

UNDERSTANDING
HOW THE BRAIN
NATURALLY LEARNS

Rita Smilkstein, Ph. D.
www.borntolearn.net



NATURAL LEARNING PROCESS:
CLASSROOM/FIELD RESEARCH

- More than 8,000 people—from 2nd graders to graduate students to educators—have reported how they learned to be good at something outside school.
- Every group, without exception, has reported the same sequence of stages by which they learned.

THE NATURAL LEARNING STAGES

(COMPRESSED IN 4 STAGES OR EXPANDED IN 6 STAGES)

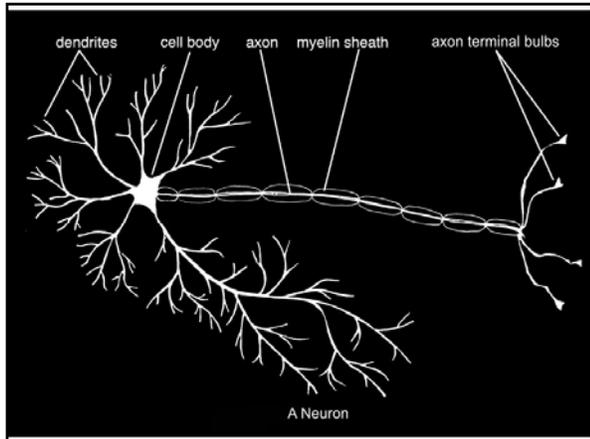
- STAGE 1: Motivation/watch, have to, shown, interest
- STAGE 2: Start to Practice/practice, trial & error, ask ?'s
- STAGE 3: Advanced Practice/practice, lessons, read, confidence
- STAGE 4: Skillfulness/practice, some success, enjoyment, sharing
- STAGE 5: Refinement/improvement, natural, pleasure, creative
- STAGE 6: Mastery/teach, recognition, higher challenges

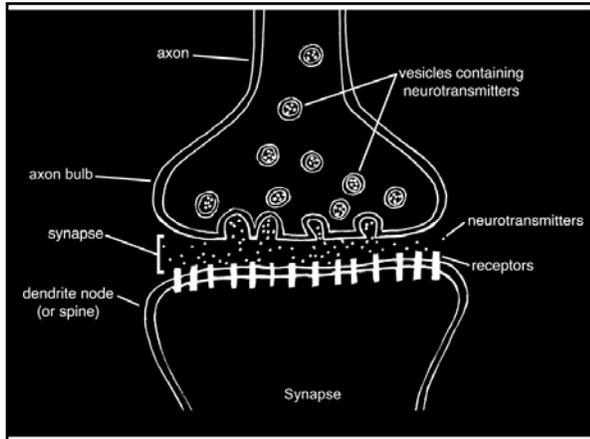
THE NATURAL LEARNING PROCESS

- We learn through those stages because this is how the brain learns-- by constructing knowledge through sequential stages.

HOW THE BRAIN LEARNS

- We have about 100 billion brain nerve cells (neurons).
- Each neuron has one axon with many tails (terminals). These axon terminals send electrochemical messages to other neurons across tiny spaces called synapses.
- Learning creates the synaptic connections. The result is knowledge and skill constructed in our brain.



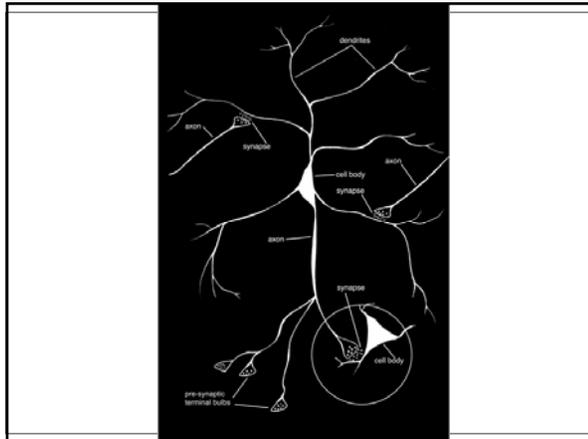


EMOTIONS AFFECT LEARNING

- When learners feel unconfident or anxious, certain chemicals flow into the synapses to shut them down: "Danger! No time to think! Just run away!" This is the flight reaction. Students mistakenly think they have a poor memory, but it is their emotions that are sabotaging them.
- When learners feel confident, different chemicals flow into the synapses that make them work quickly and well: "I can handle this." This is the fight reaction

