The Science of Reading:
Evidence-based Reading Instruction for Students with Dyslexia

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Colorado Reading Forum
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Our Mission is to
EMPOWER TEACHERS
to ensure that every child learns
to read by third grade.

Our model is research based.
Our approach is values driven.

Most Children in Our Country
Read Below Grade Level

64% of the Nation's 4th graders read below grade level.

Yet 95% of ALL children can learn to read! (Torgesen, 2004)

http://nces.ed.gov/nationsreportcard/naepdata/
Literacy How, Inc.

**Colorado and National NAEP 4th Gr Trend Scores**


- 40% (CO) vs. 36% (US) of our students are reading on grade level

**2017 Reading State Snapshot Report**

**Achievement-Level Percentages and Average Score Results**

- 40% (CO) vs. 36% (US) of our students are reading on grade level

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**Early Intervention is Clearly Effective**

- Prevention studies commonly show that 70-90% of at-risk children (bottom 20%) in K-2 can learn to read in average range. Prevent automaticity problems.

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**Why Focus on Prevention & Early Intervention?**

- 88% of students reading poorly at the end of first grade will read poorly at the end of the fourth grade.
- Unless effective reading instruction is provided, students reading poorly at the end of the fourth grade will have reading difficulties for the rest of their lives!
- Effective prevention programs demand shared responsibility and a common language.
- Teachers need to learn the science of teaching reading to ensure that all children learn to read to succeed in school and in life!
Today's Learning Objectives

1. To present the science of the reading brain
2. To explain evidence-based instruction for all students, including those with dyslexia
3. To define and describe the core components of comprehensive literacy (phonemic awareness, phonics (decoding and encoding/spelling), reading fluency, vocabulary, text comprehension (syntax too!) and written expression (and dispel a few myths))

THE NEUROBIOLOGY OF READING

The Science of Teaching Reading

Reading is complex!! Teaching reading successfully requires a teacher who understands the reading process, assessment, and different forms of instruction to ensure that instruction is comprehensive and successful.

Teachers must know which programs are based upon solid evidence-based principles and are effective, and which programs are based on (incorrect) beliefs, philosophies, anecdotes, and untested assumptions.

One rule of thumb is that ‘the more difficulties kids are having with learning to read, the more systematic and direct the instruction must be.’

Reid Lyon, 2008

The First Literacy How Reading Wheel


5 Big Ideas:
- Phonemic Awareness
- Phonics
- Fluency
- Vocabulary
- Comprehension
Myth: Reading is Natural

“Reading print is as natural as reading faces. Learning to read should be as natural as any other comprehensible aspect of existence.”

Frank Smith, 2003

Corollary to this: If you can read, you can teach someone to read.

Reality

Learning to read is NOT natural. Our brains are wired for oral language but reading is a relatively new cultural invention. Therefore, children must be taught explicitly and systematically to apply the code -- not in a kill and drill mentality that may have been applied in olden days, but in an interactive, developmentally-appropriate, and engaging manner.

The Reading Brain

“Each new reader comes to reading with a 'fresh' brain -- one that is programmed to speak, see, and think, but not read. Reading requires the brain to rearrange its original parts to learn something new.”

(Maryanne Wolf)

“Teaching reading is rocket science.”

(Louisa Moats)

All students need to know the structure of English -- that is, our language is based on an alphabet (phonemic) and meaning (morpho). English is morphophonemic. Example: health is pronounced /h/ /e/ /l/ /th/ but is spelled with an ea because it has the root heal in it.

Early Brain Development: Everything Matters!

