Good Morning!

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Moving the Frontal Lobe to the Front of the Class:

Executive Function & Literacy

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Licensed Psychologist

Half-Day Version!
Why this matters . .

“Academic success, as defined by high school graduation, can be predicted with reasonable accuracy by knowing someone’s reading skill at the end of third grade. A person who is not at least a modestly skilled reader by that time is unlikely to graduate from high school.”

The National Research Council, Preventing Reading Difficulties in Young Children, Snow, Burns, & Griffin, 1998.
Why this matters . .

“The link between academic failure and delinquency, violence and crime, is welded to literacy failure.”

U.S. Department of Justice

“About 85% of all juvenile inmates are functionally illiterate.”

National Center for Educational Statistics.
Executive Function

The ability to **direct** and **regulate** one’s cognition, academic functioning, and social/emotional functioning.
The Two Strands of Executive Function

The Executive Skills

The Metacognitive Strand
- Goal-Setting
- Planning/Strategizing
- Sequencing
- Organization of Materials
- Time Management
- Task Initiation
- Executive/Goal-Directed Attention
- Task Persistence
- Working Memory
- Set Shifting

The Social/Emotional Regulation Strand
- Response Inhibition (AKA: Impulse Control)
- Emotional Control
- Adaptability
Set shifting/cognitive flexibility: Among the most important EF’s related to literacy

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Literacy: *Receptive vs. Expressive*

Reading (Receptive)

Writing (Expressive)
Input vs. Output Regions of the Cortex

Output & Self-Direction

Input & Sensory Processing & Storage
Reticular Activating System (RAS) determines the level of alertness
Frontal-reticular-posterior cortical attention loop
(Goldberg, 2001, p. 172)

The attention ‘flashlight’

The hand directing the flashlight

Cognitive areas illuminated by flashlight

Prefrontal Cortex

Posterior (‘Association’) Cortex

Reticular Activating System
The Five Core Skill Aspects of Reading

- **Phonemic Awareness** *(the ability to focus on an manipulate the sounds of spoken language)*
- **Phonics** *(letter-sound association and synthetic blending)*
- **Fluency** *(reading aloud with speed, accuracy, and expression)*
- **Vocabulary** *(receptive/expressive word knowledge)*
- **Comprehension** *(reading for meaning)*
The Five Primary Impacts of Attention Deficits and Executive Dysfunction on the Acquisition of Reading Skill

1. On **word-level reading** (attention, working memory, and self-regulation deficits impacting decoding/word attack accuracy)

2. On **fluent reading** (impacting passage level reading speed and accuracy)

3. On **motivation** (impacting the quality and quantity of reading practice)

4. On **comprehension** (particularly implicit/inferential comprehension)

5. On **writing** (its executive aspects)
Four Types of Developmental Reading Disorders (Feifer, 2011)

1. **Dysphonetic Dyslexia** (difficulties processing the component sounds of speech and with linking letters to sounds – *inhibits the ‘sounding out’ of words*)

2. **Orthographic Dyslexia** (difficulties recalling/recognizing the visual features of words; this is a particular problem with irregular words like ‘enough’ and ‘yacht’ and ‘the’)

3. **Mixed Dyslexia** (Impaired phonological and orthographic processing)

4. **Comprehension Deficits** (no obvious word level/mechanical reading deficits, but comprehension is impaired)
Cracking the Code: The Role of EF

Decoding requires:
• Phonological awareness
• Phonemic awareness
• Morphological awareness
• Orthographic knowledge
• Sound/symbol mastery
• Sound blending skill
• Vocabulary skill
• Syntax skill

Decoding also requires:
• Goal-directed attention
• Working memory
• Sequencing skill
• Frustration tolerance
• Task persistence
Developmental Phases of Word Reading

1. Pre-alphabetic (AKA: ‘Logographic’ reading)

2. Partial Alphabetic (initial phonics skill; e.g., guessing at words based on their initial sounds)

3. Full Alphabetic (more skilled/active use of phonics to decode words)

4. Consolidated Alphabetic (More fluent phonics skill, and the ability to recognize words based on features analogous to words already known)

5. Automatic (Recognizing most words quickly and easily by sight; that is, as mastered whole word forms linked to a growing vocabulary)

Ehri & McCormick, 1998
Research has linked attention deficits and developmental dyslexia

Comorbidity of attention deficit hyperactivity disorder (ADHD) and reading disorder (RD) is frequent (with co-occurrence rates ranging from 12 – 25%; Shaywitz, 2003, Germano et al., 2010).

