The Messiness of LD Identification
Implications for Educators

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Presenters
Eric

- Is a smart kid but academic performance doesn’t match ability
- Guesses at unfamiliar words.
- Spelling errors.
- Can’t put ideas down on paper.
- Can’t recall math facts

Prevalence – 5-15% of school-age children (DSM-5, 2013)
LDAC’s Official Definition of LD

- Refers to a number of disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information.
- Affect learning in individuals who otherwise demonstrate at least average abilities essential for thinking and/or reasoning. As such, learning disabilities are distinct from global intellectual deficiency.
- Are lifelong.

Range in severity
May interfere with the acquisition and use of:
- Oral language
- Reading
- Written language,
- Mathematics,
- Organizational skills
- Social perception
- Social interaction
- Perspective taking
Dr. Samuel A. Kirk (1904-1996)

- Father of Special Education
- 1963 - Coined term “learning disabilities”
- 1964 – Instrumental in Administration and Congress’ decision to provide financing to train teachers to provide expert help to children with LD

History of LD

1800s to mid-1900s
- 1877 – Adolf Kussmaul (German neurologist) coins term “word blindness”
- 1877 – Rudolf Berlin (German physician) uses term “dyslexia”

1960s and 1970s
- 1963 – Samuel A. Kirk (Chicago psychologist & educator) first to use term “learning disability” at an education conference
- 1968 – The Alberta Association for Children with Learning Disabilities (now LDAA) incorporated

1980s and 1990s
- 1966 The National Institute of Mental Health team identifies regions of the brain that work differently in people who have dyslexia.
- 1966 LD Online launches as first web resource for parents and teachers.

2000 to Present Day
- 2005 Yale University team identifies a gene associated with dyslexia
- 2013 The DSM-5 Broadens its definition of term “specific learning disorder”
### History of LD

<table>
<thead>
<tr>
<th>Rank</th>
<th>Order</th>
<th>Keyword</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>Children</td>
</tr>
<tr>
<td>2</td>
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<td>School Psychology</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Students</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Intervention</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Behavior</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Adolescent</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Achievement</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>Adjustment</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Mental Health</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>Outcomes</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>Learning Disabilities</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>Issues</td>
</tr>
</tbody>
</table>

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### The Messiness of LD Identification

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Multiple Approaches to “Identifying” LD

Diagnostic / Classification Systems

“Operational” Definitions

Diagnostic Methods

Educational Policies and Guidelines

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Diagnostic and Statistical Manual of Mental Disorders (DSM-5)

- DSM-III (1980)
  - Specific Developmental Disorders (Developmental Reading Disorder and Developmental Arithmetic Disorder)

- DSM-IV (1994)
  - Learning Disorder

- DSM-5 (2013)
  - Specific Learning Disorder
  - Substantial changes in LD identification criteria
  - Viewed as more aligned with contemporary views

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LDAC Operational Definition

- Viewed as “national definition”
  - Ratified by LDAC membership from every province/territory
  - Heavily influence on education policy (Kosey & Siegel, 2008)

- Development:
  - Originated with work of a panel of Canadian experts (1996)
  - Heavily influenced by the existing Learning Disabilities Association of Ontario (LDAO, 2001) definition
  - Ratified in 2002; Re-endorsed in 2015

- Definition, with loosely outlined

AB Education Special Education Coding Criteria

- Criteria set by AB Education to identify students (ECS-12) who require additional supports in their educational program
- Target Audience: teachers and administrators in school authorities
- Code 54: Learning Disability
- Not diagnostic criteria, but funding/administrative mechanism.
Framework to identify a processing deficit as related to a corresponding achievement deficit, while both are not related to cognitive strengths (Hale & Fiorello, 2004; Hale et al., 2010).