- Visual and auditory development
- Cognitive development
- Language development
- Social development
- Emotional development

Maryanne Wolf, 2009
Areas of the Brain Used for Reading

- Sound-symbol Connection
- Phonological Processing
- Letter Recognition (orthographic processing)
- Phoneme processing [S/S]
- Parieto-temporal
- Interior frontal gyrus
- Visual Word – Fluent Orthographic memory
- Occipito-temporal

Neurobiology of Dyslexia

Typical Readers

Dyslexic Readers

Dyslexia

- Is a language-based problem
- Does not mean seeing things backwards
- Exists across all levels of intelligence
- Is not caused by a lack of motivation
- Occurs at all socioeconomic levels
- Occurs slightly more often in boys than in girls
- May develop even with good classroom instruction
- Often occurs with other disorders

Moats and Dakin, 2008

White Matter Pathways

- Aruate fasciculus
- Superior longitudinal fasciculus
- Inferior fronto-occipital fasciculus
- Inferior longitudinal fasciculus
The Simple View of Reading

(Gough & Tunmer, 1986)

At Risk Reader

Left Hemisphere Right Hemisphere

Kindergarten

1st Grade

Simos et al.

The Simple View of Reading (D x LC = RC)

© Literacy How, 2018

Simos et al.

Mixed Reading Disability (weak phonological processing and comprehension-related issues)

Specific Comprehension Deficit (weak vocab, morphology, syntax, discourse-level processing & comp strategies)

Phonological Skills

Poor Comprehension

Nonphonological Language Skills

Good Comprehension

Dyslexic/RD (phonological processing problems - including difficulties with decoding and encoding)

Skilled readers

SIMPLE VIEW OF READING

3 = DECODING

2 = PHONEMIC AWARENESS

1 = WORD RECOGNITION

Source: Neuman, Susan B. and Dickinson, David K., “Handbook of Early Literacy Research” Adapted from the work of Hollis Scarborough, 2001
Important Research Findings

3. Dyslexia occurs as part of a natural, unbroken continuum of ability--what causes good reading also causes poor reading (Shaywitz et al., 1992).

We only need one theory to explain success and failure in reading.

Students with Reading Difficulties: A Continuum of Severity …

...that requires a continuum of instruction

...and increasing amounts of teacher knowledge and expertise

WHAT IS EVIDENCE-BASED INSTRUCTION?

Research-based vs. Evidence-based

Research-based means that the program or instructional approach is based on what research has demonstrated that works.

If we want to know if that program/approach is effective, evidence must be gathered using that specific program/approach. If that evidence shows that the program/approach is effective, then we can call that practice evidence-based.

The Voice of Evidence, McCurle and Chhabra, 2004
What does evidence-based mean?

An intervention that is supported by evidence from well-conducted research studies (4 criteria):

- Uses a sound design (comparison group)
- Based on high quality data analysis
- Peer-reviewed (other researchers review the study)
- Converging evidence (these findings are consistent with other studies)

According to ESEA, and amended by ESSA, it is an intervention, tool, or practice that meets one of the following 4 evidence levels

Reading Intervention

- Instructional approaches and programs designed to either prevent or remediate persistent reading difficulties
- Prevention programs focus on at risk children with limited amounts of crucial reading-related knowledge, skills and experience at school entry.
- Remedial programs target students who are failing to make adequate progress in learning to read.

Tunmer, 2008  

What is intensive intervention?

Intensive intervention is designed to address severe and persistent learning or behavior difficulties. Intensive interventions should be:

(a) Driven by data
(b) Characterized by increased intensity (e.g., smaller group, expanded time) and individualization of academic instruction and/or behavioral supports

http://www.intensiveintervention.org
Differentiate: One Size Does Not Fit All

Three profiles of students who struggle:

1. **Students with phonologically-based reading difficulties** who need to focus on accurate and automatic word recognition (i.e. dyslexia)

2. Students with language comprehension-based reading difficulties who need to focus on oral language and vocabulary.

3. Students who have difficulties with both word recognition and language comprehension

Each profile may have different causes (e.g., LD/dyslexia, inadequate instruction, limited exposure to English language and literacy). *The Power of RTI and Reading Profiles* (2014), Spear-Swerling
Standard Treatment Protocol

- A single, consistent intervention is used
- This ensures accurate implementation – that is, treatment fidelity.
- The interventionists must receive comprehensive training.
- ‘They also need to receive ongoing support and professional development while delivering the standard treatment protocol procedures to ensure that the intervention is delivered correctly.’

