

Brain Based Teaching

Making Connections for Long-Term Memory and Recall

Goals

- **To explore neuroscience and educational research as it relates to education, teaching, and learning**

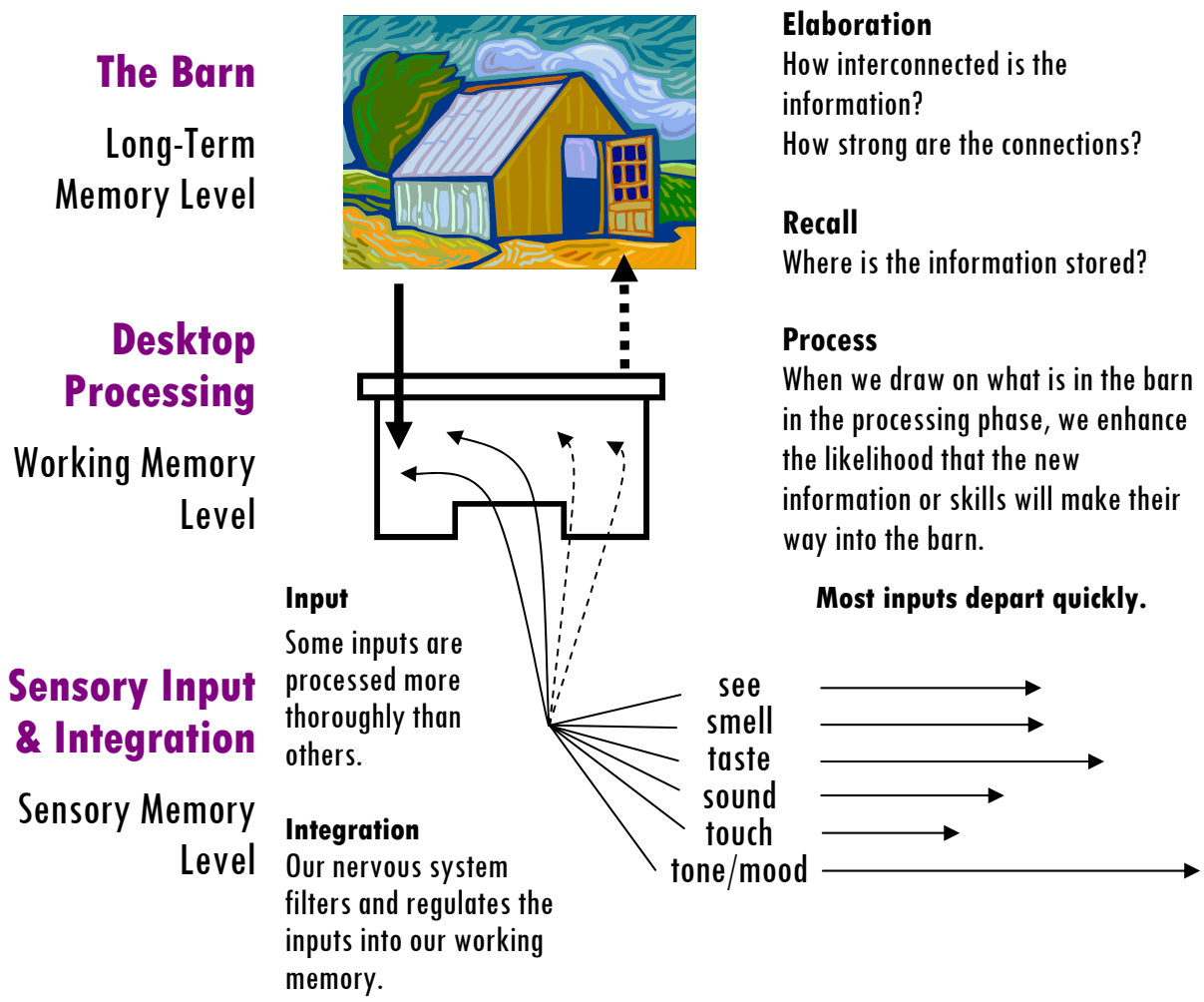


Objectives

- **To invite all learners to participate**
- **To cause all learners to process sufficiently for memory**
- **To create multiple pathways for transfer and recall**

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Memory is Divided into a Multiple Level Process

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NATURAL LEARNING SYSTEMS a la Barbara Given

Premise: The brain has "natural" learning systems: Cognitive, Emotive, Social, Physical, and Reflective

Cognitive Learning System

- Interprets, stores, and retrieves information via patterns and pictures
- Establishes integrated circuits of knowledge and skill

Caveat: Can be overrun by the stress response system and other perceived priorities