• Visual attention deficits (Thomson et al., 2005)
• Spatial attention deficits (Facoetti et al., 2010)
Attention Deficits

Global Processing Speed Deficits

Rapid Automatic (‘Speeded’) Naming Deficits

Reading Skill Deficits
Prefrontal Cortical Impact on Reading Fluency

Fluency requires: **sustained attention and mental effort** (variable attention leads to missed or misread phonemes, morphemes, and whole words; variable energy leads to insufficient effort to scan memory for phoneme/grapheme linkages and sight words).

Fluency requires: **consistent self-monitoring and impulse control** (prevents impulsive guessing at words)

Fluency requires: sticking to it, even if it’s hard or ‘boring’
Your Turn: Read this if you can . . .
The ‘Matthew Effect’

- Good fluency leads to this . .
- A lack of fluency leads to this . .
- The years going by . .
Working Memory (short-term memory put to work)

The brain’s RAM (Random Access Memory)

Info from short- and long-term memory are temporarily held ‘on line’ in working memory

Auditory learners: Rely on the phonological rehearsal loop

Visual learners: Rely on the ‘visual-spatial sketchpad’
How Large is the Child’s Working Memory Bucket?

Case 1: Rachel Recalls it All

Case 2: Nicky Normal

Case 3: Frankie Forgetaboutit
What do good readers do . . .

• **Before** they read?

• **While** they read?

• **After** they read?
The Literacy ‘Mix’ in Working Memory

Background Knowledge

New Information From Text

Working Memory (Cognitive ‘Desktop’)

Concepts & Inferences
The process of reading is not a half sleep, but, in highest sense, an exercise, a gymnast’s struggle; that the reader is to do something for himself, must be on alert, must himself or herself construct indeed the poem, argument, history, metaphysical essay – the text furnishing the hints, the clue, the start or frame-work.

-- Walt Whitman
It’s the self-directed mixing together in working memory of information/content extracted from text with prior knowledge (facts, schemas, paradigms, etc.) that yields meaning and understanding.
Levels of Text Processing

**Surface /Orthographic Level:**
ABCABCABCABCABCABCABCABCABCABCABCABCABCABCABCABCABCABC

**Factual/Explicit Comprehension:**
*Who, What, Where, When ("Gimme the facts – just the facts")*

**Conceptual/Implicit Comprehension:**
*Why, Original Thoughts, Inferences, Predictions*
Bottom line: Kids with EF weakness tend to be . . .

Passive readers who process text in a fairly superficial, shallow manner!!
The Five ‘Big Ideas’ Written in Instructional Terms for Kids with Executive Struggles

1. Teach phonemic awareness explicitly.
2. Provide systematically sequenced phonics instruction.
3. Teach synthetic phonics where letters are converted into phonemes and then blended to form whole words.
4. Use guided oral reading with appropriate error correction techniques and feedback strategies to facilitate reading fluency.
5. Develop vocabulary and use systematic instruction to teach strategic reading comprehension.
Break Time!

ZITS  BY JERRY SCOTT AND JIM BORGMAN
Systematic phonics instruction is essential.

“Phonics instruction in general education may present problems for students who are at risk. For example, it may not be explicit enough, encourage students to guess at words, provide little systematic presentation of sound-symbol relationships, and/or may not include decodable reading materials that allow students to apply the sound-symbol relationships practiced during phonics lessons” (Moats, 2007, as cited by Bursunk & Blank, 2010, p. 423).
Elkonin Boxes

Sheep
Most important fluency-related strategy for kids with EF issues

PRACTICE!!!

Specifically, daily guided oral reading practice

Problem is, many kids with EF weakness find reading boring/tedious and therefore avoid practice.
Improving the Power of Repeated Reading with Kids with EF Weakness

• Cue kids, before they read, to ‘read what’s on the page’ and to ‘read the whole word’

• Remind kids, before they read, of the types of fluency errors they tend to make (“Remember to not skip small words”)

• Have kids guide their reading using a finger or note card/paper

• Model distractibility management!
Comprehension depends on:

EXTRACTION

and

CONSTRUCTION
Essential Comprehension Strategies (and the evidence supporting their use)

Table 2. Recommendations and corresponding levels of evidence

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Minimal Evidence</th>
<th>Moderate Evidence</th>
<th>Strong Evidence</th>
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<td>1. Teach students how to use reading comprehension strategies.</td>
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<tr>
<td>2. Teach students to identify and use the text’s organizational structure to comprehend, learn, and remember content.</td>
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<td>3. Guide students through focused, high-quality discussion on the meaning of text.</td>
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<td>4. Select texts purposefully to support comprehension development.</td>
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<tr>
<td>5. Establish an engaging and motivating context in which to teach reading comprehension.</td>
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Shanahan et al., 2010
“Is this strategy Instruction?”

What the panel refers to as “strategies” are not the same as comprehension skills typically listed in core reading programs, nor are they teaching activities.

