



**An Inquiry into the Brain,  
Learning and Teaching Practice:  
Review, Strategies & Applications  
for Consideration**

c 2012

**Brain & Learning Applications Institutes**  
[Frankfurt, Ontario, New Mexico, North Carolina, Vancouver,  
Switzerland, Lisbon, Madrid, Beirut



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# Perspectives on Learning, Teaching and the Brain

G. Christian Jernstedt ~ Dartmouth College, 2004

“The biological limits to our potential are relatively minimal compared to the **cultural and environmental** limits.

There are sound and weak techniques of **learning and teaching**, more than bright and dull minds.

We can now consider our own philosophy of teaching, our own goals for what will happen for our students, the methods we use and would like to use to help our students learn, and the outcomes we typically achieve.”

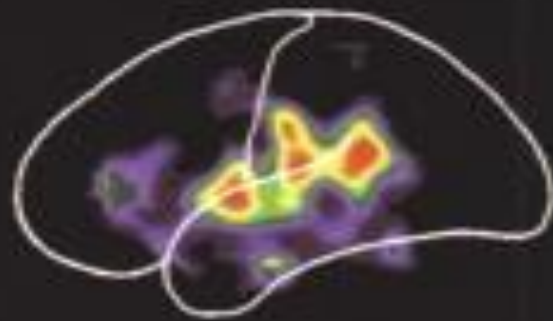
# General Cellular Level Information

- Each “fires” 2x second.... or more
- 100 Billion Neurons
- Each as complicated as a major city [David Eagleman,2008]
- 10,000 dendrites per neuron—connections to other cells
- The brain entertains 400 Billion impulses per second ~ yet only 2,000 make it to the Reticular Activating System (to be processed for memory) [Judy Willis, 2008]