**Average Performers (68%)**

- Poor Performers (18%)
- High Performers (16%)

**Standard Score**

- No LD
- MD-AP
- MD-Calc
- MD-MF

**WJ-III Ach Subtest**

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## Differences Between Approaches

<table>
<thead>
<tr>
<th>Criteria</th>
<th>LDAC</th>
<th>DSM-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Specific Learning Disorders</td>
<td>Learning Disabilities</td>
</tr>
<tr>
<td>Intellectual Functioning</td>
<td>FSIQ ≥ SS 85</td>
<td>FSIQ ≥ SS 70</td>
</tr>
<tr>
<td>Math Achievement</td>
<td>Composite/subtest ≥ 15 points (1 SD) below measure of intellectual functioning</td>
<td>Composite/subtest ≤ SS 78</td>
</tr>
<tr>
<td>Processing Deficit</td>
<td>≥ 1 SD below measure of intellectual functioning (e.g., working memory, perceptual reasoning, processing speed)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

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## Multiple Approaches to “Identifying” LD
Considerable research support LD identification as method contingent (Maki, Floyd, Roberson, 2015)

- *Who* receives a diagnosis depends on the identification method employed

- As such, the various diagnostic approaches are not interchangeable (Proctor & Prevatt, 2003)
Borderline Intellectual functioning vs. SLD

<table>
<thead>
<tr>
<th>Standard Score</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-110</td>
<td>Average</td>
</tr>
<tr>
<td>70-89</td>
<td>Below Average</td>
</tr>
</tbody>
</table>

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Indices of FSIQ

- Visual Spatial processing
- Working memory
- Nonverbal reasoning
- Verbal reasoning

Full Scale IQ

Processing Speed

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SLD Identification

<table>
<thead>
<tr>
<th>Area</th>
<th>LDAC</th>
<th>DSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSIQ</td>
<td>&gt; 85</td>
<td>&gt; 70</td>
</tr>
<tr>
<td>Academic score</td>
<td>&gt; 15 below FSIQ</td>
<td>&gt; 78</td>
</tr>
<tr>
<td>Processing weakness (i.e., Index)</td>
<td>Index &gt; 15 below FSIQ</td>
<td>n/a</td>
</tr>
</tbody>
</table>

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Typical SLD profile

Student: Lisa

Comparison

<table>
<thead>
<tr>
<th>Lisa’s Scores</th>
<th>LDAC</th>
<th>DSM-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSIQ = 95</td>
<td>FSIQ &gt; 85</td>
<td>FSIQ &gt; 70</td>
</tr>
<tr>
<td>Reading = 77</td>
<td>Academic score 15 points or more below the FSIQ</td>
<td>Academic score &lt; 78</td>
</tr>
<tr>
<td>Working memory = 75</td>
<td>Index score 15 points or more below the FSIQ</td>
<td>n/a</td>
</tr>
<tr>
<td>Diagnostic Conclusion</td>
<td>Meets criteria for SLD</td>
<td>Meets criteria for SLD</td>
</tr>
</tbody>
</table>
Example: Eric

<table>
<thead>
<tr>
<th>Verbal</th>
<th>Nonverbal</th>
<th>Visual Spatial</th>
<th>Working Memory</th>
<th>Processing Speed</th>
<th>Full-Scale IQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>100</td>
<td>93</td>
<td>86</td>
<td>89</td>
<td>82</td>
</tr>
</tbody>
</table>

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Comparison

<table>
<thead>
<tr>
<th>Eric's Scores</th>
<th>LDAC</th>
<th>DSM-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSIQ = 82</td>
<td>FSIQ &gt; 85</td>
<td>FSIQ &gt; 70</td>
</tr>
<tr>
<td>Reading = 77</td>
<td>Academic score 15 points or more below the FSIQ</td>
<td>Academic score &lt; 78</td>
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<tr>
<td>Verbal Comprehension = 81</td>
<td>Index score 15 points or more below the FSIQ</td>
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<tr>
<td>Diagnostic Conclusion</td>
<td>Does not meet criteria for SLD</td>
<td>Meets criteria for SLD</td>
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</table>

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Jeanie


Comparison using DSM-5

<table>
<thead>
<tr>
<th>DSM-5 criteria</th>
<th>Eric</th>
<th>Jeanie</th>
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</thead>
<tbody>
<tr>
<td>FSIQ &gt; 70</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>Academic score &lt; 78</td>
<td>Reading = 77</td>
<td>Reading = 77</td>
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<tr>
<td>Meets criteria for SLD</td>
<td>Yes ✓</td>
<td>Yes ✓</td>
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</table>