Key Questions About the Secondary Intervention

- Has the student been taught using an evidence-based secondary intervention program (if available) that is appropriate for his or her needs?
- Has the program been implemented with fidelity?
  - Content
  - Dosage/schedule
  - Group size
- Has the program been implemented for a sufficient amount of time to determine response?

http://www.intensiveintervention.org

Problem-Solving Approach

The student intervention teams meet to discuss what will work best for the individual student. This team will use a menu of intervention options that begins with assessment data that is diagnostic in nature so that the student will receive an intervention that is matched to his/her profile and academic needs.

‘... the quality of the instruction depends on the skills, knowledge, and training of the team personnel who plan each individualized program.’
http://iris.peabody.vanderbilt.edu/module/RTI01-overview/cresource/q2/p05/

Establish a Menu of Interventions (an EXAMPLE)

<table>
<thead>
<tr>
<th>Phonemic Awareness</th>
<th>Phonics</th>
<th>Fluency</th>
<th>Vocabulary</th>
<th>Text Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road to the Code</td>
<td>Guided reading w/ decodable text</td>
<td>Repeated Reading</td>
<td>Intentional word selection</td>
<td>Text Structure SGM/Braidy</td>
</tr>
<tr>
<td>Say It and Move It</td>
<td>Lexia</td>
<td>Words and Phrases</td>
<td>Word Heroes</td>
<td>Questioning the Author</td>
</tr>
<tr>
<td>Phoneme Grapheme Mapping</td>
<td>Phoneme Grapheme Mapping</td>
<td>RAVE-O</td>
<td>Lexia</td>
<td>Reciprocal Teaching (Strategies)</td>
</tr>
<tr>
<td>LIPS</td>
<td>Word Sorts</td>
<td>Read Naturally</td>
<td>Word Gen</td>
<td>Making Meaning</td>
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<tr>
<td>Wilson</td>
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</tbody>
</table>
Structured Literacy Instruction Includes Two Important Components

- Elements of language are taught to address the language basis of the LD/RD—for example, sounds and symbols, meaning (semantics), and sentence structure (syntax).
- Principles of instruction that guide how the elements are taught (for example, explicit, cumulative, and diagnostic teaching).

Structured Literacy Instruction

- Elements of language
- Principles of instruction

http://dyslexiaida.org/effective-reading-instruction/

Principles of Structured Literacy

![Diagram showing the components of structured literacy]

- Explicit: Deliberate teaching of all concepts with continuous student-teacher interaction
- Systematic: Material follows the logical order of the language from easier to more difficult and each skill/step requires mastery before moving on
- Cumulative: Each step is based on previously learned concepts
- Diagnostic: Instruction is individualized based on formal and informal data including observation of reading behaviors
- Prescriptive: Scaffolds used to manage the level of difficulty and corrective feedback is given so students know how monitor their reading errors
Present Information Using More Than One Modality

- Speak and write/draw/project information as you present it.
- Repeat important instructions, key words, etc.
- Model procedures to provide students with a visual image of the steps.
- Teach students to visualize information in text, including stories, word problems, etc.

Elements of Structured Literacy

- Phonology: say bloom. Now say it again, but don’t say /m/….don’t say /l/.
- Sound-Symbol: How many sounds in the following word? How many letters represent those sounds?
- Syllables: literacy
- Morphology: intro spect ive
- Semantics: Here are tips that safety experts say could help you survive some tight spots.
- Syntax: The dog who ran to the kitchen door and who barked furiously at the cat had thick dark brown fur.

