What Brain Research Says About Learning
Brain-based or brain compatible learning is based on how research in neuroscience suggests our brain naturally learns best.
When you understand **how the memory works.**

You have the tools to improve your **job performance, school achievement, and personal success**
Some Brain Facts

Every brain is different
No brain is perfect
It is our responsibility to learn about ourselves and what gives us each a unique way of seeing the world
Your brain works on electrochemical energy and weighs approximately 3 pounds. Size of fists together. More than 100 billion brain cells called neurons. Connections more important than number.
In Fact, the Only Way We Learn is by MAKING CONNECTIONS
Neurons

Nucleus directs activity inside cell (electrical)

Axon sends messages to other cells (chemical)

Dendrites receives messages from other cells (chemical)
Neurotransmission

*The transfer of a message from axon of one cell to the dendrite of another*

Many connector points in both axon and dendrite so neuron receives and sends many messages at a time.

**No contact** made between from axons to dendrites

Communication through release of chemical substances into the **SPACES** between the axon and dendrites

This space is known as the **SYNAPSE**
Synaptic connections

Subject of much of current brain research

- Most learning and development occurs through the process of strengthening or weakening of these connections
- Each of hundred billion neurons may have 10,000 synaptic connections to other neurons
- Theoretical number of connections possible in a single brain is forty quadrillion.
Neurotransmitters

Carry information across synaptic clefts

- 53 known to date

Learning depends on the strength of the connection combined with the neurotransmitters

Brain changes its connective patterns every second in response to everything we perceive, think, or do.
Stimulus enters the brain through senses
Promptly processed by an electrical chemical reaction in a complex network of neurons.

Prioritized by value, meaning, and usefulness as well as how it relates to prior learning
Learning originates in concrete experience.
This is called experiential learning-- but that’s just the beginning.
Learning depends on experience, but requires *reflection*, *developing abstractions*, and *actively testing abstractions*. 
Not like personal computer
-More like an ecosystem

Composed of maps-- arrays of neurons that apparently represent objects of perception or cognition

- color, texture, credibility or speed

Most cognitive functions involve the interaction of maps from many different parts at once
Memory is not stored in one place in the brain, bits and pieces of memory are stored in various functional areas – neuroscientists are beginning to map the different parts of the brain where memory resides.
The brain *assembles perceptions* by simultaneous interaction of **whole concepts**, **whole images**

Rather than logic of microchip, the brain is an **analog processor**

Works through **analogy** and **metaphor**

Relates **whole concepts** to one another

Looks for **similarities** and **differences** or **relationships** between them
Learners need a sense of control over their learning.

When a learner *feels in control*, the *cortex is fully functional* and higher level meaningful learning is possible

- creativity, analysis, synthesis, planning and problem solving

When a learner feels he is *not in control*, these parts of the brain *shut down* and the only learning possible is rote memorization or simple learning based on habit or instinct.

Caine and Caine (1991)
If we learn new material by making connections to what we already know - by trying to figure out what it’s like, let’s try that with what we just covered.

Neurons are like__________________________ in that they_____________________________.

The Nucleus is like__________________________ in that it_______________________________.

Axons are like__________________________ in that they_______________________________.

Dendrites are like__________________________ in that they_______________________________.

Groups—each group responsible for one.
Groups keep same color and try one more.

**Synapses** are like_________________________ in that they______________________________

**Neurotransmitters** are like_________________________ in that they______________________________

**The connections made** are like_________________________ in that they______________________________

**Learning is** like_________________________ in that it______________________________
Memory Principles are strategies developed from brain research--

--So that you can learn the way the brain naturally learns.