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Both profiles

<table>
<thead>
<tr>
<th>Score</th>
<th>Eric</th>
<th>Jeanie</th>
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<tbody>
<tr>
<td>Verbal</td>
<td>85</td>
<td>81</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>85</td>
<td>83</td>
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<tr>
<td>Visual Spatial</td>
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<td>86</td>
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<tr>
<td>Working Memory</td>
<td>89</td>
<td>80</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

Cornoldi et al., 2014

Daily functioning

**Borderline IF**
- Early developmental delays (language, motor)
- Weaker adaptive functioning
- Weak higher order thinking (conceptual)

**Specific Learning Disability**
- Typical adaptive functioning in most areas
- Specific learning problem – cognitive processing weakness

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Long-term outcomes

**BIF**
- Unskilled or semiskilled jobs
- Incarceration
- Mental health problems
- Not eligible for services provides to ID

**SLD**
- Postsecondary training
- Few life limitations
- Can utilize strengths
- Accommodations for weaknesses
- Fewer risk factors

Wielan & Zitman, 2015

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**Learning Disabilities**

- Behaviours associated with learning disabilities
  - Struggle to complete tasks, despite understanding
  - Learning problems, especially in: language arts, spatial conception, memory and sequencing abilities.
  - Poor reading and spelling.
  - Poor handwriting.
  - Difficulty with rote memorization.
  - Perform poorly on timed tests.
  - Have difficulty with computation.
  - Do not respond well to auditory instructions/information.
  (Fetzer, 2000)

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Learning about Working Memory

What is working memory?

- The ability to hold information in one’s head while working with it.

- This includes:
  - Auditory information
    - What you hear
    - Where you hear it from (location)
  - Visual information
    - What you see
    - Where you see it in space
What is working memory?

- Think of RAM (Random Access Memory) on a computer

Working memory

Working memory involves the capacity to:

- Manage
- Manipulate
- Transform

...Information held in memory
Working memory impacts...

- Retrieval speed
- Active searches of long-term memory
- Sorting of competing memory traces

Learning about Processing Speed
What is Processing Speed?

- Processing speed involves
  - Speed of processing **visual information** (e.g., seeing, recognizing, comparing, searching, matching)
  - Speed of completing **fine-motor tasks** (e.g., making simple marks, printing)
  - Speed of processing **auditory information** (e.g., hearing, understanding)
  - Response time (decision making once information has been received)

Impact of slow processing speed:
- Work is slow → ideas are lost (holding sand in a sifter)
- Lose flow and comprehension
- Sentences + ideas → less complex
- Increased frustration (e.g., driving to Edmonton at 50 kph)
- Decreased self-esteem
- Working memory problems exacerbated

- Working memory impairment can also exacerbate processing speed.
- Together, there is a compounded impact
Conditions that worsen working memory ...

- Stress (physical, emotional)
- Fatigue (physical, mental)
- Time-on-task
- Environmental distractions
  - Noise, movement, lighting, temperature, seating
- Age (executive working memory most affected)

What subjects are most affected?

- Most academic working memory research has been done in the area of reading.
- Areas of functioning affected:
  - Reading decoding
  - Word-reading accuracy (sight vocabulary)
  - Reading comprehension
  - Language comprehension (oral comprehension)
- Processing speed will also affect academic performance
What subjects are most affected?

Math is also affected:
- Word problems
- Problem-solving procedures and algorithms
- Accuracy of calculations (careless errors)
- Attention to function signs
- “Set-loss” (forgetting task expectations)
- Geometry affected by visual-spatial working memory

Written language is also affected:
- Spelling accuracy
- Written Expression
  - Length of sentences
  - Missing words in sentences
  - Length of paragraphs and essays
  - Missing ideas in paragraphs and essays
  - Missing punctuation / capitals
Subjects that involve application of core academic skills:
- Social studies
- Science
- History
- Geography
- Second languages

Arts
- Music
- Dance
- Drama
- Painting, sculpture, etc

Physical education

Industrial arts (trades)
### Types of working memory implicated in academic areas

