Effectively Differentiating Mathematics Instruction to Help Struggling Students

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Effectively Differentiating Mathematics Instruction to Help Struggling Students

Donna Knoell, PhD
Educational Consultant and Author
dknoell@sbcglobal.net

Tim Hudson, PhD
Senior Director of Curriculum Design
DreamBox Learning
Every child can successfully learn mathematics.
Re-thinking How We Teach

• How we teach affects learning.

• How we teach affects student attitudes about math, and all aspects of learning.

• What we do, what we say, how we say it, the tools we use, the technology we integrate, and the curiosity and passion we exhibit for learning all matter!
• We can:
  • Reduce the gap in achievement.
  • Break the cycle of failure for students.
  • Help students become competent and proficient.
  • Help students develop confidence.
  • Ignite a Love of Learning in mathematics.
Struggling Students…. 

• Analyzing and Diagnosing the Problem…..

• Designing instruction to meet the needs of every child…
Differentiation

• Meeting Every Child’s Instructional Needs

• Help Every Child Experience Success in Mathematics
• Differentiation – uses flexible grouping –
  • Based on Content and Student Needs
  • Whole class
  • Small group
  • Independent learning

What works best for the learner?
• ASCD – differentiated instruction gives students “multiple options for taking in information, making sense of ideas, and expressing what they learn”.

• Adapting instruction to match student differences/needs
  • Concepts (readiness; appropriate level of instruction that is need)
  • Language (ELL students)
  • Interests (engage them)
Blended Learning

• Making use of effective technology to increase student understanding.

• Making use of effective technology to provide practice to help students gain fluency….build confidence….improve attitudes ….to help them experience success in an enjoyable but effective environment.

• Small group instruction….with targeted goals for individual student learning needs.

• Whole group instruction when appropriate or to remind all students of something you want to emphasize.
• Concrete – manipulatives
  Virtual manipulatives – (digital world – infinite possibilities)

• Visual representation
Children Are Curious

• Why?
• How?
• What?
Classrooms Alive with Curiosity

Curiosity is the spark that ignites inquiry!

Encourage the “Why” Questions!
  Why?
  How?
  Help them figure it out

Keep the curiosity alive….don’t stifle or kill it!

Ignite and sustain a Passion for Learning!
• Develop **Competence** –
• Develop **Confidence**
• Create “**Mind Habits**”
  • Engage Students as **Thinkers**!

• Students Who Can **Reason and Think Analytically and Critically**

• Students Who Can **Grapple with Real Life Mathematics** Problems, and **Persevere** to Solve Them
Creating an Effective Classroom Culture

• Creating an Environment Conducive to Thinking, Discourse and Learning:
  • Accepting Environment – all ideas are valued
  • Build Trust and Confidence in Students
  • Peer thinking is valued and respected
  • Engaged Listening – both students and teacher
  • Planning time for ‘thinking’ is essential!
  • Plan time for discourse/rich discussion with the questioning.
Number sense is essential.....if students are to understand progressively more difficult mathematics concepts.

Repetitive experiences with varied formats are important to help children develop number sense and comprehend important concepts.

- Productive Practice
Use blocks to subtract $\frac{1}{2}$ from 2.

$$2 - \frac{1}{2} = ?$$
Use coins to build $\frac{13}{10}$ of a dollar.

\[
1 \frac{50\text{¢}}{100\text{¢}} + 3 \frac{25\text{¢}}{100\text{¢}} + 1 \frac{5\text{¢}}{100\text{¢}}
\]
Types of Problems

• Puzzles or Logic Problems – including Brain Teasers
• Traditional Word Problems –
• Problems that ask students to identify and apply strategies to solve them.
• Real Life Problem Applications
Apply Logic and Apply Reading or Listening Skills

Sue is older than 5.
She is younger than 9.
Her age is an odd number.
How old is Sue?

I’m thinking of an even number.
It is more than 10 and less than 20.
The sum of the digits is 9.
What am I?
Sam is going to a friend's house. Sam remembers that his friend's house is on a street parallel to Metcalf Ave. On which street does Sam's friend live?