Structured Literacy Interventions

These interventions use an approach that includes several important characteristics:

- Data-driven
- Diagnostic and prescriptive
- Explicit and direct
- Language-based
- Multisensory with immediate corrective feedback
- Sequential and cumulative
- Systematic
### 4 Types of Assessments

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION/USE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome (Summative)</td>
<td>Evaluate success of a program or a school based on student performance after instruction is completed (standardized).</td>
<td>“Reaching our goals”</td>
</tr>
<tr>
<td>Universal Screening (Formative) Formal</td>
<td>Identify students who need more intense assessment to determine the potential for intervention. External benchmarks or norms are used.</td>
<td>“First Alert”</td>
</tr>
<tr>
<td>Progress Monitoring (Formative) Formal</td>
<td>Determine student progress over time as compared to a validated trajectory and to plan differentiated instruction.</td>
<td>“Growth Charts”</td>
</tr>
<tr>
<td>Diagnostic (Formative) Formal or informal</td>
<td>Understand student performance in authentic context, especially to inform instruction and intervention strategies. These are most closely aligned with instruction.</td>
<td>“In-depth View”</td>
</tr>
</tbody>
</table>

### Complex Therapies in Reading and Dyslexia

Effects stronger if interventions are:

- more explicit
- increase time on task (i.e., supplement, not supplant; Vaughn)
- reduce size of instructional group (small group, not 1:1; Vaughn)
- More comprehensive (multi-component; Mathes, Denton) and include self-regulation component
- differentiate according to instructional needs in the domain of interest (Connor)
- Teach in the context of academic content

### Some General Remedial Principles

- Remedial interventions must increase intensity and differentiation, so the first steps are to increase time on task, reduce the size of the instructional group, and differentiate
- Whenever possible, interventions should supplement, not supplant
- No intervention is effective if it does not involve the academic skill itself (must read, do math, and write)
- The longer intervention is delayed, the slower the response (on average) and the greater the need for intensity
- Intervention always begins in the general education classroom
- Effective interventions include a self-regulation component
- Progress must be assessed at all levels

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1. Phonemic Awareness

Phonemic awareness is an awareness of and the ability to manipulate the individual sounds (phonemes) in spoken words.

All students benefit from explicit instruction in phonemic awareness, segmenting and blending the sounds in words.
**Phonological Awareness** develops sequentially, so we begin where the student is in that progression.

**Sound Articulation**

- Should be clear and precise
- Consonants should be pure sounds without an added vowel or /uh/

Practice: Segment the sounds in *crest*

\[ /k/ /r/ /e/ /s/ /t/ \]  
\[ /kuh//ruh//e//suh//tuh/ = ču rů esů tuč \]

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**The Alphabetic Principle**

- Chinese writing (logographic) vs. alphabetic writing
- We don’t write words! We write sequences of phonemes in spoken words.
- Poor access to the phonemes makes reading alphabetic languages very difficult.
- Phoneme skills are needed for BOTH sounding out new words AND remembering the words we read.
- Orthographic processing involves unlocking language from vision which is ALSO needed to read words.

David Kilpatrick, 2018
**Grapheme = Letter(s)**

- symbols of the writing system
- one or more letters that represent one speech sound or phoneme
- categorized as **consonants** and **vowels**

**2. Phonics**

Phonics is the study and use of sound/spelling correspondences and syllable patterns to help students read written words.

**Myth: Phonics**

The English language is so irregular and inconsistent in its spellings, it is unnecessary to teach children the letter-sound correspondences that form the basis of phonics instruction - and it is a waste of time to teach the rules of the language.

**Reality**

Teaching Phonics or “The Code”

- Reading or “Decoding” is applying sound-symbol associations and blending sounds together.
- Begin with VC words (most transparent pattern)
- Spelling or “Encoding” is segmenting words by sounds and applying sound-symbol correspondences (upper levels apply spelling patterns and rules).
- Reading and spelling are reciprocal skills.

Orthographic Mapping

The process readers use to store written words for immediate, effortless retrieval. It is the means by which readers turn unfamiliar written words into familiar, instantaneously accessible sight words.

This explains how readers build a sight vocabulary.

David A. Kilpatrick, 2015

What is a Sight Word

- A word that is recognized instantly regardless of whether or not it is phonetically regular or irregular. It is known as a familiar word rather than an unfamiliar word.
- An unfamiliar ‘sight word’ is one that children either try to sound out or guess.
- A sight vocabulary is a pool of words that an individual can instantly and effortlessly recognize.

