Making Curriculum Accessible: Mathematics in a UDL Classroom

AzTAP
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Resources available: https://www.diigo.com/user/possbeth/AzTAP
Supporting Students in a Universally Designed for Learning Classroom

How Do I Plan for All The Different Students With Whom I Work?
Plan Instruction by Considering Barriers to Learning

Decoding Skills
Sensory Needs
Motor Limitations
Attention/Engagement
Self Regulation
Background Knowledge
Language skills
What are the Barriers Imposed by Traditional Math Worksheets?
When an educator goes to plan a lesson, what should they keep in mind?
What is the Learning Goal?

● How can I gain and maintain attention?
● Can I convey information in more than one way?
● What is acceptable evidence of student learning?
Standards Based Dictates What is Learned, NOT How
Basic Premises of CCSS in Mathematics

- Increased time on developing an understanding of number sense, including understanding of place value
- Strategy based learning
- Building fluency
- Use of tools is expected in building fluency
- Extended time across standards—not just spiraling, but building a foundation for understanding
- Mathematics is understanding, computing, applying, reasoning, engaging (UCARE—National Research Council, 2001)
Back Mapping in Math

...a bit more complicated task than back mapping in ELA. Mathematics Progressions provide explicit guidance. Learning Trajectories describe how concepts and student understanding develop over time.
Technology, Defined

Science or knowledge put into practical use to solve problems or invent useful tools.

http://www.yourdictionary.com/

UDL features: Provides images, examples, some text to speech, how the word is used in a sentence, multiple dictionary sources
A Focus on Results, Rather Than Means

"Teachers are free to provide students with whatever tools and knowledge their professional judgement and experience identify as most helpful for meeting the goals set out in the standards."

from Key Design Considerations, CCSS Introduction, p.4
What Does Technology Do?

Provide Options
UDL Practices

Best Practices in Mathematics Instruction
Students with Mathematical Difficulties

Students should receive mathematics instruction that emphasizes both procedural and conceptual learning (Gersten, Jordan, & Flojo, 2005) and that provides visual representations to help students understand key mathematical concepts (Gersten et al., 2009; Witzel, Mercer, & Miller, 2003).
Rethink the way we teach students to engage with math

● A progression from conceptual understanding to informal strategies to fluency
● Requires more than just memorizing procedures—it requires knowing when to use a strategy and why
● Accomplish this through a range of tools and supports for ALL students
Overcoming misconceptions
Continuum of Concrete $\rightarrow$ Representational $\rightarrow$ Abstract

- The National Math Panel (2008) concluded that use of visual representations, such as the CRA sequence of instruction is a powerful instructional tool.

- Highest effect sizes with secondary students were from CRA instruction (Gersten et al., 2009; Witzel, Mercer, & Miller, 2003; Witzel, 2005).
Using Representations

- "Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitation"

- "Mathematically proficient students consider the available tools when solving a mathematical problem."
## Common Core State Standards – Mathematics

### Standards Progressions

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Base Ten Representations
Operations and Algebraic Thinking
Numbers and Operations:
Number Lines

\[
\frac{16}{12} - \frac{9}{12} = \frac{7}{12}
\]
Equivalent Fractions

With traditional pattern block set (excluding square and tan parallelogram), the fractional parts were limited to halves, thirds, sixths.

Ask: What fractional relationships can be represented with the expanded set of pattern blocks? (halves, thirds, fourths, sixths, eighths, twelfths, twenty-fourths)
Don’t forget low tech and strategies, too
Math Manipulatives

- National Library of Virtual Manipulatives
- Virtual Manipulatives app (ABCya)
- NRich Maths
- Illuminations
- Virtual Hundreds Chart
- Number Line Arithmetic
- Printable number lines
- Base Ten Blocks apps (Joe Scrivens, Elementary Connection)
- Number Line, by the Math Learning Center--Clarity Innovations (app)
Using Video

Engagement
Flipped Classroom
Review
Digital vs Pencil and Paper

- **Illuminations Dynamic Paper**

  *Dynamic Paper*

  Need a pentagonal pyramid that’s six inches tall? Or a number line that goes from -38 to 39? Or a set of pattern blocks where all shapes have one-inch sides? You can create and more with the Dynamic Paper tool. Place the images you want, then export it as a PDF activity sheet for your students or as a JPEG image for use in other applications or on the web.
Digital vs Pencil and Paper

Math Paper App (Panther)

Advanced modes for doing algebra!
Equation Editors
Considerations for Students with Low Incidence Disabilities

**AAC Users and Core Vocabulary work from UNC Chapel Hill**

- Evidence based on the use of a Core Vocabulary system that based on analysis of key vocabulary from the CCSS and Clendon’s 150 most frequently used written words by K-4th grades
- Provided opportunities for students to use vocabulary on AAC systems in flexible ways with words embedded in daily communicative exchanges incorporate a base or core set of vocabulary with other content specific language
- Examined the type of language students need to participate actively in instruction
  - Subtraction: take from
  - Addition: put together
  - more than/less than; same/different
  - Turn (rotate)
Core Vocabulary Aligned with CCSS--DLM Top 40

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**Math**
Ablenet Action Dictionary

Free Download from iBooks
Correlates to Tier 2 vocabulary

Cover Page
1
1) Add 14
2) Answer 19
3) Attend 23
4) Blow 27
5) Bring 31
6) Choose 35
7) Clap/chant 42
8) Clean up 49
9) Collect 53
10) Color 57
11) Compare 61
12) Count 69
13) Cut 75
14) Describe 79

Example 1
The student sweeps objects to add.

Instructor: The instructor places first set on plastic tray and counts aloud as student sweeps one at a time. The instructor repeats for the second set. The instructor records numbers for counting the total on
UDL Look Fors in Mathematics Instruction

Options for Presentation
Focused Small Group Instruction
Options for Expression
Math Talk
Self-Paced
Concrete Representations
Virtual Manipulatives
People Learn in…

Different Ways

Provide Options!
Action Planning!

Time to apply what you've learned!

What are your next steps? What are you going to do when you head back to your institution? Take a few moments to map out what your next steps will be and then...Share!