Emotional Learning System

- Personal meaning ~ relevance ~ accelerate learning
- Empowers and energizes or depresses and stifles all other learning systems
- Manages a learner's motivation, demeanor and creativity

Caveat: Operates internal stress response activities and generates powerful vehicles for enhancing memory ~ or likewise powerful inhibitors and blockers

Social Learning System

- Governs interactions and communications with others
- Teamwork and team accomplishment are integral to integrated systems
- Working together in pairs or small groups to problem solve integrates systems

Caveat: Acquiring skills to work effectively with all other types of people is crucial to reducing inefficiencies and increasing long-term productivity

Physical Learning System

- Gathers information through all senses
- Distributes information throughout the brain and they body
- Converts input into action ~ physical encoding and engagement promotes connection and ownership

Caveat: Takes longer to establish, however is sustained ~ like riding a bike

Reflective Learning System

- Weighs past, present, and future projections
- Interprets verbal and nonverbal cues ~ monitoring mechanisms
- Meta-cognates: "Under this circumstance, in this environment, what do I need to do to increase my understanding?" ~ performance

Caveat: Cognitive, Emotive, and Physical Systems always operate within a context. An environment that exists either physically or perceptually in the mind.

Barbara Given: "Teaching to the Brain's Natural Learning Systems" ASCD 2002



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"CLASSROOM INSTRUCTION THAT WORKS"

Marzano, Pickering, Pollock ~ ASCD 2001

Categories of Instructional Strategies That Impact Student Achievement
Figure 1.3, p.7

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

Marzano, Pickering, & Pollock, "Classroom Instruction that Works," ASCD Yearbook 2001



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WAIT ~ PAUSE ~ REFLECTION TIMES

Defined: Short, intermittent pauses in the instructional flow designed to provide time for learners to recall, think, process, discuss, and organize current knowledge and ideas with prior understandings and information.

Researchers: *Mary Budd Rowe (1987) ~ First Wait-Time; Robert J. Stahl (1990) ~ "Think-time"; Kenneth Tobin & Capie (1987), William W. Wilen (1987) ~ Question Techniques*

Research The average teacher pause after a query is 0.7 to 1.4 seconds, before comment, redirect, prompt, continuation, or redirect.

Strategy **1st WAIT TIME** (after a teacher question)

- **Method** ~ Allow 3-5 seconds of uninterrupted silence after a prompt to allow students to consider/recall responses.
- **Caution** ~ Too much time after imprecise questions can increase confusion. More often this is a period for "recall" requiring less processing.

Strategy **2nd WAIT TIME** (after a student response)

- **Method** ~ Provide uninterrupted silence after a prompt to allow students to consider/recall responses. Allows other students to consider whether to add to the response or offer a response of their own. This provides an opportunity for the brain to process, search, connect, organize.

Strategy **REFLECTIVE "PAUSE" TIME** (before, after, or within commentary)

- **Method** ~ Deliberately pause for 3-5 seconds after a student question, before responding or in the middle of a statement... allowing students to consolidate thinking - requesting no input from them. This provides time to consider information in a smaller "chunk" rather than in mass.
- **Method** ~ Extend the pause time to 1-2 minutes, asking students to think an idea carefully through or to write ideas down. Reflection is vital to long term memory and understanding.

Strategy **WORK-WAIT TIME** (brief think/do task)

- **Method** ~ Individuals or pairs to remain on task to complete a 30 second to 2 minute activity (silently or quietly in pairs). For Example: pairs interactions ask learners to apply skill, concept, or knowledge immediately after explanation or discussion.

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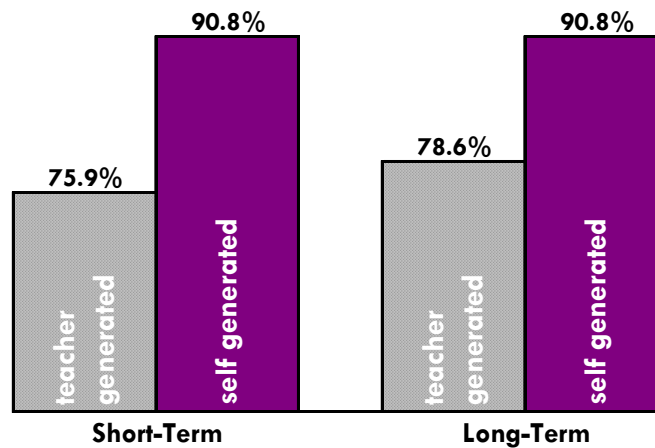
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LEARNER GENERATED QUESTIONS

Topic Prompt:

