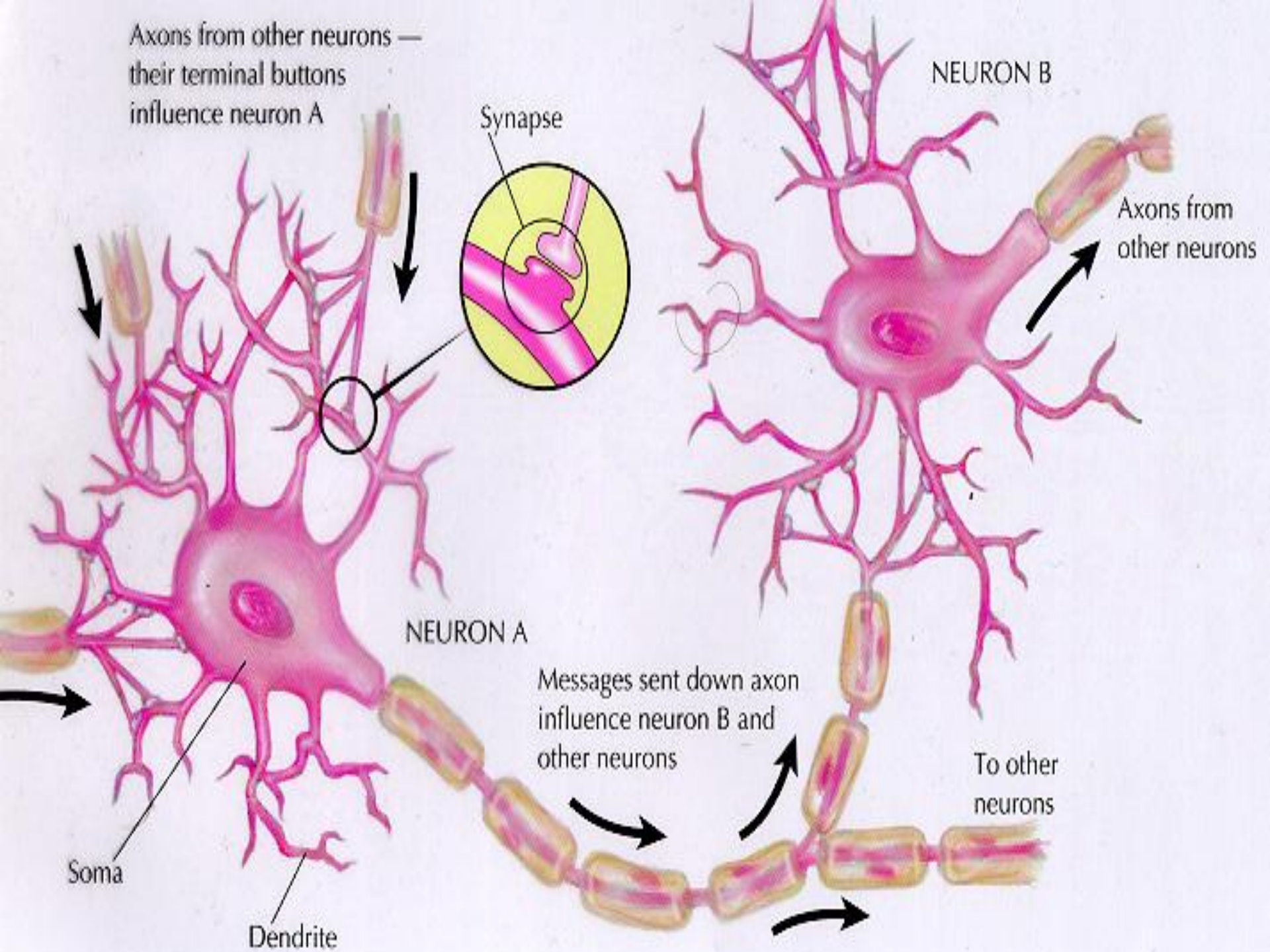
The Deeper You Go Into the Brain, Generally Speaking, the More Primitive the Structure and Its Function



What Are Brains Made of?

