



# Study Habits that Build the Brain

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# Introduction/Overview

- Physiological Operation of the Brain
- Brain Learning Principles
- Levels of Learning
- Study Habits

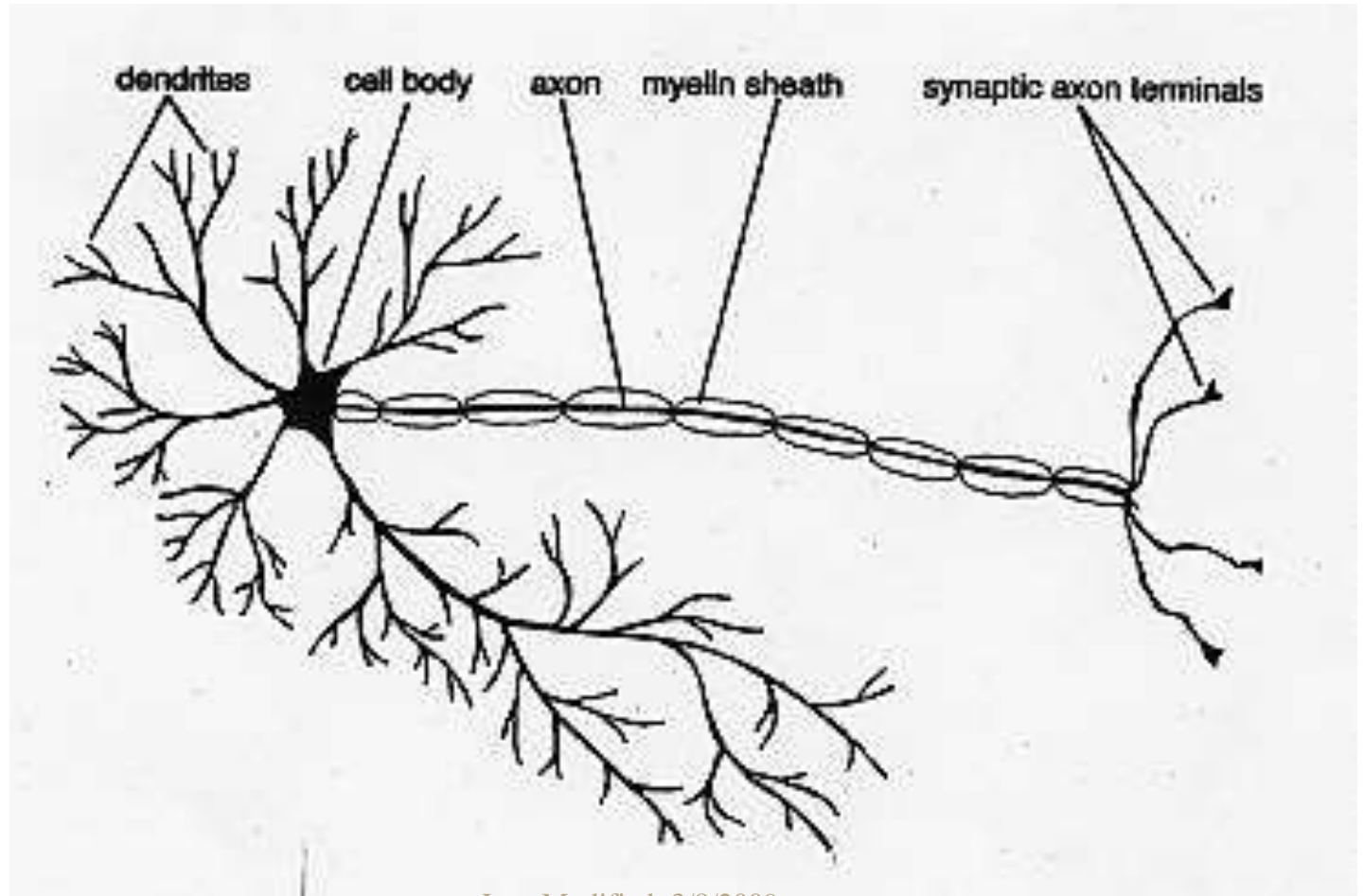
# Physiological Operation of the Brain

- Neurons
- Building “gray matter”
- Synapses
- Neurotransmission

# Neurons

- Neurons are the building blocks of the brain. They contain various parts:
  - Cell Body
  - Dendrites
  - Axion
  - Synaptic Terminals
- We often describe the neurons collectively as our “gray matter”