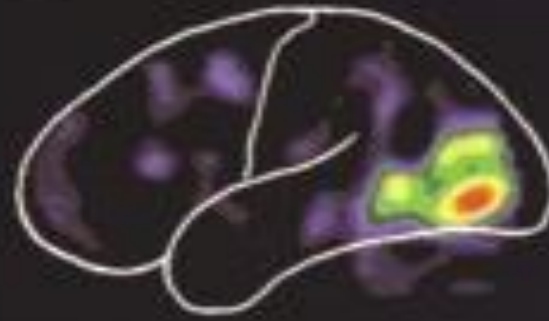


# Levels of Activation & Areas of the Brain

Slide by Dr. Judy Willis, M.D., M.Ed. 2008



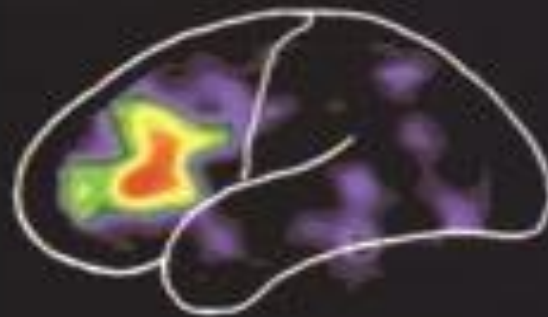
**Hearing  
Words**



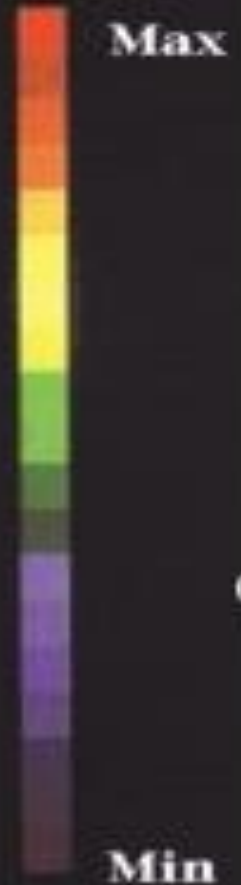
**Seeing  
Words**



**Speaking  
Words**



**Thinking  
About  
Words**



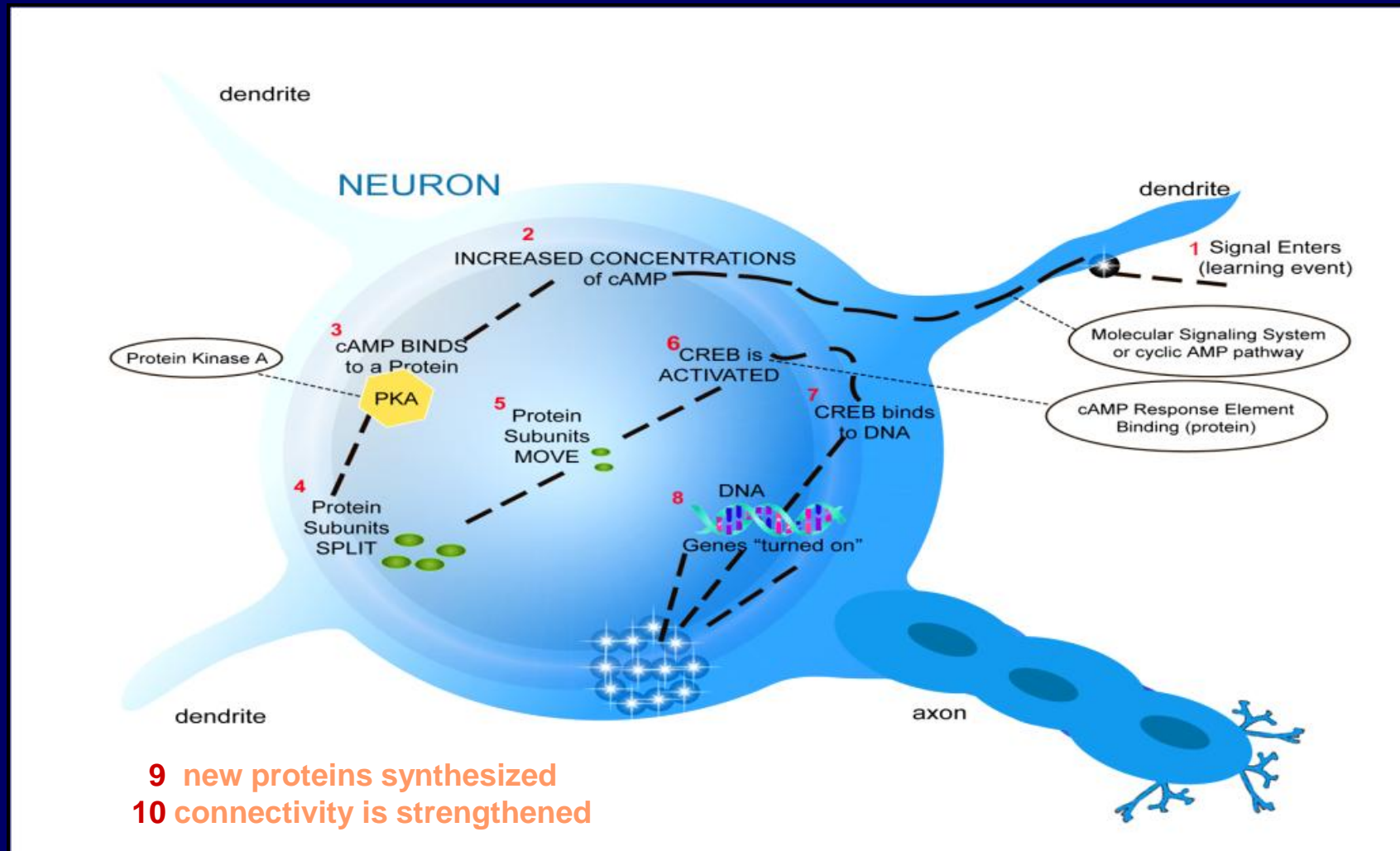
# Research Studies & Localization

- **Most studies examine “initial” activity or “most” activity... not *ALL* activity**

**Reality: We constantly use all of our brain neurons.**



# Cellular Micro-Perspective: Production of Long-term Memory



“The Search for the Memory Switch”  
Rusiko Bourtchoiuladse, Cerebrum, 2002



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# Overarching Educational Benefit to date from the Neuroscience Literature:

***ALL teaching / learning practices  
must be geared to address  
long-term memory, recall & transfer.***



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# (Human Behavior ~ Education Application) Processes in the Formation of Memory

**The Barn:  
Long-Term Memory  
Processing Level**

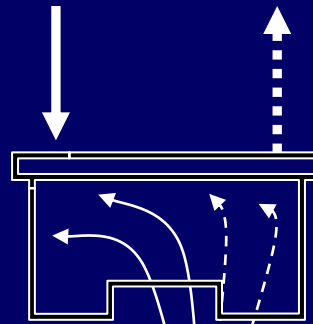


## Elaboration

How interconnected is the information?  
How strong are the connections?

**Recall:** is the information readily retrievalbe?

**“Desktop” Processing  
Short-Term, Working, or  
Continuous Memory  
Processing Level**



## Process

When we draw on what is in the barn in the processing phase, we enhance the likelihood that new information or skills will make their way into "the barn."

**Sensory Input & Integration  
Sensory Processing Level**

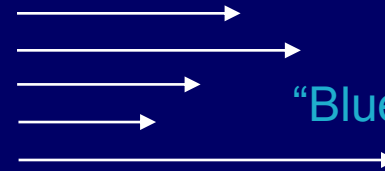
## Input

Some inputs are processed more thoroughly than others

quickly.

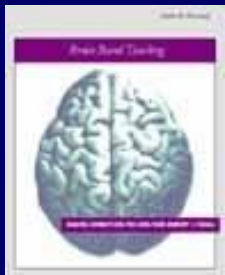
see  
smell  
taste  
sound  
touch

**Most inputs depart**



## Integration

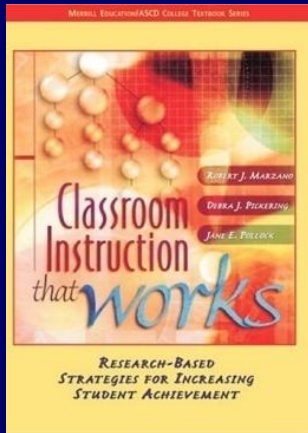
Our nervous system filters and regulates inputs that initiate memory making paths... *or not!*



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# 9 Most Effective Strategies for Achievement a la Marzano et. al. 2001



## "CLASSROOM INSTRUCTION THAT WORKS"

CATEGORY	PERCENTILE GAIN	NUMBER Of STUDIES
Identifying Similarities and Differences	45%	31
Summarizing and Note Taking	34%	21
Reinforcing Effort and Providing Recognition	29%	21
Homework and Practice	28%	134
Nonlinguistic Representation	27%	246
Cooperative Learning	27%	122
Setting Objectives and Providing Feedback	23%	63
Generating and Testing Hypotheses	23%	63
Questions, Cues, and Advance Organizers	22%	1,251



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# How do we take our **EXISTING LESSONS**

And “FRAME” them to:

**INVITE...** learners to participate

**CAUSE...** learners to think,  
process and work

**CREATE...** multiple connections?



# The Formation of Memory

## BOTTOM LINE:

The mental conclusion of “not important” suggests that little meaning (value) is indicated.

That which has only minimal impact on learners can, by definition, have no significant emotional base for retention.

**“No Meaning” ~ No Sustained (LTM) Memory !!**

\* (read aloud—PARIS)



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# Three lenses for exploring Long-Term Memory and Recall *as it applies to our practice.*



Statement: **S/he who does the work, learns.**

#1: Who is doing the **work** of learning in your classroom?

Statement: **The formation of long-term memory requires more than participation. It requires active processing.**

#2: What must the learner actually “**do**” in order to complete the task assigned?

Statement: **No meaning, no long-term memory.**

#3: What context or personal connection(s) to the curriculum does the **learner** experience *in their mind*?