Two types of cells:

- Neurons
- Glial Cells


Axons from other neurons — their terminal buttons influence neuron A
Synapse
NEURON B
Axons from other neurons
NEURON A
Messages sent down axon influence neuron B and other neurons
To other neurons
Soma
Dendrite

Neurons Communicate Through an Electrochemical Process

- When a neuron is stimulated, an electrical impulse goes from the cell body, or soma, down the axon, to the ends of the axon terminals
- Neurotransmitters are released into the synapse between the axon terminal of the pre-synaptic cell and attach to receptors on the dendrites or cell body of the post-synaptic cell
- The action within the cell is electrical and between the cells is chemical

Information on the Brain

- An adult brain weighs approximately 3 lbs.
- We are born with about 100 billion neurons
- At birth the brain weighs about one pound; by the end of a year, it's about double that; by about four years old, the brain is roughly 90% of its adult weight
- Some estimate that there are approximately 1000 trillion connections among neurons in the adult brain

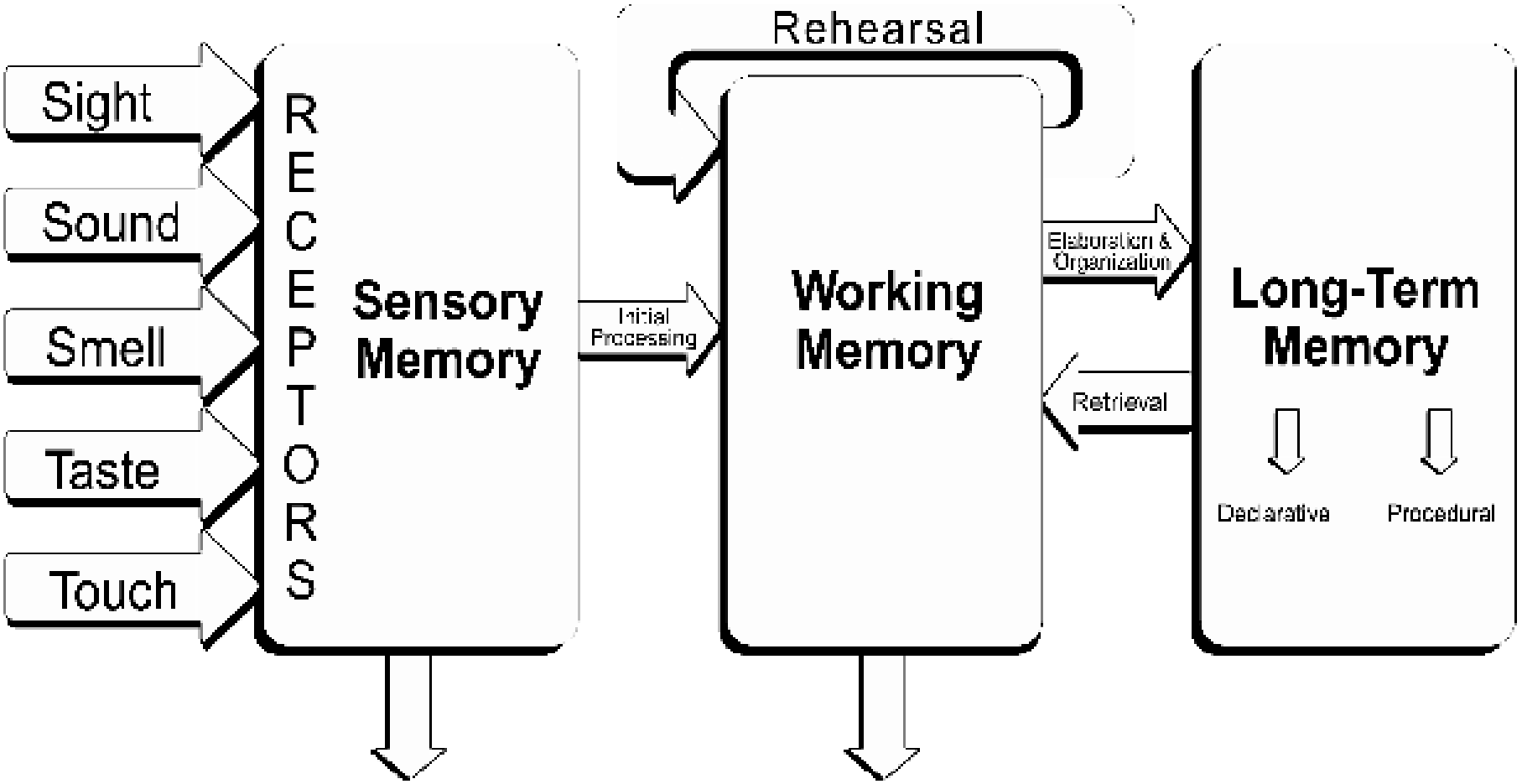
Learning

- When we learn, we are forging and strengthening connections among thousands and thousands of neurons in the form of neural circuits or neural networks

