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Mathematics for Students with Severe Disabilities

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Agenda

• Why is math a concern for students with severe disabilities?
  – Transition
    • Life skill
    • Employment

• To help, should we focus on building their academic math skills or functional math skills?

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Goals of changing math achievement

Academic
• With the higher math needs per career, we must increase our expectations and demand higher level mathematics.
• Those skills can be transitioned into functional and work-related settings.

Functional
• Since students with low-incidence disabilities struggle using math in real life settings, the focus should be application.
• Skills can still be taught and practiced within the functional curriculum.

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Content to be covered

- Number recognition
- Counting
- Quantification
- Basic Facts
- Vocabulary
- Instructional Delivery
- Bringing it all together

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Number Sense defined

The NMP defined number sense as "an ability to immediately identify the numerical value associated with small quantities, a facility with basic computing skills, and a proficiency in approximating the magnitudes of small numbers of objects and simple numerical operations" (2008, p. 27).

More advanced forms of number sense involve understanding of place value, composition and decomposition of number, and the concept of basic arithmetic operations (Chard, 2006; Gersten & Chard, 1999; NMP, 2008).

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Areas within Number Sense

(Fuchs, Compton, Fuchs, Hamlett, Bryant, & Hamlett, 2005; Fuson, 1990; Gersten, Jordan, & Flojo, 2005)

a) counting forward and backwards
b) fluent quantification and magnitude of number
c) number to numeral identification
d) base-10 and place recognition and recall
e) fluent use of arithmetic strategies

Focus on these in your assessment of early learners
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Make Numbers Relevant

- Cooking
- Hop scotch
- Calendar
- Sport scores
- Game boards
- Color by number

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Numeral and quantity

Around the tree and around the tree,
that's the way we make a three

Down and over and down some more, that the
that's the way we make a four

Dot notation

Wisniewski and Smith (2002) found that students with disabilities excelled in speed and accuracy when taught using a dot notation format and transitioned to fluency.

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Some Basic Skills

a) Counting and counting on
   - Counting chart, unifix cubes, feed the monkey

a) Counting backwards (difficult until early elementary)
   - Counting chart, unifix cubes

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Number line

Example 4. Representation of the counting on strategy using a number line

Ten Frames

Using patterns to earn numeracy skills and numbers (subitization)

- 3+4=7
- 5+2=7
The number code

Some people say that they like math because it logical...  
Find the pattern in each of these groups of numbers. 
Is the pattern visual, auditory, both, or neither?  

A. 1-9  
B. 10-19  
C. 20-29  
D. 100-120
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**Language Experiences**

Teach base ten – Example: Understanding of 17

Try one says and floor to 100

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**Building Fluency**

- Students with developmental disabilities have made gains in oral and written fluency based on systematic and ongoing practice with addition and subtraction facts (Jolivette et al., 2006).
- Build practice and repetition within math class.

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**Extra Practice Options**

(Chapman, 2010)

I have 35. Who has 6 groups of 8?
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Multiplication Assessment (Chapman, 2010)

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Instructional Delivery

- Daily routines (Browder & Cooper-Duffy, 2003) within explicit instruction
- Systematic instruction (Jackson et al., 2000)
  - Explicit think alouds and modeling
  - Task analysis
  - Practice practice practice
- Errorless response practice with delayed prompting (Ault et al., 1989)
- Hands-on with relevance and stepwise procedures

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Manipulative Objects: A Number Sense Teaching Tool

- Researched benefits span over:
  - Developing numeration
  - Basic facts
  - Fractions
  - Negative #s
  - Area & perimeter
  - 3D figures

- Manipulative objects do NOT teach children... Teachers do!

- Some helpful hints:
  - Practice using manipulatives before you teach
  - Provide language experiences while using manipulatives
  - Develop a pictorial representation for transition to abstract understanding... the ultimate purpose
Concrete to Representational to Abstract

Next Steps

- Consider
  - General Education Access
  - Planned modifications and accommodations

- What is the difference between accommodations and modifications?

Potential accommodations

- Extra wait time
- Procedures clarification
- Minimize classroom distractions
- Homework reminders and planners
- Weekly progress report and home checks
- Increased 1:1 assistance
- Peer tutoring or reciprocal teaching
- Homework from previous week

- Classroom signals for attention
- Visual organizer
- Scribe or notetaker
- Guided notes
- Shortened assignments
- “Chunked” lesson of brief assessed activities throughout a lesson
- Frequent praise to teach proper academic and social behaviors

Any more????
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Potential modifications

• Altered grading procedures
• Alternate but related standard during lesson
• Different reading assignments
• Different questions
• Alternate assessment content and / or expectations
• Elimination of parts of assignments if they remove a standard
• Calculator during math fluency assignment

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Modifications and Accommodations

• What are modifications to a teacher’s instruction?
  – An algebra teacher is teaching trigonometric ratios (sine, cosine, tangent). You expect students to memorize the formulas to solve for angles and lengths of sides. How might you modify the assignment for a student with memory problems and calculation at the 2nd grade level?
  – What are accommodations?
  – The same teacher decides not to modify the assignment but instead provides accommodations. What accommodations could be applied and how?

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Warning for Accommodations and Modifications

• Before using accommodations, and even more so with modifications, one must make detailed preparations with the long term goal of their planned and successful omission.
  • Unless the outcome allows an inclusion of their use (e.g., glasses), accommodations and modifications must be faded from instruction.

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Final Thoughts:
Choose a pathway to helping students with severe disabilities in math

1. Set Content - Choose an outcome
2. Organize Content - Set short-term goals and mathed assessments
3. Set Instructional Delivery - Choose a technique
4. Engage and Reassess the decisions and process

References


Wisniewski, Z. G., & Smith, D. (2002). Hw effective is touch math for improving students with special needs academic achievement on math addition mad minute timed tests? ERIC (ED469445).