# Strategy #7

## Student Generated Learning

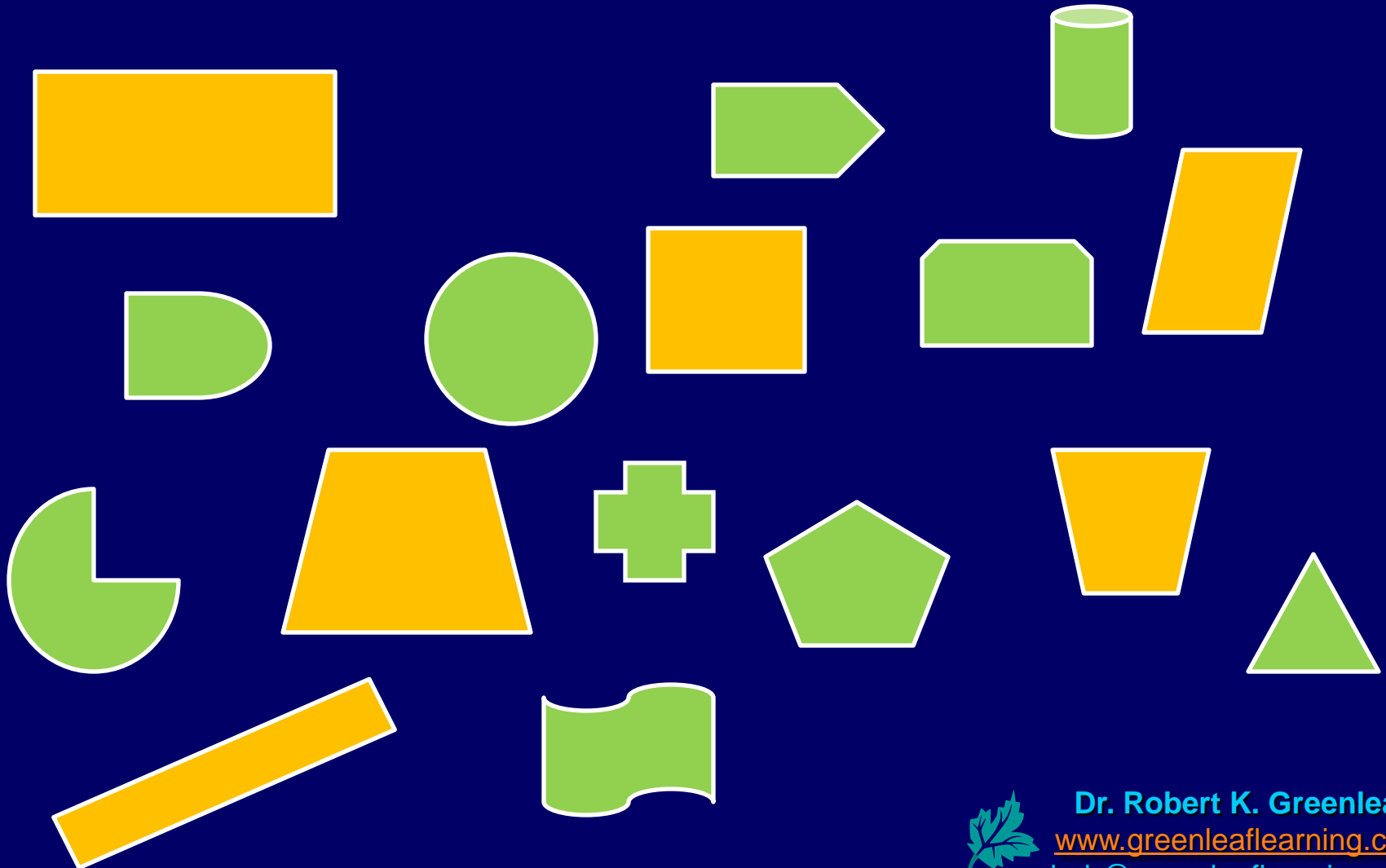
[Context Availability & Classification]