David A. Kilpatrick, 2015
Syllable Instruction

- Concept of a syllable – one vowel sound
- Six basic syllable types
- Key to determining the sound of the vowel in each syllable
- Syllable division rules support multisyllabic reading accuracy and automaticity.

### The Six Syllable Patterns

<table>
<thead>
<tr>
<th>Syllable type</th>
<th>Pattern</th>
<th>Vowel sound</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>VC, CVC</td>
<td>Short vowel</td>
<td>at, Ed, it, on, up; cap, bit, pet, tol, cut</td>
</tr>
<tr>
<td>Open</td>
<td>CV</td>
<td>Long vowel</td>
<td>be, I, my</td>
</tr>
<tr>
<td>Silent e</td>
<td>VCe</td>
<td>Long vowel</td>
<td>cape, bite, Pete, tote, cute</td>
</tr>
<tr>
<td>Vowel teams</td>
<td>W</td>
<td>Long vowel</td>
<td>cape, bite, Pete, tote, cute</td>
</tr>
<tr>
<td>Talker pattern</td>
<td>Vw</td>
<td>Vowel sound is neither long nor short but a different sound called a diphthong</td>
<td>rain, boat, free</td>
</tr>
<tr>
<td>Whiner pattern</td>
<td>Wv</td>
<td>Vowel sound is neither long nor short but is influenced by r that follows the vowel letter</td>
<td>far, for, her, fir, fur</td>
</tr>
<tr>
<td>R-controlled</td>
<td>Wr</td>
<td>Vowel sound is neither long nor short but is influenced by r that follows the vowel letter</td>
<td>rain, boat, free</td>
</tr>
<tr>
<td>Consonant-le</td>
<td>C-le</td>
<td>Vowel sound is schwa</td>
<td>candle, table, gurgle</td>
</tr>
</tbody>
</table>

Effective Intervention

- Teach phonological awareness and phonic EXPLICITLY with an approach that includes comprehension and fluency components (NRP about explicitness, not phonics)
- Prevent word recognition problems because remediation is difficult and requires considerable intensity, especially for automaticity
- Older students and adults can be taught word recognition if the approach is sufficiently intense. Fluency more difficult.
- No “dyslexia specificity” of appropriate interventions. Traditional service delivery models ineffective

Proactive Intervention (Mathes, Torgesen)

- Explicit instruction in synthetic phonics, with emphasis on fluency.
- Integrates decoding, fluency, and comprehension strategies.
- 100% decodable text
- Carefully constructed scope and sequence designed to prevent possible confusions.
- Every activity taught to 100% mastery everyday.
3. Vocabulary

Vocabulary refers to the body of words and their meanings that students must understand to comprehend text.

Comprehension Depends on Knowing Word Meanings

- Vocabulary knowledge is strongly related to overall reading comprehension.
- If a word is decoded and pronounced but the meaning is not recognized, comprehension will be impaired.
- Knowledge of a word’s meaning also facilitates accurate word recognition.

Principles of Effective Vocabulary Instruction

- Present word(s) using child-friendly definitions.
- Draw attention to orthographic (spelling) and phonological (sound) representation.
- Engage students in repeated use of word(s) in different contexts.
- Teach words in categories.
- Make the word meaning visual.
Brick and Mortar Words

(Dutro and Moran, 2003)

Specialized Academic Vocabulary: Bricks
Content Specific/ Technological Words
democracy, mammal, numerator

General Academic Vocabulary: Mortar
Utility words to hold bricks together
evidence, nevertheless, consequently, dependent

Brick Words

<table>
<thead>
<tr>
<th>Content (Brick) Words</th>
<th>Morphological Elements</th>
<th>Word Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>hat (animal, outdoor equipment)</td>
<td>hat, bats</td>
<td>hat, mammal, habitat, sound</td>
</tr>
<tr>
<td>season (time of year, flavoring for food)</td>
<td>seasons, seasoning, seasoned, season</td>
<td>season, climate, weather, environment, temperature, geography</td>
</tr>
<tr>
<td>blue (a color, a feeling of dejection) and as part of a common phrase or idiom (e.g., out of the blue, meaning suddenly)</td>
<td>seasonal (-all), batty (-y), unlock (un-), reread (re-), bluish (-ish)</td>
<td>evacuate, -ed, -ion for evaporates, evaporated, and evaporation</td>
</tr>
</tbody>
</table>

