Goals

- Explore Multiple Aspects of Nonlinguistic Representations as a Vital Method for Work with Learners

Objectives

- Review 5 Natural Learning Systems a la Given
- Review 9 Researched Strategies for Student Achievement Outcomes a la Marzano et. al
- Define the role of Bi-Modal packets in Knowledge Representation
- Establish the impact of "Visual" practices on Long-Term Memory and Recall
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 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
## "CLASSROOM INSTRUCTION THAT WORKS"
Marzano, Pickering, Pollock ~ ASCD 2001

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

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>AVERAGE EFFECT SIZE (ES)</th>
<th>PERCENTILE GAIN</th>
<th>NUMBER OF STUDIES</th>
<th>STANDARD DEVIATION</th>
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<td>Identifying Similarities and Differences</td>
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<td>Summarizing and Note Taking</td>
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<td>Homework and Practice</td>
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<td>Cooperative Learning</td>
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<td>Setting Objectives and Providing Feedback</td>
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<td>23%</td>
<td>63</td>
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<td>Generating and Testing Hypotheses</td>
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<td>Questions, Cues, and Advance Organizers</td>
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Marzano, Pickering, & Pollock, "Classroom Instruction that Works," ASCD Yearbook 2001
RESEARCH RESULTS FOR NONLINGUISTIC REPRESENTATION

<table>
<thead>
<tr>
<th>AUTHOR OF THE STUDY</th>
<th>AVERAGE EFFECT SIZE</th>
<th>PERCENTILE GAIN IN STUDENT ACHIEVEMENT</th>
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<td>Mayer, 1989</td>
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<tr>
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<td>1.31</td>
<td>40%</td>
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<tr>
<td>Powell, 1980</td>
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<td>34%</td>
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<tr>
<td>Hattie, 1996</td>
<td>0.91</td>
<td>32%</td>
</tr>
<tr>
<td>Walberg, 1999</td>
<td>1.04</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>0.56</td>
<td>21%</td>
</tr>
<tr>
<td>Fletcher, 1990</td>
<td>0.50</td>
<td>20%</td>
</tr>
<tr>
<td>Guzzetti, Snyder, &amp; Glass, 1993</td>
<td>0.51</td>
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</tr>
</tbody>
</table>

Research +27% impact on student performance outcomes

- Variety of ways to accomplish the production of imagery in minds (NLRs)
  - Graphic representations created on paper or other medium.
  - Physical Models: commonly thought of as manipulatives or ways to engage learners in concrete representations of the idea, info, skill, pattern or process.
  - Mental Pictures: Symbolic of the construct being learned, ways to help learners “feel” or consider circumstances regarding the topic/situation.
  - Drawing and Pictographs: Mind mapping, a la Buzan, or Clustering a la Rico - symbolic images/drawings that represent relationship, meaning, or importance relative to other factors or information.
  - Kinesthetics: Using physical movement or positioning to demonstrate or replicate an idea, context or flow of activity.

- Nonlinguistic Representations should elaborate knowledge, devising mental models to approximate concrete forms.


**Effects of Illustration & Analogy on Written Prose Recall**


**Effects of the Use of Analogies in Learning**

Gick, Mary & Holyoak, Kieth

BI-MODAL PACKETS:
Links the VERBAL and VISUAL aspects of processing potentials

1. **STRENGTH:** Memory records are assumed to have "Strength" which increases with repeated practice. Nuthall ('95) ~ four exposures in no more than two days apart

2. **DEPTH OF PROCESSING:** Identify characteristics of topic or subtopics or provide and explore detail

3. **ELABORATION:** variety of associations made with information or making varied connections

**VISUAL** Simultaneous ~ Sequential ~ All Parts

**VERBAL** Text ~ Sequential ~ Linear

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**Dual Coding Research:** Mental Imagery Training & Comprehension: (Gambrell & Bales, 1986)
- 4th & 5th grade poor readers
- Short training session encouraging students to make pictures in their head while reading
- Control group was told to do whatever they could to understand and remember while reading
- The reading passages used included both explicit and implicit inconsistencies embedded in the text
- Students were instructed to determine if there was anything not clear or easy to understand.

**Results:** The imagery group identified both types of inconsistencies more than TWICE as well as the control group.

**Dual Coding Research:** Degree of Importance, Emotional Response & Degree of Spontaneous Imagery and Recall (Sadoski, Goetz & Kangiser, 1988)
- Students read literary short stories and articles from magazines.
- Students rated each paragraph (5 point scale) for: 1. The degree of imagery experience; 2. The degree of emotional response evoked; 3. The level of importance of the information.

