Numeracy and Learning Disabilities

[Image of LD@school logo.

Text on screen: Numeracy and Learning Disabilities.]

[Text on screen: Numeracy

Image on screen: the profile of a boy's head as he thinks about mathematics.]

Numeracy is the ability to understand and work with numbers in a variety of different contexts. It requires the development of many skills, including logical and strategic thinking, working memory, and the ability to organize, sequence, and focus on a problem. Approximately 7% of school-aged children have an LD in mathematics, and these learning disabilities are as complex and varied as those associated with literacy.

[Text on screen: Indicators

- *Students with LDs in math may struggle to:*
    - *Understand how numbers work*
    - *Follow verbal explanations*
    - *Memorize basic number facts*
    - *Sequence complex operations*
    - *Use visual representations.]*

Learning disabilities in math can affect a wide range of skills. Students with LDs in math may struggle to:

- Understand how numbers work
- Follow verbal explanations
- Memorize basic number facts, or develop effective memory strategies
- Sequence complex operations
- And use visual representation strategies

[Image on screen: a piece of grid paper with a line graph, Venn diagram, and various 3D shapes to illustrate visual representation strategies.]

There is no single mathematics disability; math LDs can exist independently or in conjunction with other disabilities, such as those affecting reading, language processing, visual spatial confusion, or executive functions.

[Text on screen: Dyscalculia.

Image on screen: a diagram of brain activation when adding. This image demonstrates the importance of the IPS.]

One specific type of math LD is dyscalculia. This neurocognitive disorder affects the acquisition of numerical and arithmetic concepts. It is believed that students with dyscalculia have a difference in the structure or function of the IPS-the part of the brain that provides us with the ability to understand and manipulate numbers. This makes intervention strategies that strengthen the meaningfulness of numbers especially important.

[Text on screen: Strategies for Educators

- *Explicit instruction*
    - *Present information in a graduate sequence*
    - *Emphasize connections between concepts*
    - *Meet working memory limitations.*

Image on screen: five small cogs labeled 'Warm up,' 'Intro,' 'I do,' 'We do,' 'You do,' and 'Review,' rotating around one large cog labeled 'Teacher.' This image represents the stages of explicit instruction.]

There are many strategies that educators can use to help students overcome learning difficulties in mathematics. One of the most recommended strategies is the use of explicit instruction. Explicit instruction is a method of teaching with clear, unambiguous explanations, and highly structured lesson plans. With explicit instruction educators can present information in a graduated sequence, emphasize the connections between new and prior knowledge, and meet the working memory limitations of students with LDs.

[Text on screen: Strategies for Educators

- *Visual Representation.*

Image on screen: the equation 1+1=2 is portrayed using apples, to provide an example of visual representation.]

Educators can help LD students learn to use visual representation strategies, such as diagrams. These supports simplify the problem solving process by organizing information, and making connections between mathematical concepts.

[Text on screen: Strategies for Educators

- *Heuristics.*

Image on screen: a piece of paper with the acronym BEDMAS labeled:
Brackets
Exponents
Division
Multiplication
Addition
Subtraction.]

Heuristics are problem solving shortcuts that help reduce the number of mental operations required to complete a task, such as underlining important information or using acronyms like BEDMAS.

[Text on screen: Strategies for Educators
- *Verbalization.*

Image on screen: a megaphone.]

Verbalization is a "think aloud" strategy that allows educators to model their problem solving process to students.

[Text on screen: Other Strategies
- *Reduce anxiety around math*
- *Reduce language related obstacles*
- *Provide prompt feedback to students.*

Image on screen: a smiling teacher working with 3 of her students.]

Other strategies include: reduce anxiety around math by avoiding surprise tests and quizzes, reduce language related obstacles by ensuring students understand the vocabulary being used, and provide prompt feedback to students to ensure they understand mistakes, and stay motivated.

[Image on screen: a student raising her hand to answer the math question 4+8.]

Educators can help students with LDs in math in a variety of ways, and with the appropriate intervention strategies, these students can develop a thorough understanding of mathematical concepts.

[Image on screen: a whiteboard with the words "Thanks for watching," and the LD@school logo.]

<u>Sources:</u>

Dyscalculia: From Brain to Education
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Evidence-Based Interventions for Students with Math Disabilities: One Size Does Not Fit All
http://ldatschool.ca/numeracy/evidence-based-interventions-for-students-with-math-disabilities-one-size-does-not-fit-all/

Helping Students with LDs Learn to Diagram Math Problems
http://ldatschool.ca/numeracy/diagrammath-problems/

Numeracy and LDs
http://ldatschool.ca/learn-about-lds/numeracy-and-lds/

Math Heuristics
http://ldatschool.ca/numeracy/math-heuristics/

Visual Representation in Mathematics
http://ldatschool.ca/numeracy/visual-representation/

Verbalization in Math Problem-Solving
http://ldatschool.ca/numeracy/verbalization-in-math-problem-solving/

Mathematics Instruction for Students with Learning Disabilities or Difficulty Learning Mathematics
http://www.centeroninstruction.org/files/Mathematics Instruction LD Guide for Teachers.pdf