

CARD #1
The Memory Web

Imagine that there are hundreds of zip lines crisscrossing the jungle of your brain. In real life, zip lines are cables strung from tree to tree in a jungle or rainforest. Explorers cross the jungle quickly by "flying" along the zip line in a harness attached to it.

The imaginary zip lines in your brain are like a giant web that connects the different areas of the brain that store bits and pieces of memories. When you want to remember something, these zip lines are activated. Along the cables rush small pieces of the memory: the sights, sounds, smells, tastes, location, feelings, time, motion, people, names, facts, etc. They all come together in your conscious mind to make up the whole memory. This can happen in a millisecond, or it can take longer, depending upon the memory you are trying to retrieve.

There are many parts to the long-term memories you have, and the parts are all stored in a different locations in the brain.

CARD #2
Different Kinds of Memory

You have arrived at this jungle outpost and suddenly you think, "Where is my daypack, the one I brought on this safari?" You put it down but you can't remember where you put it. You look around but don't see it. So you think back to *where* you were when you arrived at the outpost. Then you think about what you were *doing* when you arrived; you might even physically retrace your steps. Still no daypack. So now you think about where it should *logically* be: by the door or under a table. Suddenly you remember how *excited* you were to arrive at the outpost because you saw an old friend that you hadn't connected with in a long time. You seek her out and, sure enough, you find your daypack because she had offered to put it with hers and you had agreed.

There are many different kinds of long-term memory. You learn better and can remember data longer when you use many ways of remembering rather than only one.

CARD #3
Episodic Memory

When you thought back to where you were when you first arrived at the outpost, you were using *episodic memory,* which is the memory of *location.* It's as if a movie of the memory played out in your mind, with you as the observer. This is also called *spatial memory.*

You use episodic memory whenever you remember data because you can recall where you were at the time you learned it.

CARD #4
Procedural Memory

When you physically retraced your steps in order to remember where you left your daypack, you were using *procedural memory,* which is also called *muscle memory.* Your brain tried to retrieve information by tying it to an activity.

Procedural memory gets stronger whenever you repeat a physical task. Over time, the task becomes easier because you can do it without having to think about *how* you are doing it.

Whenever you do a physical activity or skill without having to consciously think about how you are doing it, you are relying on procedural memory.

CARD #5
Semantic Memory

When you paused to think logically about where the daypack should be, you used *semantic memory,* which is also called *factual memory.* You relied on previous facts and analyzed them for relevance to what you were trying to remember: Semantic memory means remembering words and data without all the details about when you first learned the information.

You use semantic memory whenever you recall information you've memorized over the years.

CARD #6
Emotional Memory

What finally helped you resolve the mystery of the disappearing daypack was *emotional memory.* You remembered how excited you felt at seeing your old friend.

Usually, the stronger an emotion is when a memory is formed, the easier it will be to access the memory later. The zip lines of emotion go deep in the jungle of the brain, so emotions are the strongest connections to long-term memory.

Emotional memory takes precedence over every other kind of memory. When a learning experience includes emotions, the learning will stick longer than a non-emotional experience.

CARD #7
Consolidation

If you want to remember something for a long time, you have to use more than one memory zip line. The more kinds of memory that you use while learning something new, the easier it will be to remember the data later.

You also have to consciously remind yourself of the memory over a period of time in order for it to stick. This is called *intermittent reinforcement.* Where you mentally remind yourself of data, or you physically practice a skill, or you recall the details of an event, you are using intermittent reinforcement.

C*onsolidation* takes place once when there is enough intermittent reinforcement to move the data, skill, or event into semi-permanent, long-term storage in the brain. This can sometimes takes two years or more. After that, the memory remains in your brain unless other factors interfere with your ability to retrieve it.

CARD #1
The Ever-Changing Jungle

Imagine that, on this safari, you stop for a few days at a jungle habitat built especially for safari visitors. Each day, you step out of the building and look around. Even though you're in the same place, the jungle has changed since the day before. New vines wind around trees. New ferns poke up from the undergrowth. Bright-colored birds flit from branch to branch. Yesterday was sunny and hot, but today it is cool and cloudy. You also notice the undergrowth that is dying, thereby making space for new plants to grow.

No two days are alike in the jungle, and you can never experience exactly the same thing twice.

CARD #2
Neuroplasticity

A real jungle is always changing and so is the metaphorical jungle of your brain. As your brain learns, it strengthens certain *neurons* which are the brain cells activated by the learning. The *dendrites*, which are the pathways between neurons, also get stronger.

Additionally, over time, your brain will weaken any neurons and dendrites that it perceives aren't necessary to the learning.

In other words, everything your brain learns and experiences changes its physiology, that is, its actual physical and chemical structure. This is called *neuroplasticity.*

No two brains are completely physically alike. Each person learns differently, even if they are both in the same learning environment.

CARD #3
Growing Dendrites

Your brain can:

Grow new pathways between neurons.
This happens whenever you learn something new and commit it to memory.

When you learn a new skill or new information, and practice it long enough to move it to long-term memory, you are growing and strengthening neural dendrites and actually changing the parts of your brain that store that particular memory.

Learning new information or skills makes the brain stronger and helps it function more effectively.

CARD #4
Pruning Dendrites

Your brain can:

Delete unused pathways between neurons.