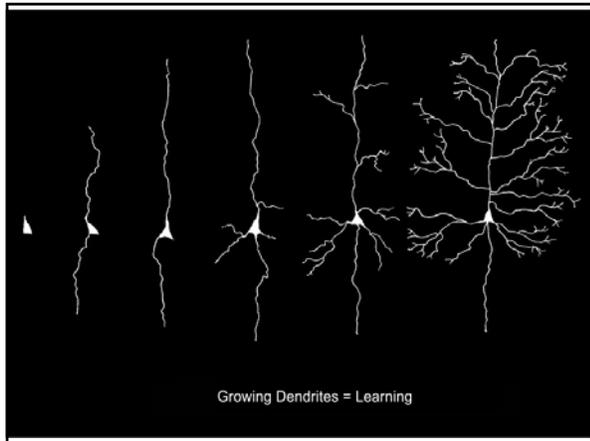
HOW THE BRAIN LEARNS

- Each neuron has thousands of dendrites (like tree branches and twigs--“dendrite” means “tree-like”) which receive chemical-electrical messages from other neurons’ axons across the synapses.



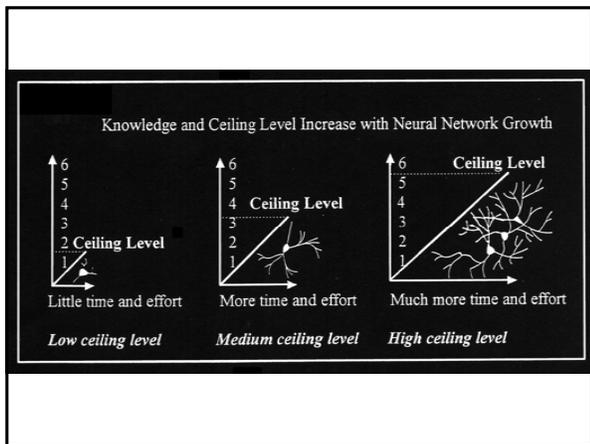
THE BRAIN'S CONSTRUCTIVE LEARNING PROCESS

- Like twigs on a tree that can grow only from a twig or branch that is already there, so dendrites can grow only from a dendrite that is already there--from something the learner already knows.
- Then, like twigs growing on a tree, learning is constructed, higher and higher, skill and understanding increasing.



HOW THE BRAIN LEARNS

- As we learn (as we experience, practice, process), specific dendrites grow so that specific neurons connect at specific synapses to create larger and more-complex specific neural networks.
- These networks are what we know.
- *The more we grow, the more we know, i.e., our ceiling level rises.*



HOW THE BRAIN LEARNS

- Specific neural networks, which might include as many as 10,000 neurons, are what we know and can do.

THE BRAIN'S CONSTRUCTIVE LEARNING PROCESS

- As a learner goes through the stages of this natural learning process, the learner's brain constructs its neural networks from the lowest twig up.
- Thus, the first lesson must be a no-fail activity to which every student can make a personal connection to a twig already there, to something already known.

THE BRAIN'S CONSTRUCTIVE LEARNING PROCESS

- Here is an example of a first lesson, a no-fail activity to which every student can make a personal connection:
 - ❖ You are a college student. You find out that the head of the mafia in your city has killed your father and married your mother. But you have no proof. What will you feel? What will you do?

**THE BRAIN'S CONSTRUCTIVE
LEARNING PROCESS**

- The students now read Hamlet and can personally connect to it. They can think and talk about it with understanding.
- *Here is another example:*
- ❖ It is 2055. Your family is jobless and starving, as are many other people in your country. But your government has no concern for any of you. Some people want to revolt. Will you? Why or why not?

**THE BRAIN'S CONSTRUCTIVE
LEARNING PROCESS**

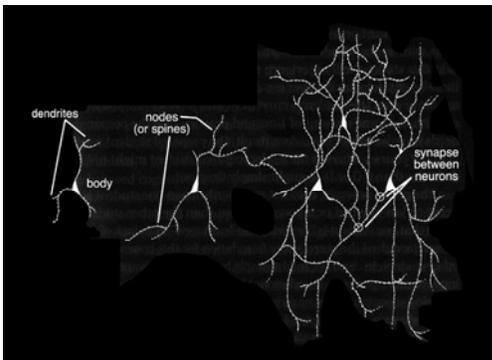
- The students now study the Russian revolution of 1905 and can think and talk about it with understanding.