<table>
<thead>
<tr>
<th>Processing Area</th>
<th>Reading Decoding</th>
<th>Reading Comp.</th>
<th>Written Language</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological STM</td>
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<td>✗</td>
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<tr>
<td>Verbal WM</td>
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<td>✗</td>
<td>✗</td>
<td></td>
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<tr>
<td>Executive WM</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
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<tr>
<td>Visuospatial WM</td>
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<td></td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>

*Palliser 2018 Schroeder, Drefs, Zwiers*

### Types of processing speed implicated in academic areas

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</thead>
<tbody>
<tr>
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<td>✗</td>
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<td>✗</td>
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<tr>
<td>Auditory PS</td>
<td>✗</td>
<td>✗</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine-motor PS</td>
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<td></td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

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Working Memory & Processing Speed also impact:

- Following directions
- Note taking
- Vocabulary development
- Reasoning and problem solving
- Complex learning
- Social interactions
- Grades

Working with LD vs BIF

- Core Principles:
  - Differentiated instruction
  - Good instructional principles, practices and research-based programs

- BIF:
  - Increased repetition of instruction and practice of skills
  - Emphasis on step-by-step processes to follow
  - Reduced emphasis on principles/abstractions
Interventions...

- Review your own practices in the classroom or home
  - Confirm what you are doing that is helpful
  - Identify new strategies to try

General Intervention Principles

- Adapt instruction (adaptations & supports)
- Adapt evaluation (adaptations & supports)
- Provide accommodations
- Use technology
- Make modifications (less common)
Interventions...

▪ Remediation
  — Specific skills – Brain plasticity
    (Note: Skill instruction does not generalize well)
▪ Compensatory Strategies
  — Rely on strengths
  — Strategy training
  — Modify the environment
  — Accommodations
  — Assistive technology

Strategy training: General principles

▪ Brief, focussed sessions
▪ One strategy at a time
▪ Teach:
  — When to use
  — Where to use
  — Why to use
  — How to use
General Strategies

▪ Teach **mind-mapping** and brainstorming
  — This helps youth to “triangulate” words and facts
  — Implement during initial learning stages, tests and exams, to cue their memory (i.e., “Think around the topic”)

▪ Encourage **self-talk** or verbal mediation while completing tasks

General Strategies

▪ **Cue youth** to focus on key information
  — “Do the following three things...”
  — “One of the most important things to remember...”
  — “This will be on your exam”

▪ Parents and teachers can ask youth to **summarize key points** of the reading or math problem
Specific Learning Process

1. Explain the strategy
2. Model the strategy (talk aloud)
3. Practice with guidance
4. Practice with “thinking aloud”
5. Practice while whispering
6. Provide ongoing feedback
7. Reinforce success
8. Encourage generalization

Adapt the Physical Environment

- **Reduce environmental distractions**
  - Noise, movement, etc.

- **Preferential seating**
  - Provides greater opportunity to observe
  - Redirection is easier
  - Breaks more easily implemented

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Adapt Instruction:
Reduce Working Memory Load

- Information should be simple, structured (one task at a time), and repeated (if necessary)
- Have the individual repeat instructions back
- Students should be focussed on instruction, not engaged in other activities
- When asking questions, youth may need additional retrieval time before responding (“Tip of the tongue” phenomenon is common)
- When asking for quick responses (e.g., large groups), avoid open-ended questions
- Allow time for review and rehearsal to promote higher-level processing

Adapt Evaluation

- Use recognition testing
- Avoid timed conditions and tests
- Alternatively, allow them to answer fewer questions
Accommodations

- Encourage use of external memory aids:
  - Visual cues
  - Checklists (on door, fridge, desk, binder)
  - Calculators
  - Paper and pencil
  - Number line, alphabet line, times table, abacus
  - Dictionary

Accommodations

- Use reference sheets for exams (e.g., math formulas, chronologies, etc.)