Much like the jungle undergrowth that dies so that there is more space for new plants, your brain also weakens or eliminates dendrites that get little or no use. This is called *pruning.*

For example, you were born with the ability to learn any language from any culture. But, as an adult, that ability has been weakened to the point that learning a second language may be a more challenging task for you now than when you were a child. Your brain has pruned the unnecessary dendrites associated with other language sounds.

Information or skills that you have learned but haven't used regularly will be weakened or forgotten by your brain.

CARD #5
Neurogenesis

Your brain can:

Repair itself and grow new brain cells when damaged.

Scientists used to think that it was impossible to grow new neurons; this has changed. Your brain can actually regenerate cells that were damaged or grow new ones, depending upon the extent of the damage. This is called *neurogenesis*.

An extreme example is when a person has a stroke and loses memory or skills. Over time, and with therapy, the brain can often regenerate those memories and skills.

When you use many parts of your brain to learn with, you are strengthening you brain. This helps it regenerate itself if there is future damage.

CARD #1
The Great Tree
(The Triune Brain)

Imagine a huge tree in the middle of the jungle, with it's roots going deep into the earth and its massive trunk rising from the root system and supporting the canopy of branches and leaves that spread across the sunlit sky. Even though all parts of the tree have their own respective jobs relating to the tree's survival, they are all connected and all work together to ensure that the tree survives, grows, remains healthy, and can support itself and other life systems.

The tree represents three general physical divisions of your brain. Much like the parts of the tree, these three brain areas function together to support the survival, growth, learning, and health of your brain.

You learn best when all three brain areas are working optimally together.

CARD #2
The Brainstem
(Survival Brain)

The roots of the great rainforest tree represent your brain's *brainstem* – the area of your brain at the base of your skull. The brainstem connects your brain to your *spinal cord* and from there to all other parts of your body.

The rivers that feed the roots are the *nerves*. Nerves run up through your spinal cord and brainstem and then fan out through the other two general areas of your brain.

You don't learn well if the needs of your brainstem aren't taken care of first: physical and psychological safety, enough food, water, and general good health.

Your brainstem is responsible for the physical well-being and survival of your brain and body.

CARD #3
The Limbic System (Emotional Brain)

The powerful tree trunk represents your *limbic system* or *mid-brain*. This general area sits on top of your brainstem and receives the messages that travel along the nerves from the spinal cord and brainstem. Various parts of the limbic system are responsible for processing sensory information, emotions, and housing long-term memories.

The tree trunk sends nutrients to the branches and leaves of the tree. The limbic system sends messages via nerves to the uppermost general area of the brain, the *cortex*.

Your limbic system houses your emotions, sensory information, unconscious thoughts, and long-term memories. For learning to stick, your limbic system must be engaged.

CARD #4
The Cortex
(Thinking Brain)

The branches and leaves of the tree represent the folds of your *cortex* or *cerebrum.* This is the area of your brain that you see in photographs: the gray wrinkled mass sitting on top of the rest of your brain.

Your cortex is primarily responsible for consciously processing the sensory information it receives from the brainstem and limbic system. It has two *hemispheres* or halves, and each half has four general *lobes* or sections. Each hemisphere and each lobe processes a whole host of data. The more parts of your cortex that are engaged while you learn something new, the stronger the learning experience becomes.

The cortex is responsible for your conscious thoughts, actions, and learning.

CARD #1
The Animals in the Jungle

When you think of a jungle or rainforest, what kinds of animals or other life forms come to mind? The ecosystem is filled with a diversity of creatures. Each animal fulfills a special ecosystem role and each has its own special ways of surviving, growing, and learning.

So too with specific parts of your brain. Different parts do different things and each has its own special role that helps you survive, grow, and learn.

Three parts of your brain that have to do with learning and the storage of long-term memory are described on the next three cards. As you read through the information on these cards, think of a jungle animal that could represent each of these three parts. Create your group presentation around the metaphor of jungle animals.

CARD #2
The Hippocampus

Located in the middle of your brain (in what is called the *limbic system* or mid-brain), the *hippocampus* plays a crucial role in the long-term memory of facts and events. When you learn or experience something new, the hippocampus assigns pieces of what you've learned to their respective parts of your brain. Without it, your brain wouldn't know what to do with the data entering it via the nerves and so would forget it immediately.

The hippocampus transforms sensory data and learning experiences into long-term semantic or episodic memory.

CARD #3
The Amygdala

Again, located in the middle of your brain and close to your *brainstem* is the *amygdala* (pronounced "ah-MEEG-dalah). The amygdala plays a crucial role in assigning emotions to sensory data and learning experiences. Then it relays the emotions to other parts of the brain for long-term storage. It is also responsible for stress reactions to perceived dangers, and any other strong emotional states.

The amygdala turns learning experiences into emotional states and from there into long-term emotional memory.

CARD #4
The Cerebellum

Also called the *little brain* because of its similar shape to the larger brain, the *cerebellum* is attached to the brainstem at the base of your skull. Its primary responsibility is to oversee physical coordination and helps you get better at physical activities by smoothing out muscular action. With repetition, actions become *automatic* and you don't have to think about them because the cerebellum takes over and remembers the muscle sequences.

The cerebellum turns physical learning experiences into long-term procedural memory.

The Jungle Jingle

Think about what you've learned at the other four Learning Outposts. Discuss and agree on a few major ideas, ones that are really important for training and learning. Work together to create a song, poem, rap or jingle that teaches the whole class these major ideas.

Print your jingle in LARGE easy-to-read text on chart paper and be ready to lead the whole class in learning the jingle when the outpost activities are done.