Memory

- When we remember, neurons are being reactivated in the same pattern, reconstructing our memory of the experience

A Model of Information Processing



Attention

- We cannot possibly take in all the information that bombards the brain through the senses
- The brain drops most of this information before it enters our consciousness
- We can pay conscious attention to only one train of thought at a time

Factors That Influence Attention

- Novelty
- Intensity of Stimuli
- Cognitive Dissonance
- Meaning
- Emotion

Meaning

- The brain tries to make sense out of its world
- When it encounters something new, it tries to fit the new information into an existing memory category (network of neurons)
- When it is unable to do this, we subjectively call the experience Meaningless

What do you see in this picture?

Emotion

- A certain level of Emotion/Stress should be present for optimal learning to occur, but…
- If the emotional level is too high, we do not do our best rational thinking
- If the emotional level is too low, it can lead to a lack of motivation

Emotion's Potential NEGATIVE Effects on Learning

-

-

-

Emotion's Potential POSITIVE Effects on Learning +

+

+

+

Now that the brain has paid attention…

So What?

Cocktail Party Effect

The Mind Pays Conscious Attention to Only One Train of Thought at a Time.

What are the implications of this effect for the classroom?

M - Spaces

1	2	3	4	5	6	7	15 y.o.
1	2	3	4	5	6		13 y.o.
1	2	3	4	5			11 y.o.
1	2	3	4				9 y.o.
1	2	3					7 y.o.
1	2						5 y.o.

Plus or Minus 2

Chunking

A chunk is any coherent group of items of information that we can remember as if it were a single item.

Long – Term Memory

1. Non-Declarative
   (Procedural)

- _____
- _____
- _____

Declarative

1. Episodic

- _____
- _____

2. Semantic

- _____
- _____

Rehearsal

There are two basic types of rehearsal:

- Rote Rehearsal
- Elaborative Rehearsal

Neural Plasticity

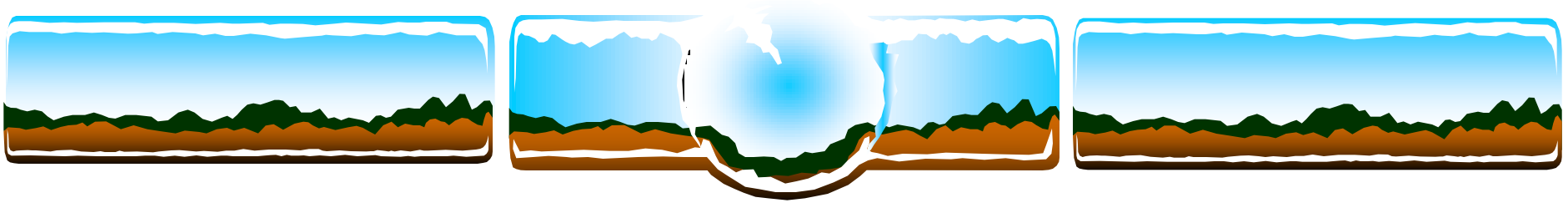
Environment Changes The Brain!

Some Strategies That Take Advantage of How the Brain Learns Best

- Brainstorming
- KWL
- Metaphor/Analogy/Simile
- Visuals/Graphic Organizers
- Mnemonics/Games
- Multiple Intelligences
- Projects

Some Strategies That Take Advantage of How the Brain Learns Best

- Reciprocal Teaching/AB Teams
- Reflect and Write/Reflection Journals
- Rhythm, Rhyme, Music, and Rap
- Simulations/Role Play
- Storytelling
- Voting
- Whip Around – Pass Option



Notes/Reflections/Next Steps