- Students can create their own at home, memorize it, and then rewrite it at the outset of their exam, prior to starting on exam questions

- Allow extended time to complete tasks and exams (consider fatigue)
Support for Organization

▪ Provide a written outline
▪ Provide written directions (on board, on worksheets, copied in assignment book by student)
▪ Provide checklists and timelines for assignments
▪ Provide a specific procedure/process for turning in completed assignments

Support for Organization

▪ Exams – Teach students to:
  — Pre-read exam
  — Plan time allocation
▪ Essay exams – Teach students to:
  — Create an outline
  — Write key words in point form, then expand on the key points
Use Assistive Technology

- Allow aids
  - Calculator
  - Word processor
  - Spell-check program
  - Grammar-check program
  - Voice dictation
  - Text reader

Working Memory Improvement

- Can Working Memory be improved?
    - Torkel Klingberg, Sweden
  - Questions:
    - Do improvements generalize?
    - Do improvements maintain over time?

Yes and No
Older students can begin to **self-advocate**

http://vimeo.com/64576041

Youth can watch video

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**Self-Advocacy** – La défense de ses propres intérêts

Download the English PDF Télécharger le PDF en français.


**Good resource:** https://www.naset.org/2522.0.html
Despite a long-standing tradition of learning disability (LD) identification within the education system, there remains much controversy in the field. Not only do school psychologists use different LD models, but which model being applied affects which body of students is eligible for identification. This presentation will talk about current trends in LD identification and the uncertainty that still exists. We will highlight one area of “messiness” for educators and psychologists – the distinction between individuals who are “slower learners” (have low average IQs) and those who have a learning disability. We will conclude by discussing implications for practice.

Subject-Specific Intervention
Reading

Reading Strategies

- Teach decoding skills through a multi-sensory approach
- Use reading materials rich in pictorial content. This includes captioned comic-book pictures and cartoons
- Select books at the youth’s instructional level
- Pre-teach new vocabulary
- Ask specific questions in advance
  - Youth can read to locate information
- Have youth monitor comprehension
Contrast Practice

- Record reading errors
- Create flash cards for drill. Make 2 cards: one with the correct word and the second with the word error (e.g., card and cord)
- Display both cards and take turns tapping one or the other to practice accurate reading
- Correct any errors immediately during practice (have youth repeat correct word)
- Add additional cards pairs for challenge

Reading ➔ Spelling: Multisensory

- See the word
- Say the word;
- Touch and “trace” each letter with a finger while saying its name (or its sound)
- Cover the word
- Picture the word while saying it (e.g., visualize the word on the object it is naming)
- Write the word
- Check the word
Word Comprehension Strategy

<table>
<thead>
<tr>
<th>S</th>
<th>Sound it Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Check the Clues in the Sentence</td>
</tr>
<tr>
<td>U</td>
<td>Use the Main Idea &amp; Picture Clues</td>
</tr>
<tr>
<td>B</td>
<td>Break Words into Parts</td>
</tr>
<tr>
<td>A</td>
<td>Ask for Help</td>
</tr>
<tr>
<td>Dive</td>
<td>Dive into the Dictionary</td>
</tr>
</tbody>
</table>


Reading Comprehension - Nonfiction

- THIEVES: A PREVIEWING STRATEGY
  - T – Title
  - H – Headings
  - I – Introduction
  - E – Every First Sentence in a Paragraph
  - V – Visuals and Vocabulary
  - E – End of Chapter Questions
  - S – Summary

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Reading Comprehension Strategies

- Use technology
  - Electronic Books
  - Electronic text reader
  - Computer-aided instruction
- Use writing starters
  - Sample topics
  - Sentence starters
  - Characters, settings, activities on cards

- Talk about ideas
  - With teacher
  - With partner

- Mind mapping / Webbing
  - Brainstorm ideas on computer (Inspiration, Kurzweil)
  - Brainstorm ideas on paper
  - Use sticky notes
Writing Strategies

▪ Scribing Strategy
  — Discuss ideas with the student
  — Have the student dictate to you
  — Scribe answers
  — Read aloud to student
  — Student writes what you dictate back
  — Review for corrections
  — Alternative: Student dictates into recorder

Writing Strategies - Revising

▪ Help students draft and revise writing
▪ Provide step-by-step instructions for review and editing
▪ Have students work with peers during editing
▪ Have students consult with teacher during editing
Writing Strategies

▪ Use an editing checklist:
  — Is my writing on-topic? Does it meet the assignment requirements?
  — What are my main points? Are they clearly stated?
  — Do I have at least 3 supporting details for each main point?
  — What three words I can replace with ones that are more precise, interesting or descriptive?