English Orthography: 3 layers

- **Meaning Layer**: Spelling relates letters and letter patterns to units of meaning.
- **Pattern Layer**: Letters combine to form patterns within syllables, and there are also patterns that occur where syllables meet within a word.
- **Alphabetic Layer**: Letters can be matched to sounds and written in left-to-right sequence.

4. Morphology

**morpho = form -logy = to study**

Morphology: The study of meaningful units of language and how those units are combined in words

**Morpheme**: A morpheme is the smallest meaningful unit or form in a language.

The goal of morphology instruction is to improve word identification, spelling, and vocabulary.
5. Fluency

Reading fluency refers to reading text with sufficient speed, accuracy and expression to support comprehension. **Myth:** Fluent readers skim words as they read, predicting what will come next based on the context of the passage.

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<table>
<thead>
<tr>
<th>Language of Origin</th>
<th>Features of Words</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglo-Saxon (Old English)</td>
<td>short, 1-syllable; common words; irregular spellings</td>
<td>sky, earth, moon, sun, water, sheep, dog, hen, horse, cow, fish</td>
</tr>
<tr>
<td>Norman French</td>
<td>soft c and g; special endings; words for food, fashion</td>
<td>amuse, cousin, cuisine, country, peace, triage, rouge, baguette, unique</td>
</tr>
<tr>
<td>Latin / Romance</td>
<td>multi-syllable words with prefixes, roots, suffixes; content words</td>
<td>firmament, terrestrial, solar, stellar, equine, aquarium, mammal</td>
</tr>
<tr>
<td>Greek</td>
<td>combinations of forms; science and math terminology</td>
<td>hypnosis, agnostic, neuropsychology, decathlon, chemistry</td>
</tr>
</tbody>
</table>

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**Reality**

- Good readers read every word and can recognize a word both in and out of context.
- Fluent readers decode every word automatically and monitor comprehension.
- Unskilled readers with weak decoding skills over-rely on context.
Fluency is the bridge between the ability to identify words and the ability to comprehend text.

Adapted from Pikulski & Chard (2005)

**What It Takes to Be a Fluent Reader**

- Accuracy (know the spelling patterns)
- Automaticity (recognize and apply the patterns in words instantly – i.e., less than one second)
- Phrasing (group the words in grammatical entities – i.e., elaborated noun phrases, prepositional phrases, verb + adverb phrases)
- Intonation (read it as though you’re telling someone a story or conveying information)

*A gigantic oak tree in my back yard was covered with acorns throughout the fall.*

**Dyslexia and Fluency**

**What To Do**

- Develop accurate reading using decodable text.
- Use repeated reading to develop prosody.
- Understand that oral reading is difficult for most students.

**What Not To Do**

- Promote memorization of sight words.
- Emphasize speed.
- Use the 3 Cueing System model.
- Drill and kill.

**Naming Speed = Slow Word Perception**

Marcia Denckla, PhD

*Slow Visual – Verbal Highway*

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Double Deficit Hypothesis

- Deficit in phonemic awareness
- Deficit in automatic retrieval of sounds and words, called rapid automatic naming

Maryanne Wolf

Oral Reading Fluency Norms

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentile</th>
<th>Fall WCPM*</th>
<th>Winter WCPM*</th>
<th>Spring WCPM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90</td>
<td>97</td>
<td>116</td>
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<td>75</td>
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<td>10</td>
<td>40</td>
<td>62</td>
<td>83</td>
</tr>
</tbody>
</table>

Syntax

- Sentence structure: words, phrases and clauses (independent and dependent)
- The set of principles that dictate the sequence and function of words in a sentence in order to convey meaning
- Includes grammar, sentence variation, and mechanics of language

“If a reader can not derive meaning from individual sentences that make up a text, that is going to be a major obstacle in text-level comprehension.”

