Reading Recovery and the Brain

What was Marie Clay Thinking?
Presented by Barbara Schubert, Ph.D., UALR

Overarching Goals for This Session

- Gain new insights into how the brain becomes a mind
- Examine ways that Reading Recovery supports brain-based learning
- Explore the “what” and the “how” to make the lesson compatible with how the brain learns
- Understand the “why” behind the action

Marie Clay’s Research

- Pioneered new directions in literacy research
- Used developmental psychology and the capturing on-task changes in behavior across time to focus on a theory of learning
- Used strategies of biological science to describe changes in reading behavior during the first year of instruction

Marie’s Definition

- To comprehend Marie’s unusual lens requires an understanding of at least two of her operational definitions:
  - Literacy refers to either reading or writing activities considered separately or together
  - Focus is on behaviors or acts which can be observed and which provide observers with signals

Unusual Lenses

- Any observational or research methodology which gathers detailed data on changes in the literacy behaviors of young children as they learn to read and write continuous text over time
- Running Records provide a lens directed to text processing
- An instrument or procedure that captures how learner works at learning and how those ways of working change

Reading Recovery Connections

<table>
<thead>
<tr>
<th>Video Games</th>
<th>Reading Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>With a video game, you enter at Level 1 and can progress as quickly as you like.</td>
<td>The OS determines a book level at which to enter; progress determines on how “spot on” the teaching decisions are</td>
</tr>
<tr>
<td>Each time you play, you get immediate feedback.</td>
<td>One-to-one ensures that immediate feedback is available</td>
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Boundless Horizons, p.104
Reading Recovery Connections

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<tr>
<td>There’s color, sound, and movement in games and you have to interact to make the game operable.</td>
<td>During the lesson, there’s physical movement, manipulatives, and colored pens.</td>
</tr>
<tr>
<td>As you get to higher levels in the games, you are rewarded with a harder challenge.</td>
<td>As the child becomes more skilled in reading and writing, new books and more complex sentences are the reward.</td>
</tr>
</tbody>
</table>

Marie Clay

- “What is possible for children with reading problems?”
- What would have to change in the classroom?
- How do children take on literacy learning?
- How does that learning change over time?

The Big Question

How does the brain become a mind?

How Does a Brain Become a Mind?

- Experience
- Process, not product
- Demonstrate habits of the mind
  - Optimism
  - Confidence
  - Action-oriented
  - Question when given a task

Wernicke's area is the semantic processing center; accounts for conscious comprehension of spoken words; stores memory of sounds that make up words.

Arcuate fasciculus takes information from Wernicke's area to frontal language regions of brain. Allows for repetition.

Auditory detects sound Thalamus – receiving point Auditory cortex works with thalamus to determine if incoming info is language or other.

Broca's area is the expressive language center; converts words into code to direct muscle movements involved in speech production; assembles words into grammatically correct phrases.

Auditory cortex works with thalamus to determine if incoming information is language or other.

Motor cortex

Figure 17.3. Diagram of the Language Pathway in the Brain.

Figure 17.4. The Flow Chart of the Language Pathway.

Figure 17.5. Diagram of the Reading Pathway in the Brain.

Figure 17.6. The Flow Chart of the Reading Pathway.
Start at the Beginning

- How does the brain “work”?

Your Job

- In a few words, describe for yourself a challenging Reading Recovery lesson that you were not happy with in the past and want to improve with regard to student engagement and memory.

Your Brain

- Hippocampus
- Neurotransmitter
- Amygdala
- Dopamine
- Cerebellum
- Pruning
- Synapse
- Axon
- Thalamus
- Neuron
- Cerebrum
- RAS

How the Brain Processes Information Learning

- Here’s a formula...
  - Reticular Arousal System
  - Amygdala’s Emotional Filter
  - Dopamine

  \[ \text{RAD Learning} \]

Let’s Take it Apart...

- Reticular arousal system
- How to use changes in the environment
- Using surprise
- Taking advantage of teachable moments
- Designing multisensory lessons

Attention and Focus Are Important in Reading Recovery

- How do we do it?
  - Use color
  - Preview and overview
  - Physical activity – every 5-10 minutes
  - Environment – clear, uncluttered
  - Novelty and surprise
Amygdala
• Stress = No Learning, No Recall, No Nothing!

Set the Emotional Climate

Let’s Take it Apart...
• Amygdala
  • How to keep the filter from blocking information
    entering the brain due to stress
  • Using stimulation to expedite passage through
    the amygdala’s affective filter
    • Building curiosity
    • Positive emotional association
    • Activating prior experience

Keep it EASY...Make sure it’s DO-ABLE...Use the clearest EXAMPLE...

Who Sets the Emotional Climate?
Teachers

What Might Create Stress in a Lesson?
• Fear of being wrong
• Embarrassed about reading aloud
• General anxiety about being in a situation and not in control
• Language limitations
• Frustration with difficult materials
• Boredom from lack of interest

Working with the Brain
• What can you use or have you used to reduce stress from one of these stressors that interferes with learning?