Things I (we) already know

Things I (we) would like to know



Effects of Self Generated vs. Instructor Generated Examples on Retention

Gorrell, Jeffrey; & Hunter, Downing

Effects of Self-Generated Examples on Retention of Selected Concepts
Presented at the Meeting of the Mid-South Educational Research Association

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LESSON DESIGN ~ TIME

METHODS OR APPROACHES

- **Mini-Lesson**
- **Lecture**
- **Q & A**
- **Practice**
- **LAB**
- **Discussion**
- **Readings**
- **Group Work**
- **Projects**
- **Activities**
- **Debate**
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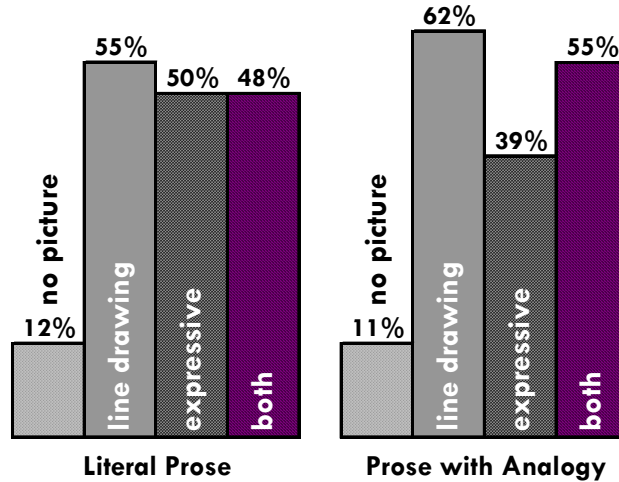
TRANSITION ~ SHIFT
TRANSITION ~ SHIFT
TRANSITION ~ SHIFT
TRANSITION ~ SHIFT

TRANSITIONS OR SHIFTS

- Ask a Neighbor
- Write a Response Before we Discuss this Further
- Q & A
- Debate
- 1-2 Students as Individuals or in Pairs
- 3-5 Students in a Group Discussion
- Whole Class
- Role Play
- Stand and ...
- Relaxation Response Break
- Illustrate
- Put Information into a Graphic Organizer
- Develop an Analogy or Metaphor
- Review and Code Notes
- Review Last 15 Minutes Major Points
- Stop and Think of a Question
- Move!
- Assume a Position (easy) and Explain a Point
- Play Soft Music in Background During...
- Demonstration
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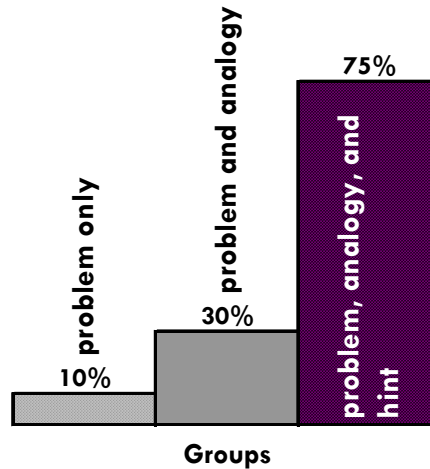
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Effects of Illustration & Analogy on Written Prose Recall

Hayes, David A.; Henk, William A. Facilitative Effects of Analogies and Illustrations on Understanding and Remembering Written Directions. Paper presented at the Annual Meeting of the American Educational Research Association (Montreal Canada, April 1983)



Effects of the Use of Analogies in Learning

Gick, Mary & Holyoak, Kieth
 "Schema Induction & Analogical Transfer: Cognitive Psych Vol. 15, Jan. 1983 p. 1-38

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SUMMARIZATION ~ NOTE TAKING

Defined: The process of selecting what to keep, delete, or alter. Delete trivia and redundancy. Alter common terms into a category. Keep main idea.

Research +34% impact on student performance outcomes

- Explicit practice with instructor demonstration can prove to be very effective.
- When students capture essential notes from an essay, it is helpful that they understand its information structure. For example: how an introduction or summary is constructed and why, the use of tense, or phrasing strategies.
- Templates with "rule-based" strategies frames can be key in enabling students to capture the important information.
- Note-worthy information can be derived from many forms: narrative, specific illustration, definition, argument, problem/solution, or conversation.
- Using reciprocal teaching techniques such as summarizing, questioning, clarifying, or predicting can also serve as productive note taking tools.
- Verbatim note taking is NOT effective.
- Remind your students that notes are a work in progress to be reviewed, reorganized, and referenced, and that they too provide feedback and reflection.
- Quantity of notes is more effective than efficiency of notes.