Scott, 2009
8 Grammatical Building Blocks

- Each “block” serves a specific, meaning-based function.
- Together, they provide the basis for all of the syntactic structures in English.

7. Text Comprehension

Text comprehension, the ability to make meaning, is the ultimate goal of reading. It requires specific skills and strategies, vocabulary, background knowledge and verbal reasoning skills (Hollis Scarborough’s Braid).

Skilled Comprehenders …

- understand words and integrate their meaning into a mental model of the text (Perfetti, Stafura, and Adolf, 2013).
- attend to the content, shift their attention to what is important, connect what they are reading to related content from text or background ... striving for coherence (Beck & McKeown, 2006)
- use their knowledge of the subject to facilitate comprehension.
- observe a comprehension process rather than a product.

8. Written Expression: A Complex Process

Writing requires the simultaneous and sequential integration of many subprocesses:
- Lower-level skills
  - Handwriting (gross and fine motor)
  - Spelling
- Higher-level (language and higher order cognition)
  - Sentence structure
  - Text structure (narrative vs. expository)
  - Ideation
  - Vocabulary
- Executive Functions (i.e., attention, organization, working memory, self-monitoring)
**The Writing Process (Executive Function)**

- Planning/Organizing
- Drafting
- Revising
- Editing
- Publishing/Presenting

**Self-regulation**

**Translation**

- Text Generation
- Discourse Level
- Sentence Level
- Word Level
- Writing Conventions

**Technology: The Great Equalizer**

- CAST is an educational research & development organization that works to expand learning opportunities for all individuals through Universal Design for Learning (UDL). [www.cast.org](http://www.cast.org)
- Bookshare provides a free library of over 475,000 titles ([www.bookshare.org](http://www.bookshare.org))
- Learning Ally (Reading for the Blind and Dyslexia) provides audiobooks and textbooks to students with LD ([www.learningally.org](http://www.learningally.org))
- [http://readeasy.si.edu/](http://readeasy.si.edu/)

**Building a Biliterate Brain**

- The future of the reading circuit will require the limits and possibilities of the literacy-based circuit and the digital-based ones.
- Young readers need to be expert, flexible ‘code switchers’ between print and digital mediums.
- Children should learn the rules, characteristics, and purposes of each medium.

  *Maryanne Wolf, Reader Come Home*

**How do we teach teachers the core components of comprehensive literacy?**

**One teacher at a time …. Through embedded PD**
Expert Teaching is the Treatment

“One of the most important conclusions from research is that for children with learning problems, learning is hard work. A corollary to this finding is that for their teachers, instruction is very hard work and requires an enormous amount of training and support. Children who have difficulty learning to read or completing mathematics problems will likely not benefit from ‘more of the same’ but require an alternative method of teaching to assist their learning.”

Semrud-Clikeman, 2005

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Thank You!
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STRANDS OF EARLY LITERACY DEVELOPMENT

LANGUAGE COMPREHENSION (LC)

BACKGROUND KNOWLEDGE
(facts, concepts, etc.)

VOCABULARY
(breadth, precision, etc.)

LANGUAGE STRUCTURES
(syntax, semantics, etc.)

VERBAL REASONING
(inference, metaphor, etc.)

LITERACY KNOWLEDGE
(print concepts, genres, etc.)

SKILLED READING:
Fluent execution and coordination of word recognition and text comprehension.

WORD RECOGNITION (WR)

PHONOLOGICAL AWARENESS
(syllables, phonemes, etc.)

DECODING (alphabetic principle,
spelling-sound correspondences)

SIGHT RECOGNITION
(of familiar words)

Birth - K 1 2 3 4 5 6 7 8

Source: Neuman, Susan B. and Dickinson, David K., “Handbook of Early Literacy Research” Adapted from the work of Hollis Scarborough, 2001