# The Neuron

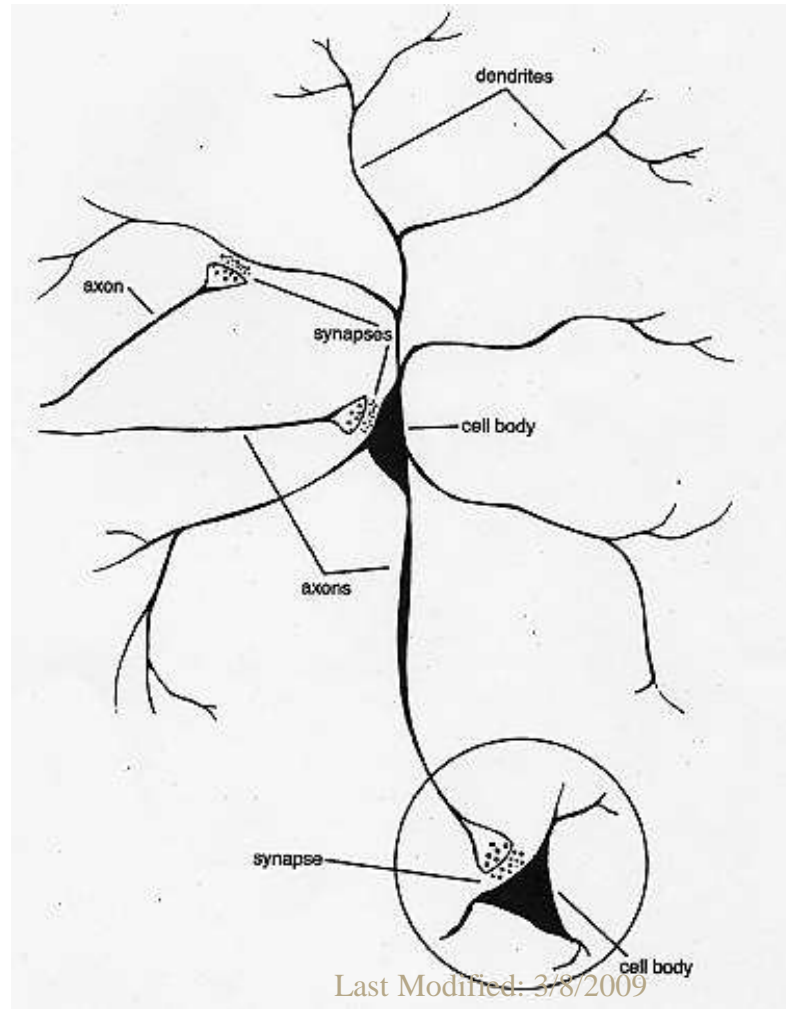


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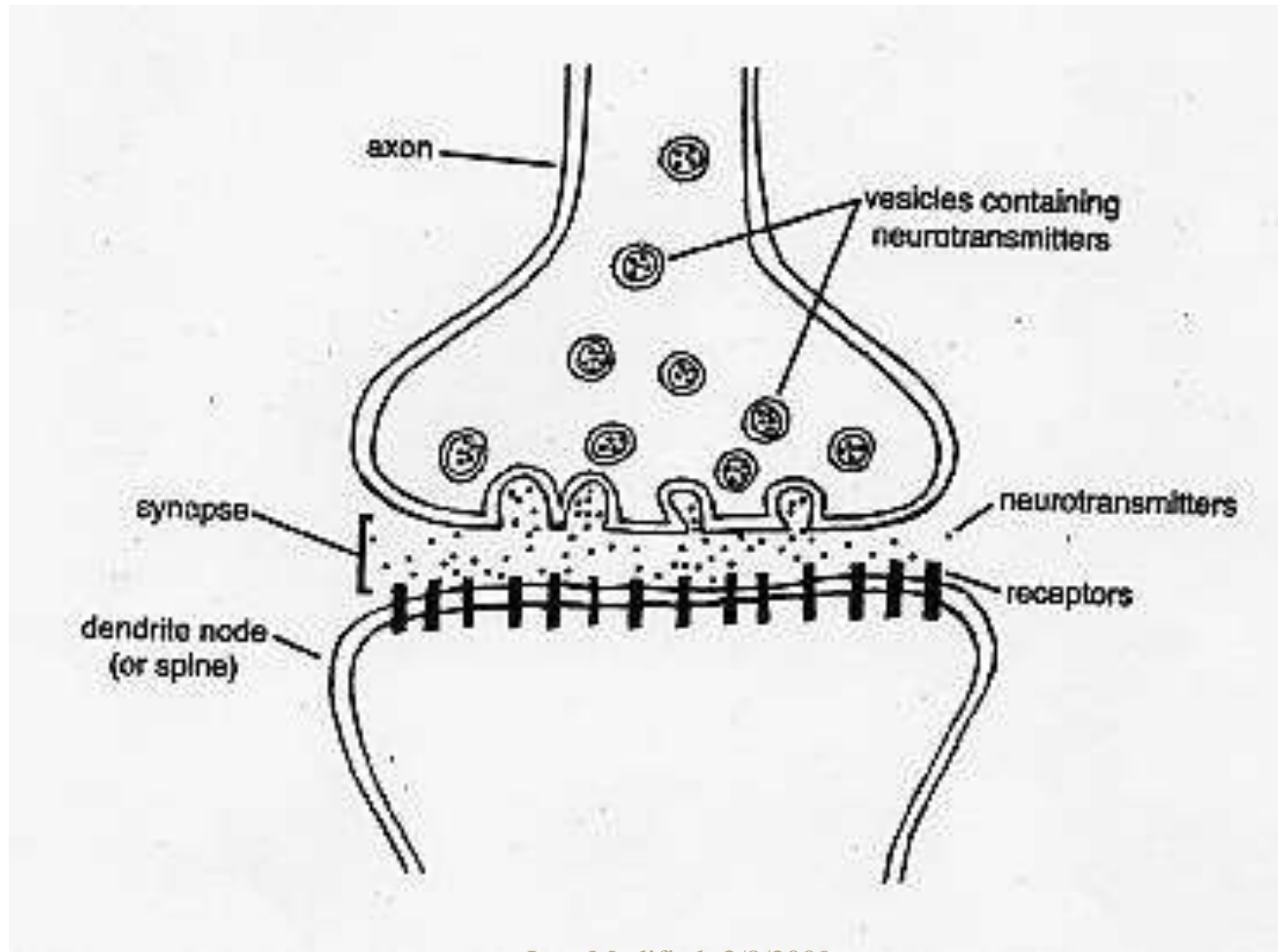
# Building “gray matter”