Points to Remember...
• Teachers set the emotional climate
• Personalize the information whenever possible by relating it to their lives, current events, their interests or talents
• Open-ended discussion strategies and real conversations

Barbara Schubert, Ph.D. UALR
The Constructive Brain

- Sense cues from environment
- Integrate new information with background knowledge
- Generate appropriate movements to add upon information
- Construct new knowledge

Simple Things that Make a Difference

- Are you tapping into prior knowledge often enough in your lesson?

Yeah, Yeah, Yeah... but I've only got 30 minutes! I can't be spending all my time tapping into prior knowledge!

Research Says...

- New knowledge is constructed from old
- Launching the learning from the prior knowledge of your students is a tenet of good teaching
- Slow down and ask the child what he or she already knows about the matter

Importance of Prior Knowledge?

- Constructivism proposes that new knowledge is constructed from old.
- Learning progresses primarily from prior knowledge and only secondarily from the materials we present to students.

What About the Environment?

- Organized
- Materials readily available
- Well-planned lesson based on prior knowledge
- Routine in place
- Leveled texts, including a variety of genres

Conventions

- 1. Accurate reading
- 2. Recording an error
- 3. Trials
- 4. Self Corrections
- 5. Insertion or No Response
- 6. Tolds
Conventions

- 7. Verbal appeal for help
- 8. Confusion
- 9. Repetition to confirm or self correct
- 10. Repetition and partial correction
- 11. Spelling
- 12. Directional attack
- 13. How reading sounds
- 14. Other behaviors

Conventions Receiving Less Attention

- Recording whether children have:
  - 1:1 (instead of rereading, attempts)
  - Accurate reading (not just errors)
  - Trials (initial cluster? whole word?)
  - Tolds (the different kinds of tolds)
  - Repetitions (recorded at the word level, phrase level)
  - How reading of continuous text sounds (in terms of analysis and literacy processing theory)

How Do We Teach?

![Biology](Biology.png) ![Philosophy](Philosophy.png) ![Education](Education.png)

Zull, *The Art of Changing the Brain*, p. 7

Parallels

**Learning Cycle**
- Concrete Experience
- Reflective Observation
- Abstract Hypothesis
- Active Testing

**Cognitive Processes**
- Sensory Cortex
- Frontal Integrative Cortex
- Temporal Integrative Cortex
- Motor Cortex

Teaching that Strengthens Executive Function Networks

- Opportunities to apply learning through authentic, personally meaningful activities with formative assessments and corrective feedback throughout a unit allows facts to move from rote memory to become consolidated into related memory banks rather than be pruned away due to disuse.

Where Does This Fit with Reading Recovery?

- authentic, personally meaningful activities
- Book selection, writing, linking lesson back to what’s important to the child (not what you’ve prepared as the “teacher”)
- formative assessments and corrective feedback
- Running Record, work work, teaching points
- move from rote memory to become consolidated into related memory
- Teaching intentionally, involving motor response, letting the child in on the “secrets”
The Biggie...

- How will you integrate this new learning into your prefrontal lobe and access it as prior knowledge next time you work with children in Reading Recovery?

Executive Function

- Working Memory
- Attention
- Executive Attention

Working Memory

Attention/Inattention

Inattention has three cognitive aspects that are determined by three neural networks, which are anatomically and cognitively separate.

- Alerting
  - Critical for optimal performance, the alerting network prepares an individual for perceiving and receiving new stimuli.
  - Symptoms of dysfunction include:
    - Complaining that a task is too boring or hard
    - Yawning
    - Laying one's head down on a desk

Attention/Inattention

- Orienting
  - This network selects and sorts relevant information from general sensory input.
  - Symptoms of dysfunction include:
    - Focusing on irrelevant stimuli
    - Easily distracted by anything

Executive Attention

- Executive Attention
  - This is the network that is responsible for planning, organizing, recognizing errors, and involves the working memory.
  - Symptoms of dysfunction include:
    - Getting sidetracked and not noticing signs in math
    - Missing words in written work
    - Forgetting instructions
    - Difficulty organizing materials and academic work
Teaching that Strengthens Executive Function Networks

- Pruning is an aspect of the brain’s neuroplasticity
- Processing new learning through executive functions promotes linkage to existing memory banks through growth of linking dendrites and synapses

Bottom Line

- Explicit teaching
- Opportunities to practice what has been taught using
  - Organization
  - Prioritizing
  - Comparing
  - Contrasting

How the brain is involved with the reading of continuous texts

New Texts

- Problem-solving using THEIR theories of the world
- THEIR theories of how to work with written language

Marie’s Words on Problem-Solving

“...The monitoring and problem-solving that young readers can learn to do seems to involve more complex brain activity than the word-solving tricks that are often taught in literacy instruction.”