**What a strategy Is:**

- Intentional mental actions during reading that improve reading comprehension.
- Deliberate efforts by a reader to better understand or remember what is being read.

**What a strategy Is not:**

- Instructional activities such as completing worksheets. Worksheets rarely include instruction in what students should do actively in their heads to improve comprehension.
- Exercises that are aimed at giving students practice with skills such as sequencing or drawing conclusions, but that lack explicit instruction in how to think in these ways during reading.

Shanahan et al., 2010
Teach Literal and Inferential Reading Comprehension Strategies . . . Explicitly!
Stages of Reading

1. Before Reading
   - ‘Gather Thoughts’
   - Activate Background Knowledge and Schemas
   - Develop Questions
   - Plan for Comprehension

2. During Reading
   - Elaboration in Working Memory
   - Visualize/Personalize
   - Talk to self about text!
   - Summarize on the fly
   - Hypothesize
   - Monitor Comprehension

3. After Reading
   - Consolidation/Organization
   - In Long-Term Memory
   - Summarize
   - Recall/Retell
   - Discuss
   - Apply
   - Change Schemas!

(Portions adapted from Daniels & Zemelman, 2004)
The ‘POSSE’
Reading Comprehension Strategy

Predicting ideas from prior knowledge
Organizing predictions based on forthcoming text structure
Searching for the main ideas
Summarizing the main ideas
Evaluate comprehension

(Mastropieri and Scruggs, 1997):
Reciprocal Teaching

Visualizing
Predicting
Summarizing
Clarifying
Questioning

Palincsar & Brown
Evidence-Based Comprehension Strategies (Grades 2 – 12)

#3. Visualizing/Imaging from Text

Shanahan et al., 2010

1. Explain to students that visualizing what is described in the text will help them remember what they read.
2. Have students examine objects placed in front of them, and later a picture depicting a scene. Remove the objects and picture, and ask students to visualize and describe what they saw.
3. Read a sentence and describe what you see to the students. Choose sections from the text and ask students to practice visualizing and discussing what they see.
1. Relate each strategy to a traffic sign; for example, a stop sign (stop reading and try to restate in your own words what is happening) or a U-Turn sign (re-read parts of the text that don’t make sense).

2. Write different reading comprehension strategies on cards with their signs, and have students work in pairs to apply the strategies to text they do not understand.
The Five Stages of the Writing Process

1. *Prewriting* (brainstorming, planning, sequencing/organizing, etc.)

2. *Drafting* (writing the initial draft)

3. *Revising* (content-oriented revision/correction)

4. *Editing* (proofreading and mechanical revision/correction)

5. *Publishing* (preparation of the final draft in its final form)
Funnel Theory of Executive Dysfunction
(Lynn Meltzer, 2007)

Academic **input** (skills and content from instruction and reading material)

Academic **output** (writing, projects, and other forms of production)
The enemy . . .
Writing, from a neurobehavioral perspective, is incredibly complex and hard!!

It involves the fluid and simultaneous (!!) coordination of the following core skill areas:

• word knowledge, retrieval, and sequencing
• working memory, sustained attention, planning, organization
• spelling, punctuation, and grammar
• visual/spatial functioning
• fine-motor/grapho-motor functioning
• higher order reasoning/cognition
Tick . . . Tick . . . Tick . . .

Time management weakness

AKA: “Limited temporal sense”

Difficulty gauging the amount of time it will take to complete a task

Difficulty gauging the passing of time.

The project is due tomorrow?!! I thought we had two weeks! It’s been two weeks?! No way!
Seeing molehills as mountains

Annoying, but doable . . .

Impossible!
Recursive Writing Cycle (With Developmentally Appropriate Levels of EF)

**Pre-Writing Phase**

*Adequate EF skill allows:*

- Task Analysis
- Schema/Prior Knowledge Activation
- Brainstorming
- Thought Sequencing/Organization
- Adequate writing confidence and motivation to engage in writing

**Revision/Editing Phase**

*Adequate EF skill allows:*

- Deep processing of one’s writing (such that content revision is possible)
- Awareness/recognition of one’s error patterns
- Careful scrutiny of written work and correction of all (or at least most) errors
- Persistence and motivation to continue

**Writing Phase**

*Adequate EF (particularly WM) skill and mechanical automaticity allows:*

- Fluent transfer of ideas to text
- Simultaneous processing of ideational and mechanical aspects of writing
- Revising and editing of text as it is produced (revising ‘on the fly’)
- Persistence and motivation to continue
Recursive Writing Cycle
(As Impacted by Executive Dysfunction)

Pre-Writing Phase

*EF weakness contributes to:*

- Poor task analysis (‘What are we supposed to again?’)
- Little to know brainstorming or thought organization (just jumps into writing, using ‘knowledge telling’ approach)
- Minimal writing confidence (desire to avoid writing)