Our intelligence that is our memory and thinking abilities are created by the brain making connections between the neurons. The synaptic terminals connect to other neurons (call a synapses) and the neurons are capable of transmitting electrical signals. Thus our memory, understanding and thinking abilities are built by making those connections.

# Synapses

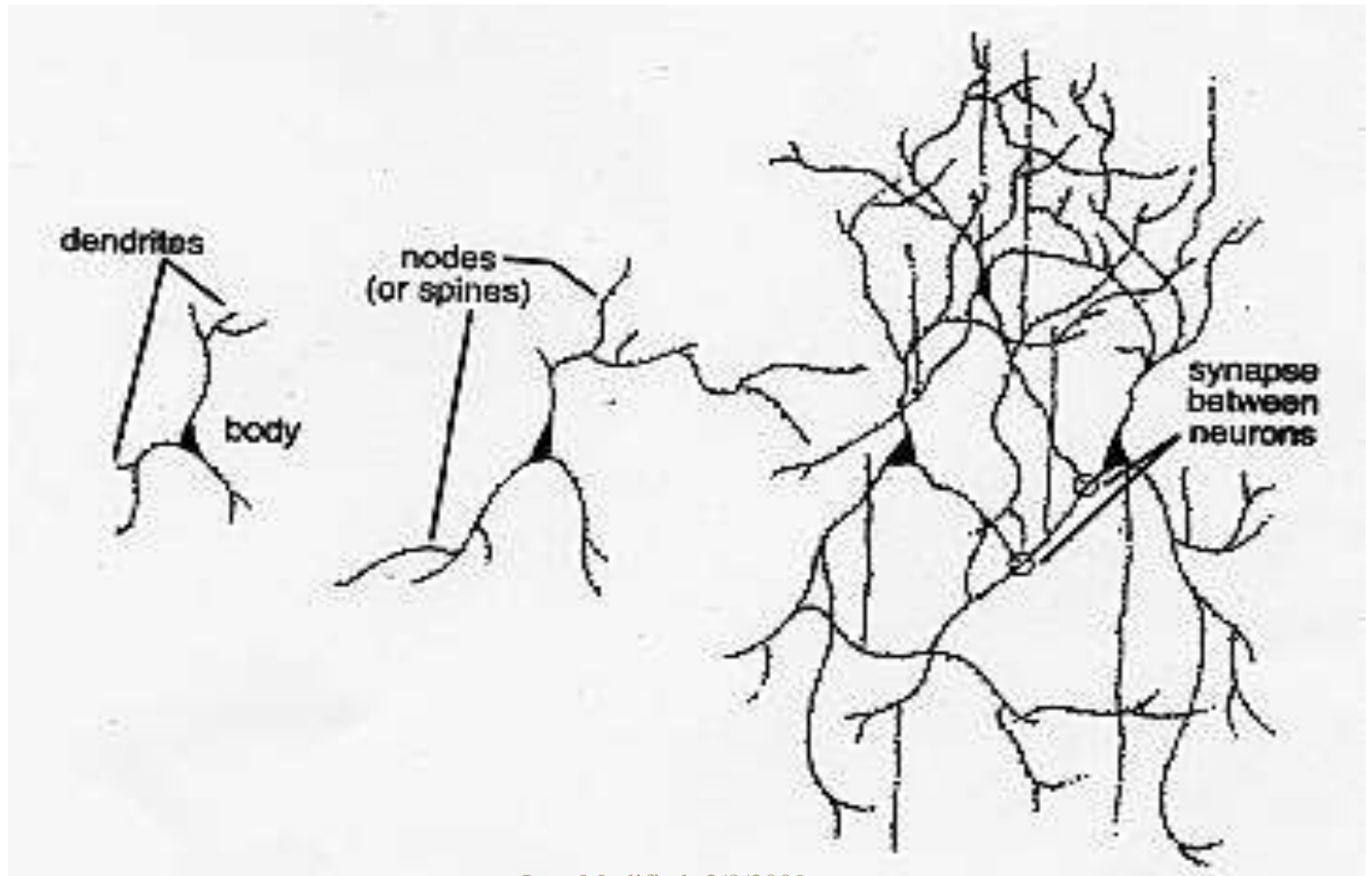


# Neurotransmission





# Building Gray Matter



# Brain Learning Principles

There are some immediate practical applications of understanding the physiological operation of the brain. The fundamental concepts of how the brain works in building memory, understanding and thinking skills can be tied to how we study.

# Brain Learning Principles

- I. Dendrites, synapses, and neural networks grow only from what is already there.