Exercise to follow

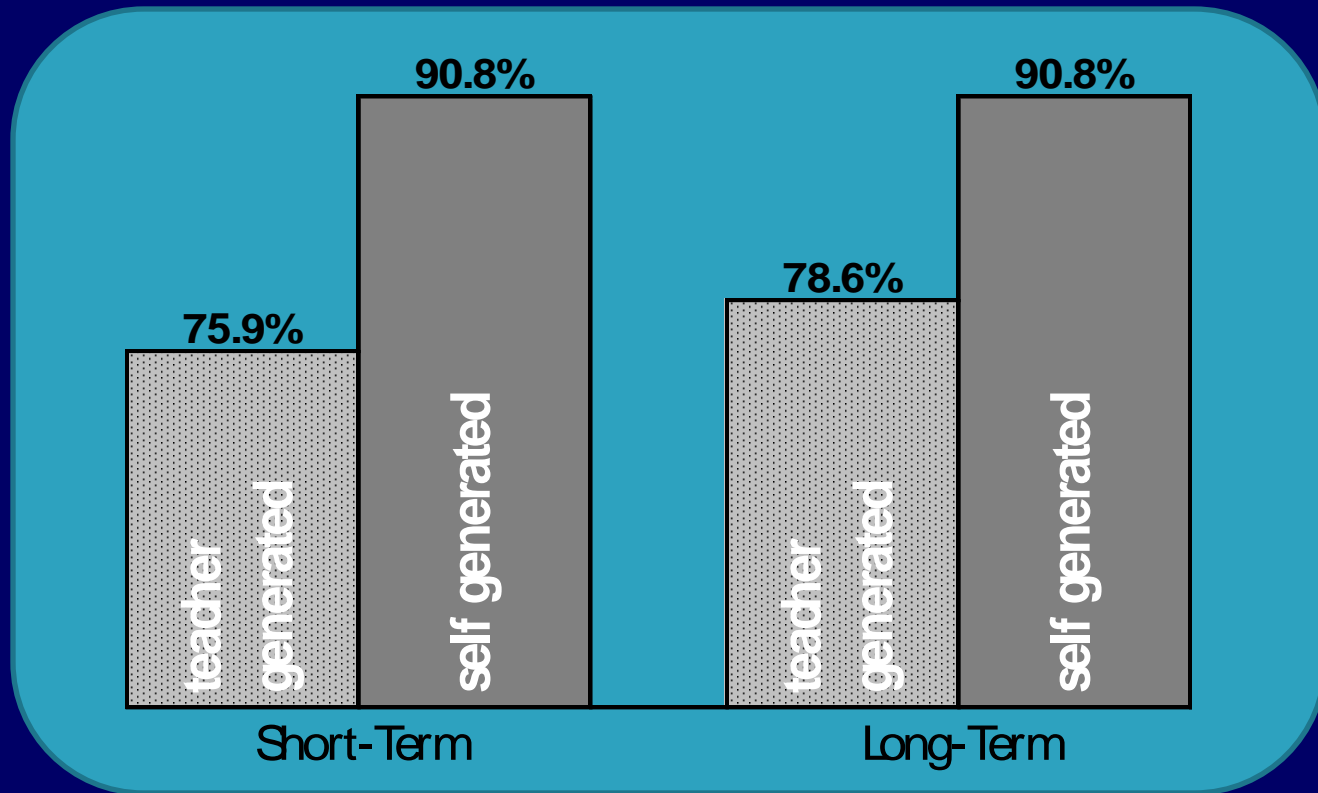


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# What do the orange shapes have in common?



# Effects of Self Generated vs. Instructor Generated Examples on Retention of Selected Concepts



Gorrell, Jeffrey; & Hunter, Downing

Presented at the Meeting of the Mid-South Educational Research Association  
~ Louisville, KY; Nov. 1998



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# Reflection Questions:

- Reflect on or discuss with colleagues how classification is critical in processing information for meaning, for access, for application and for transfer. What does it mean to identify criteria or standards to determine membership in a set or group?
- Reflect on your teaching to identify when you give students criteria for classifying material or information. How is providing this criteria different from asking the students to come up with their own ways of ordering or classifying content?

Dr. Betty Garner, "Getting to Got It,"  
ASCD, 2007



# Context Availability

...having a “place” to hold new ideas and information while pattern & meaning are being explored and developed...

...provides greater retention (processing for meaning) during the “construction” of networks—as well as for transfer to other domains of learning.



**Please feel free to email if you have questions!**

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Books available at:**

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This presentation was based on this book.  
Available from the presenter today—or pick up  
an order form from the table at the back.