Notes Strategies

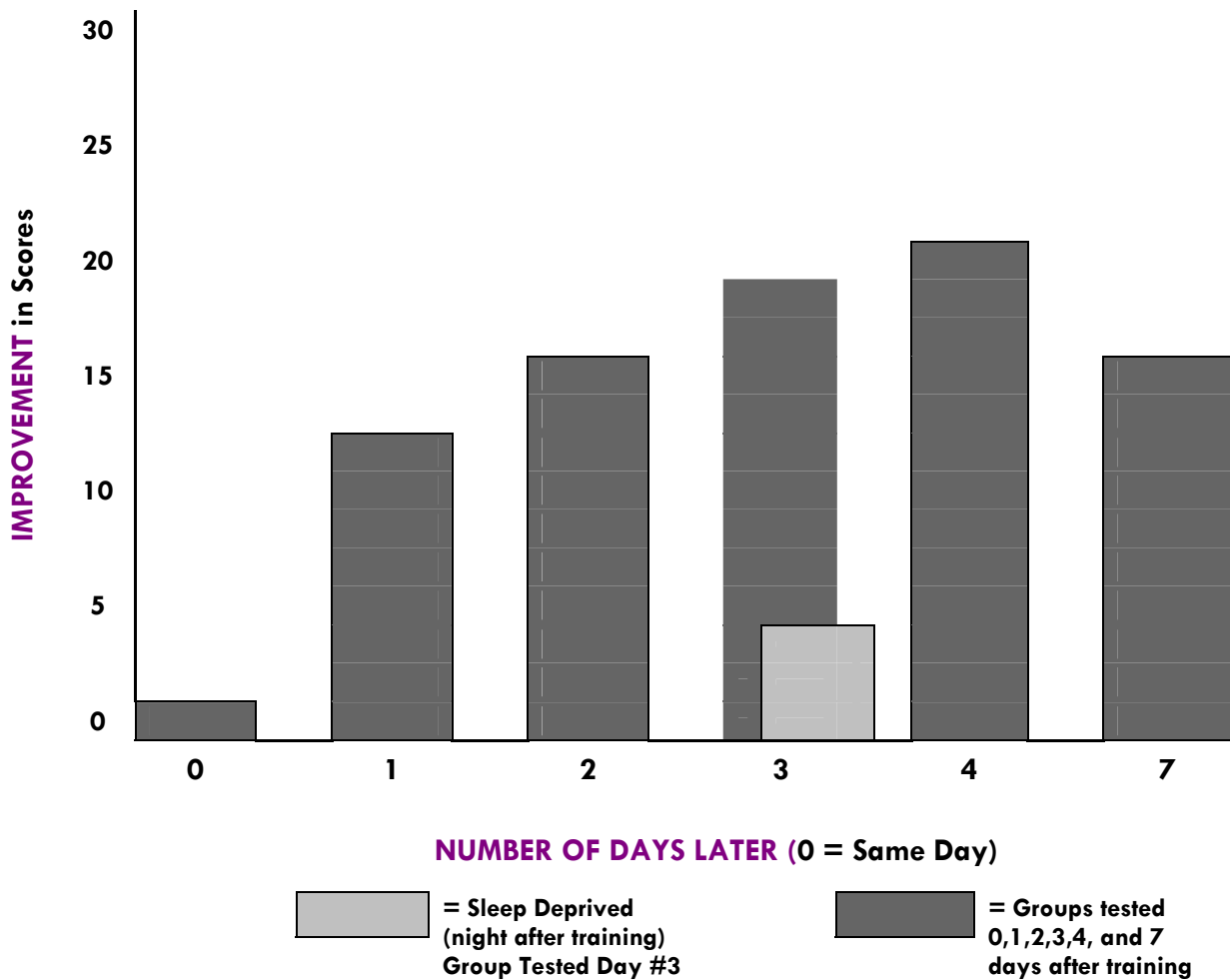
- Informal Outline: focus on major ideas and related details.
- Clustering, webbing, or mind mapping: encircling main ideas in a nonlinear manner, drawing lines to related information, the use of color to organize like information, or illustrations to tell stories.
- Templates: prepared nonlinguistic forms to support the collection and organization of information and related detail.

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LINKING BRAIN AND BEHAVIOR in Sleep Dependent Learning and Memory Consolidation

Stickgold, Fosse, and Walker Study
PNAS, December 24, 2002, v.99 n.26 16519-16521




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RESOURCES

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- Kohn, Alfie, "Punished by Rewards." Harvard.



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**Long-Term Memory ~ Personal Meaning ~
Processing Strategies**

**Instructional Frameworks that Foster
Greater Learner Retention**

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