  - Previous understanding of something similar
  - Outlines or lists that connect

# Brain Learning Principles

2. Dendrites, synapses, and neural networks grow from stimulating experiences.

- Visual – Reading or Seeing
- Aural – Hearing
- Writing
- Discussion – Questioning
- Pondering – Thinking

# Brain Learning Principles

3. The more involved the learning experience, the more vivid the memory.

- Using more than one type of stimulus
- Being emotionally connected

**Is your heart in it?**

# Brain Learning Principles

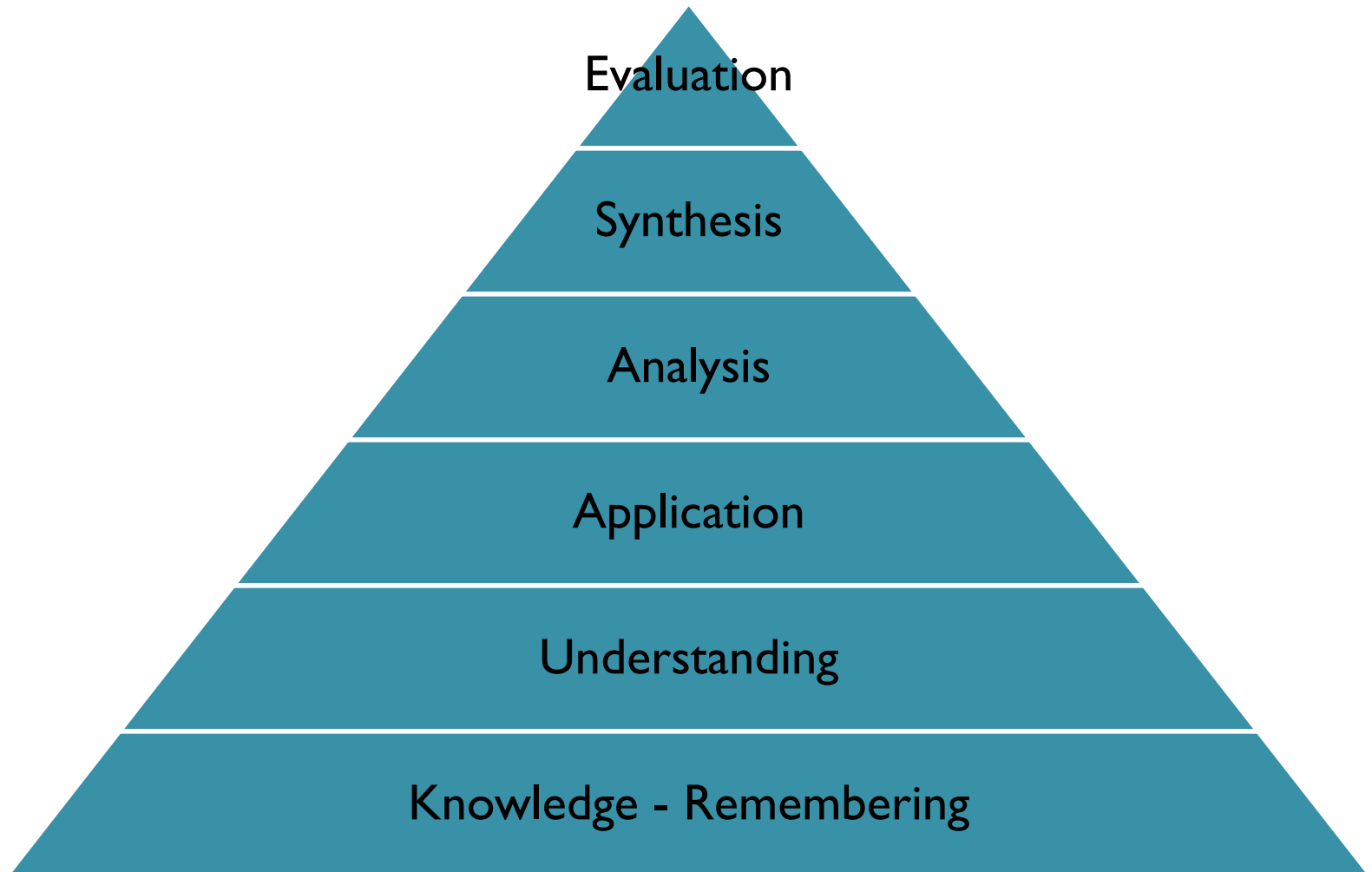
4. Dendrite growth and neural network development takes time.
  - Implies a repetition necessary for the learning process to take place
  - Implies that cramming only works short term