A. Mercury Ave.
B. Boulder St.
C. Johnson Drive
Questions to ask yourself when you are trying to solve a mathematical word problem

1. What is the question? What do we want to find out?
2. Are there any words in the problem/question that will help us know what to do? (difference, how much more, how much all together or in all, total, greater than, less than, equal, what part of?)
3. What are the important pieces of information?
4. Is there any information in the question/problem that is unnecessary?
5. What do we need to determine in order to “work” the problem? (questions, facts, relationships, mathematical processes)

6. Can I draw a picture or sketch of how I will do it, or how I figured it out?

7. Does my answer seem reasonable? Does it make sense?

8. How can I “check” my answer to see if I am “correct”? 
If each person gets 2 cookies at the picnic, how many cookies do I need to buy (for 36 people)?
Becky baked some cookies. She baked 36 cookies in all. Mary took half of the cookies. Then Sue took half of the remaining cookies. Later, Lisa took half of the cookies that were left. How many cookies did Lisa take?
Dan baked some cookies. Janet took half of the cookies that Dan baked. Then Sue took half of the remaining cookies. Later, Joey took half of the cookies that were left. When Dan came home, he saw only three cookies. Tell how you would figure out how many cookies Dan baked altogether.
Strategies to help students solve mathematical word problems

1. Delete extraneous information.
2. Draw a picture.
3. Draw a diagram.
4. Draw a table.
5. Act out the problem or use concrete materials.
6. Create an organized list.
7. Make an estimate. Guess and Check.
8. Look for a pattern.
9. Write a number sentence/equation.
10. Work backwards.
11. Use logical thinking.
Impact of Visible Thinking
Discourse

Discourse – integral component of effective mathematics instruction

- Dialogue about concepts and ideas
- Accurate Vocabulary – not a drill;
- Visible Thinking

Development of discourse and communication skills to enable students and teachers to communicate what they are thinking, and how they are applying their thinking to specific mathematical problems and real life experiences.
Important consideration: for teachers:

• Designing instructional time effectively:
  • Provide dedicated time for students to:
    • Reflect
    • Discuss their thinking
    • Consider alternatives to solving real-life problems
    • Develop Mind Habits of Thinking!

• Provide time to explore and to test their ideas.
Discourse and Visible Thinking

• Teachers—thinking aloud so that students can hear and understand the thinking processes they are utilizing.
  • Words that demonstrate their thinking
  • Visuals that demonstrate their thinking
  • Using manipulatives to demonstrate their thinking

• Students – thinking and talking about mathematics so that others can hear and understand what they are thinking
Focus on Understanding

Developing sound thinking and reasoning is essential!

Effective questioning - KEY to developing deep understanding…

• Why do you think that?
• Tell me a little more?
• Could you tell us how you figured that out?
• Is there some other way we could do it, too?
We need to give children time to:

- Think about mathematical ideas.
- Grapple with mathematical explanations. (Be ready to coach and give them hints when necessary and appropriate.)
- Help students learn and feel comfortable with the language of mathematics and trying to solve real life math problems.
On Day 2 of a trip, Jim drove 425 miles. On Day 3, he drove 85 miles less than he drove on Day 2. He drove 860 miles in all on his three day trip. How many miles did he drive on Day 1?
There are 12 flights from New York City to Washington DC each morning. Flights start at 5:00 AM. If a flight leaves every 30 minutes, at what time does the last morning flight leave?
Two Kinds of Coin Problems

I have 5 coins – a nickel, two quarters, and two dimes. How much money do I have?

Alternate Coin Problem:
• I have 5 coins in my pocket. The coins may only be pennies, nickels, dimes, or quarters. I reach into my pocket and pull out 3 coins. How much money might I have in my hand?
• What are some different ways I could have 5 coins in my pocket?
• With 3 coins, what is the smallest amount of money I might have in my hand?
• With 3 coins, what is the largest amount of money I might have in my hand?
Mrs. Johnson has decided to replace the carpet in her living room. Her living room is rectangular, and the dimensions are 19’ by 12’.

1. How many square feet of carpeting will she need to buy?
2. How many square yards does she need?
3. Draw a picture or use models to support your thinking and solution.
Focus Teaching to:

• Plan instruction to meet the needs of each child
• Promote Thinking and Understanding
• Clarify Misconceptions
• Engage Learners
• Connect with Students’ Interests
• Build a Growing Curiosity
• Unleash a Passion for Learning
“We may not be able to prepare the future for our children, but we can at least prepare our children for the future.”

(Franklin D. Roosevelt)
Questions?

Dr. Donna L. Knoell
dknoell@sbcglobal.net
(913) 642-6522
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Intelligently adapt & individualize to:
• Students’ own intuitive strategies
• Kinds of mistakes
• Efficiency of strategy
• Scaffolding needed
• Response time
Actionable Reporting

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<th>2nd Grade Curriculum</th>
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Concept: Multiplication: Double & Halve

Students use known basic facts and double one factor and halve the other to determine the product of a more challenging problem.

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