**USING THE NATURAL
LEARNING PROCESS FOR
ACTIVE, STUDENT-CENTERED
LEARNING**

- For all lessons, students first do their own thinking and then share and discuss in pairs or small groups. Finally, they participate in a whole-class discussion.
- After this, the teacher might want to add something—and the students will be eager to hear and discuss it.

IMPLICATIONS

- Students who have had the opportunity to construct a foundation of the specific prerequisite dendrites for a specific skill or subject—or for school learning in general—will be able to catch on in class. They will be the A or B students.
- Students without this opportunity, even though capable and intelligent, won't be able to catch on as easily and quickly. They will be the F, D, or C students.



Learning and Grading

IMPLICATIONS

- If students haven't had the opportunity to grow the foundation dendrites for a new topic or skill, they don't have the basis from which to grow—on which to connect and construct—the dendrites for the higher levels of skill and knowledge.
- Should we judge them as incapable or of less intelligence or talent and throw them and their potential away because they never had that opportunity?

Special Learning Needs

- Special learning needs are varied and can be mild to severe. All the causes are not known. However, we do know a possible cause for students who have reading and writing problems and for students with autism.
- When children walk early, their creeping and crawling networks do not have the chance to develop fully. Since these networks are the foundation for the language networks, the result is that too-early walkers might not have the foundation for fully constructing their language—reading and writing—networks/skills.
- A cause of autism might be hyper-sensitive, continual, uncontrollable sensory input experiences. Focusing on and doing repetitive actions might be helping the sufferer overcome the confusion and pain caused by constant and overwhelming sensory information. Focusing also helps (see Temple Grandin).

Special Learning Needs

Each person's special learning needs might be different from any other person's and also difficult to diagnose. When my granddaughter went to first grade, we thought she'd be a great reader. Her parents always read to her, and she could read her books. No, she had memorized them, as many children do.

Her first grade teacher thought she had ADHD and wanted her to take ritalin. I said no and began to tutor her. I quickly saw that she couldn't remember a word from one minute to the next. She was dyslexic. She seemed to have ADHD because, as she told me, whenever she would have to show she couldn't read, she got up and ran around; it was better to be bad than stupid. With appropriate help she became an excellent reader.

Only 5% of students have ADD, but more than 25% are given ritalin, which stifles normal brain growth. These students say they are so bored they can't sit still, be quiet, listen and obey; they want to think, figure things out themselves, be creative.

IMPLICATIONS

- Students from different cultures have different experiences and learn different things, grow different neural networks.
- However, we all learn by the same brain-based natural-learning process.
- When students have this metacognitive knowledge, they are curious about what and how other people learn rather than disrespect them for being ignorant or wrong.

STUDENTS AS EMPOWERED, ENGAGED, SUCCESSFUL LEARNERS

- When students self-evaluate how much their dendrites have grown, they see that they are in control of their learning.
- They know their learning (ceiling level) increases as they put in more time and effort.
- 

STUDENTS AS EMPOWERED, ENGAGED, SUCCESSFUL LEARNERS

- Learning is all about empowerment.
- The brain is our survival organ. It is born to learn, is impelled to learn.
- The brain produces endorphins, the pleasure hormone, when it is learning.
- What if we had a way to help students, in any class, be the motivated, engaged, natural learners they are born to be?

ESSENTIAL TRUTHS ABOUT LEARNING AND TEACHING

- The brain starts all learning from where it is and constructs the new from there.
- The seven magic words that are the mating call of the brain are, "See if you can figure this out."
- When these seven magic words are implicit or explicit in any lesson, the brain says, "I want to do that!" and the learner is motivated, engaged, and empowered.

AND TEACH
ESSENTIAL TRUTHS
ABOUT LEARNING

- When learners have all this invaluable metacognitive knowledge, they are empowered to be self-responsible and to have self-efficacy.
- When teachers have this knowledge, they can better help their students become the natural, motivated, successful learners they are born to be.

FACES

Behind every face is a brain that puts the look in the eye, the expression on the face, the words that come out of the mouth—and has these innate needs:

- Figure it out (Fairness/Justice)
- Acceptance (Affirmation/Respect)
- Community (Connections/Constructivism)
- Empowerment (Engagement)
- Safety