# Levels of Learning

We are going to switch from the brain to view how education approaches learning.

In 1956, Benjamin Bloom, an educational psychologist, developed a classification of levels of intellectual behavior important in learning. Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation.

# Bloom's Taxonomy





# Most Undergraduate College Courses

Learning is often at the three lower levels of Bloom's Taxonomy. Learning objectives include:

- Define or explain
- List
- Why do you use something?
- How - Demonstrate (lab assignments)

# Study Habits

We are now going to look at study habits by evaluating four quotes from educational psychologists:

- Emotions
- Repetition
- Connections
- Feedback

# EMOTIONS

“Emotions produce chemicals that enter the brain and ...affect the brain’s ability to think, learn, and remember. Thus, emotions and thinking, learning, and remembering are inextricably bound together.”

(Smilkstein, 2003)

# Emotions

How students feel about what they are learning is very important. Setting aside quiet time on a regular basis can help students “get into it”. Having a positive attitude and putting your “heart” into studying new materials is extremely important.

# REPETITION

“The more often an experience repeats, the stronger the habit becomes, and the denser the resulting neural connectivity.”

(Goldman, 2006)

# Repetition

It takes time for the brain to learn new materials because it usually takes several reinforced experiences for the brain to make long term neural networks (permanent “gray matter”). Reading material more than once, taking all possible repeats on quizzes and reviewing materials over various study periods will help the learning process.

# CONNECTIONS

“Once our mind connects (new) information with what we already know, we will be able to bring the new understanding to mind weeks or years later.”

(Goldman, 2006)

# Connections

Attaching a chain to the learning process by progressing up Bloom's Taxonomy helps make connections. A C++ programming example:

1. Knowing how to make a compound statement using braces { }
2. Knowing why we must or should use compound statements
3. Properly using compound statements in a lab assignment



# FEEDBACK

“Learning theorists have consistently emphasized (that) feedback (is) one of the most important stimuli to learning.”

(Boylan, 2002)

# Feedback – first slide

Within many courses we get feedback when we:

1. Do memory building activities (MBAs) such as flash cards and crossword puzzles.
2. Complete lab assignments.
3. Take quizzes (sometimes immediate and sometimes after instructor grading).

# Feedback – second slide

When doing a computer programming lab assignment that requires the source code to be compiled, the compiler provides immediate feedback if something is wrong. The creation and using of test data confirms our understanding and confidence (and the experience can be emotionally charged when the student is successful).

# Summary

This presentation has hopefully provided new understanding and insights as to how you learn. How one studies (their study habits) directly effects how your brain learns new material (builds neural networks).

You know you are learning when

You say, “Voila!” or “Eureka!”  
and your light bulb turns on.





**THE END**