SCOPE Strategy – Editing

▪ **SCOPE Strategy** requires reading through written work five times, each time looking for a different type of error.
  — **Spelling**
    ▪ Look for misspelled words
    ▪ Rewrite it in different ways to see if one “looks right”
    ▪ Underline uncertain words
    ▪ Use an electronic spell checker
SCOPE Strategy – Editing

- **Capitalization**
  - Reread to find all capitalized words
  - First word of a sentence
  - Proper nouns
  - Names and titles (e.g. Ms., Mr., Dr.)
  - Important words in titles
  - Titles (e.g. Reverend, Honourable)
  - Days of the week, months, and holidays

SCOPE Strategy – Editing

- **Order of words**
  - Check that words are in the correct order in each sentence
  - Check that no words are missed
  - Read aloud or have someone else read it aloud
  - Point to each word as you say it to make sure no words have been:
    - Omitted
    - Added, or
    - Mixed up
 SCOPE Strategy – Editing

- **Punctuation**
  - Reread your paper for correct punctuation
  - Check for:
    - Periods
    - Question marks
    - Commas
    - Colons
    - Semicolons

- **Express a complete thought**
  - Read each sentence aloud for correct grammar
  - Check for:
    - Complete sentences (each sentence is a complete thought)
    - No run-on sentences (all parts of the sentence are related)
    - Agreement (all parts of the sentence are in agreement, including subject, verb, pronoun)
Use assistive technology

— **Word processing**
  - Require full-screen computer / laptop
  - *(Not AlphaSmart or Neo)*

— **Semantic Mapping / Organization**

— **Electronic recorder**

— **Voice dictation**
Writing Strategies - Technology

— Spell check
  ▪ Various Word Processors
  ▪ Word-Q http://www.wordq.com/
  ▪ Read-and-Write Gold http://www.readwritegold.com/

— Grammar check
  ▪ Various Word Processors

Mathematics
Math Strategies

- **Use manipulatives** (concrete three-dimensional materials) so students can make sense of and work out math calculations
- **Use an abacus** to solve math problems
- **Show your work** – Encourage students to record their thinking with paper and pencil
- **Use visual memory** strengths to support math problems
- **Visualize** math problems in their head

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Math Strategies

- **Combine verbal instruction** with pictures, diagrams, models, and concrete illustrations
- **Use cue cards** with a step-by-step process
- **Use calculators** to check work
Math Strategies

- **Teach mnemonics** for math algorithms

1) **Long-Division Problem Solving Strategy**
- “Does McDonalds Sell Burgers?” (DMSB)
  - Divide, Multiply, Subtract, Bring down

2) **Algebra-Problem Solving Strategy**
- “Big Elephants Destroy Mice And Snails” (BEDMAS)
  - Brackets
  - Exponents
  - Divide
  - Multiply
  - Add
  - Subtract
Science Strategies

- Pre-teach key vocabulary
- Teach synonyms
- Create mental frameworks
  - Metaphors
  - Similes
  - Analogies
- Use webbing to make ideas meaningful and link to prior learning
Science Strategies

▪ Use pictures, diagrams, models, hands-on learning
▪ Provide handouts
▪ Photocopy other student’s notes

▪ Record instruction / lectures electronically for later review
▪ Be available afterwards for:
  — Questions
  — Clarification
  — Study periods
▪ Provide regular review
Science Strategies

- Teach how to read a textbook
  - SQ3R
  - Take notes as you read
    - Draw images
    - Use semantic webs
  - Model what to highlight from textbook
  - Help students determine what is important
- Teach students how to study

Science Strategies

- Modify assignments
  - Fewer items
  - Short-answer items
- Modify assessment
  - Multiple-choice tests
  - Short-answer items
  - Allow use of technology
  - Increase time available