Revision/Editing Phase

*EF weakness contributes to:*

- Superficial processing of one’s text
- Disregard of mechanical and content errors
- Very limited motivation to revise and extend writing
- Limited persistence/frustration tolerance (very limited willingness to revise/edit)

Writing Phase

*EF weakness land a lack of mechanical skill
Automaticity contribute to:*

- WM easily overloaded by simultaneous ideational and mechanical writing demands
- Minimal writing
- Writing that includes numerous content and/or mechanical errors
- Very limited ability to revise/edit ‘on the fly’
- Limited persistence and frustration tolerance (desire to be done as soon as possible)
Task Persistence and Frustration Tolerance

Essential EF’s related to the writing process!
Core Strategy Principle 1:

THE **EXPLICIT** TEACHING OF THE WRITING PROCESS IS GOOD.
Explicit Teacher Modeling and Gradual Release of Responsibility

- Teacher modeling of writing strategies in whole group settings makes the implicit explicit for all kids

- Best to also model likely problems/mistakes and ways to cope with them!!

- Gradual release (teacher models, small group practice, individual practice) can be very effective for kids with EF weakness
Essential EF Targeted Writing Strategies

1. Heavy, heavy, heavy (HEAVY!!) emphasis on pre-writing

2. These kids need a clear writing plan to follow (diminishes WM load)

3. Scaffolds for mechanical writing (sentence starters, cloze techniques, dictation)

4. Systematic editing systems/rubrics
Self-Regulated Writing Instruction (SRSD) (Graham & Harris)

1. Develop background knowledge (teacher)
2. Discuss the strategy (teacher)
3. Model the strategy (teacher)
4. Memorize the strategy (students)
5. Support the strategy (teacher)
6. Independent performance (students)
   (Harris et al., 2008)
Bashir and Singer’s EmPower approach

• Evaluate
• Make a Plan
• Organize
• Work
• Evaluate
• Rework
An essential EF-related writing fact:

Picking, deciding, choosing, and selecting are all executive skills!
Graphic Organizers:  
*A Double Edged Sword* . . .

- Great way to teach and build on concepts (story webs, story maps, Venn diagrams, etc.)
- But, they are often perceived by ADHD kids as “MORE WORK” (“I have to do that and then write?!”)
- If these are used, consider allowing kids to hand them in as a completed product or give them lots of support in their use
- For writing, **linear organizers** are best
Story Web Worksheet

Story Web Worksheet
courtesy of Learning with Mysteries
http://www.MysteryNet.com/learn/
Main characters

Problem of the story

A story event

A story event

How the problem is solved

The ending

Setting
P.O.W. (Graham & Harris)

• Pick my idea

• Organize my thoughts
  1. _________
  2. _________
  3. _________

• Write and say more
STAR Organizer Strategy (Kaufman’s adaptation . .)

1. Who?
2. What?
3. Why?
4. How?
5. Where?
6. When?

Main Idea

1. How does story start?
2. What happens next?
3. Then what happens?
4. Then what happens?
5. Then what happens?
6. How does story end?
Defeating the dreaded ‘blank page’ phenomenon: Providing kids with specific prompts/sentence starters

Original assignment:

Pick your favorite fairy tale and develop a ‘fractured’ version of it. Make sure you also make at least three illustrations and show in your writing how the main characters resolve an essential conflict.

Modified assignment:

List the five main characters in Cinderella

Where does the story take place?

What was Cinderella’s main problem? What was she doing to cope with it?

What might be some funny ways to change the story?

How would one of those changes change the ending?
The Story Grammar Marker®

MAIN CHARACTER:
Who or What is the story about?

SETTING:
Where and When does the story take place?

INITIATING EVENT (kick-off):
What happened to the character to cause him/her/it to do something?
(If it was a ho-hum day until...

INTERNAL RESPONSE (response to the kick-off):
How did the character feel about what happened?

PLAN:
What does the character want to do? Why will he/she/it choose this plan? Think about the kick-off and internal response.

ATTEMPT:
What action does the character take to achieve the plan?

ATTEMPT:

ATTEMPT:

ATTEMPT:

OBSTACLE:
Is there a complication to the plan? If yes, this becomes a new kick-off, creating an embedded episode.

DIRECT CONSEQUENCE:
What happened as a result of the attempts/actions?

RESOLUTION:
How does the character feel about the direct consequence? Is there a lesson learned or a moral to the story?

FEELING WORDS:
Happy
Proud
Angry
Brave
Sad

PLANNING WORDS:
Want
Decide
Desire
Need

THINKING VERBS:
Think
Remember
Know

COHESIVE TIES:
And
Because
But
So
Or
Q & A . .
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