(For example, sounding out a word, phoneme by phoneme, or skipping a word and reading on to the end of the sentence, rarely occur in the records of successful young readers unless these activities have been relentlessly drilled in the classroom)

LLI, 2, p101
Good Readers/Poor Readers

<table>
<thead>
<tr>
<th>Teaching Items</th>
<th>Teaching Children</th>
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<tbody>
<tr>
<td>The child practices a word 25 times to establish learning</td>
<td>Let them see a word, hear the word, and make links between the word and what they already know</td>
</tr>
<tr>
<td>The child waits for the next task from the teacher</td>
<td>Let them search for relationships</td>
</tr>
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Brain Functions

- “The moment of truth is in the moment of input: how you attend, how much you care, how you encode, what you do with it, and how you organise it. You relate what you see and hear to things you already understand. How well you access it depends on how well you stored it in the first place. How do you (the learner) become more savvy about your way of remembering things? Put things in the same place. Have a good system.”

J. Squire, Dana Foundation, p. 102

A Self-Extending System

**Brain Research**

- Information enters the RAS and either goes to the lower brain (where nothing happens) or it goes to the prefrontal cortex and is integrated with what is already known.
- Which path it takes is dependent upon 1) RAS; 2) amygdala (emotions) and 3) successful completion.

**Clay’s Work**

- If you successfully solve the problems of a simple task then this prepares you to tackle a more complex problem at a higher level. Slowly, through success, the system builds a greater capacity to solve the new challenges and get to the precise reference of new words used by the author.

Strategic Activities

- “In reading we sometimes consciously search for a word or a meaning or a correction but most of the time our active search is a fast reaction in our brain that appears to be automatic and is rarely conscious. I use the words strategic activities to describe this fast brainwork. The term refers to electrical impulses that race around the neural networks as we read, without us consciously directing them.”

How to do it...

<table>
<thead>
<tr>
<th>What</th>
<th>Why</th>
<th>How</th>
</tr>
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<tbody>
<tr>
<td>Judgment</td>
<td>Promotes a student’s ability to monitor the accuracy of his/her work</td>
<td>Guidance, experiences and feedback in estimation. Reinforce self-monitoring attempts. Editing and revising one’s own written work. Engage in discussions to solve problems.</td>
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<td>Prioritizing</td>
<td>Helps students separate low relevance details from the main ideas of a text, lecture, math word problem or complete units of study. Helps students see how new facts fit into broader concepts to plan ahead for the long term.</td>
<td>Model thinking process when describing work to be completed. Review effective practices that students have used in their own work.</td>
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<tr>
<td>Setting Goals</td>
<td>Until kids develop the ability to do this, they are limited in their capacity to set and stick to realistic and manageable goals</td>
<td>Help them see the incremental progress they are making by scaffolding devices and Ask them to find the problems</td>
</tr>
<tr>
<td>Providing self-feedback</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring progress</td>
<td></td>
<td></td>
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</thead>
<tbody>
<tr>
<td>Metacognition development</td>
<td>When kids experience these opportunities, they recognize their own changing attitudes and achievements</td>
<td>Share the process you used to solve a problem and Point an effective strategy out to the child when he/she puts one to use</td>
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<td>Writing</td>
<td>Enhances the brain's intake, processing, retaining, and retrieving of information. Helps students increase their comfort with and success in understanding complex material, unfamiliar concepts, and subject-specific vocabulary Builds capacity to define own thinking, communicate ideas and defend their opinions</td>
<td>Write descriptive stories about things that are important to the child Encourage the child to do the work...but be there to provide feedback and support Don’t let the same mistakes happen over and over</td>
</tr>
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What Else Can Writing Do?

- Varieties of writing guide the brain to recognize, construct, and extend patterns.
- Activates prior knowledge to link with new learning through
- Illuminates sequential procedures that make a word a word

What Else Can Writing Do?

- Increase personal relevance and confidence
- When incorporated into learning and assessment, there is an increased opportunity to produce the ideal situation for active, attentive learning with collaboration, revision, and metacognition.
- Reminding students of previous successes promotes confidence and lets them see change over time.

Edutopia, The Brain-Based Benefits of Writing for Math and Science Learning: Willis, 7/11/11

Was Executive Function Promoted?

<table>
<thead>
<tr>
<th>Executive Function</th>
<th>Yes</th>
<th>No</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judgment</td>
<td>X</td>
<td></td>
<td>Estimating, editing, monitoring work</td>
</tr>
<tr>
<td>Prioritizing</td>
<td>X</td>
<td></td>
<td>Main idea, see how new information fits</td>
</tr>
<tr>
<td>Goal-setting, providing self-feedback, monitoring progress</td>
<td>X</td>
<td></td>
<td>Able to manage the goal of putting the needed information in writing and communicating it; was able to receive new information and provide a response</td>
</tr>
<tr>
<td>Actively participate in learning</td>
<td>X</td>
<td></td>
<td>Was able to communicate his own ideas and recall quantity and qualities of the &quot;recipe&quot;</td>
</tr>
<tr>
<td>Was the task relevant and personal?</td>
<td>X</td>
<td></td>
<td>Idea originated with the writer</td>
</tr>
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