**Results:** 16 days later, the recall on highly rated imagery and emotion paragraphs was high, but recall on paragraphs rated high in importance was not.
Illustration: Referencing a Map

Aligning with dual coding theory, the mind stores information in "packets" that are comprised of both verbal and visual elements. Having students interact with visual representations relating to information to be learned enhances their capacity for understanding and recall.

Teacher selects a book to read. This may be a book read to the class or a book the class will read independently and work with during class time.

1. Tell the class that "we" or "they" (depending on the appropriateness to the objective and the capacity of learners) will be constructing "maps" of the journey the characters in the story will be taking.

2. Assign (read) the first section (chapter). Provide students with a map of the journey. For example:
   - Gulliver's Travels includes one in the book - or you will need to create one for students to use as the story progresses. At times, particularly if you are working with young children, you may want to create a class map together. Students can then copy this from the board or chart paper and have a personal copy to work with.

3. After having read the section, ask students to review the map and "track" the journey with a pencil (permanent markers can be used at an appropriate time).
   - Repeat this process of linking the visual map with sections of the reading intermittently. At times it may be sufficient to have students work independently. At other times, you may want to have students work in small groups to discuss each other's map and to compare ways to depict the story's progress. Also, it would be helpful to periodically discuss or review the map(s) as a class, as a way of providing feedback to everyone or to get an idea of how each child is doing.
### Memory, Recall, the Brain & Learning

The Nonlinguistic and Visual Attributes of Memory and Recall
Taken from Greenleaf Learning, “Memory, Recall, the Brain & Learning,” 2005

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**Unit Planner: Multipurpose**

**Assignment and Variations**

This organizer intends to prompt thinking about aspects of an upcoming unit that will be important for a student to keep in mind - elements that will support organization, memory, and ultimate learning. Components may be altered to suit any specific unit of study and its commensurate objectives aimed at what a learner must know and be able to do as a result of the unit.

**Unit Name or Title**


**Primary Concept or Essential Question**


**Main Ideas and Components**

1. 
2. 
3. 
4. 
5.

**Key FACTS, Knowledge, or Process Components**

1. 
2. 
3. 
4. 
5.

<table>
<thead>
<tr>
<th>Critical Vocabulary</th>
<th>Teacher Example</th>
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</thead>
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<tr>
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<td>5.</td>
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<table>
<thead>
<tr>
<th>Additional Vocabulary</th>
<th>Student Example</th>
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<tbody>
<tr>
<td>1.</td>
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<thead>
<tr>
<th>Analogy / Metaphor</th>
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### Vocabulary Development

**Assignment and Variations**
This template is organized to prompt learner exploration of meaning prior to any exposure to or attempt to converge on a definition.

- identifying descriptors
- words that help to explain
- words or phrases that support or provide context
- words that help describe - provide a basis for understanding that will build meaning around an idea
- concept or new vocabulary term

Begin this template at the top, as a class discussion, having students locate images/photos (middle-left) for homework or to create drawings that result from the discussion. Only after the top two sections are complete will a definition better be processed for longer-term memory and transfer.

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<thead>
<tr>
<th>Descriptor</th>
<th>The Word or Concept</th>
<th>Descriptor</th>
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<table>
<thead>
<tr>
<th>Picture or Photo</th>
<th>Student Generated Drawing or Illustration</th>
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</tbody>
</table>

**Definition ~ filled out last**
## Memory, Recall, the Brain & Learning
The Nonlinguistic and Visual Attributes of Memory and Recall

### Story Events

<table>
<thead>
<tr>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>Provide basic categories that prompt students to “look” for information can help them identify main ideas and details that serve to organize information for later use in projects, writing, and other appropriate purposes. The number of major topics will vary by unit and could include one or more that students select.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title of the Story, Event, or Item</th>
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<table>
<thead>
<tr>
<th>History</th>
<th>Geography</th>
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Knowledge Representation and the Brain
The Nonlinguistic and Visual Attributes of Memory and Recall

Pro-Con Issue Deliberation

Assignment
This template is vital for developing the organization necessary for a thesis statement or argument position. It helps learners think about main ideas and support details for the main ideas. As they organize or prioritize the details, in order of importance to the support of a position (either side), they begin to develop the structure for their thesis and how to prepare a conclusion regarding their position.

Support and Reasons

Against

1.

2.

3.

4.

5.

6.

In Favor

1.

2.

3.

4.

5.

6.

Central Question

Conclusion and Findings

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Greenleaf Learning
www.greenleaflearning.com
Photographs to “drain” ideas/feelings/meaning ~ text