Connections: Linking Research-Based Instructional Strategies with Standards-Based Mathematics

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Milwaukee Public Schools
Math Teaching Specialists

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Build a career. Plan to be better tomorrow than today, but don’t ever plan to be finished.
-Carol Ann Tomlinson, The Differentiated Classroom, Responding to the Needs of All Learners

The Milwaukee Mathematics Partnership (MMP), an initiative of the Milwaukee Partnership Academy (MPA), is supported with funding from the National Science Foundation

Rectangle
Quotes Splash
From the Milwaukee Math Partnership (MMP) course we teach, “Improving Mathematics Teaching and Learning: Standards-based Mathematics with Instructional Strategies” and from noted experts in the field.

“Thanks for everything. You and Rosann were great presenters and I learned a TON of new things that I hope to use with the new teachers that I work with. You both will probably see me again if you teach another course. If you two helped me start to actually like math or at least help alleviate my anxiety about it, then you can help ANYBODY! :-)
-Kimberly Guy, MPS City-wide District Mentor

“Working with special education students strategies have been very important in helping them to grasp ideas and concepts that they otherwise might not have understood. It has also been very beneficial in assessing. I have had to adapt certain ideas to fit my students which keeps me fresh and them interested.”  -Tove Case, MPS teacher

“The biggest impact it has had on my class, is that it has kept my students on task and they are learning to work cooperatively with each other - an important job skill they will need in the future!”  -Sandy Wiesen, MPS teacher

“Taking this class really helped me to model for teachers how to get out of the rut of simply presenting content in a ‘cookie-cutter’ fashion and to more strategically plan how to execute lessons to promote greater student engagement and achievement.”  -Shawn Holloway, MPS teacher

“Due to the increase in the 'different' strategies that are now part of my 'tool bag,' I am able to present my lessons more effectively. I often spend a little extra time thinking as to which strategy would be more effective for a particular lesson/topic. I strongly believe that there is no such thing as one best approach. However, student achievement does not depend solely on good teaching, but the majority of the students seem to benefit from the strategies I have been employing.”
-Sanjay Raut, MPS teacher

“This is the methods course you take after you become a teacher. Now you know what you know and you know what life is like as a teacher. Therefore all the "stuff" they talk about in class makes sense b/c you know what it means to transition, to have multi-level kids and classroom disruptions and uncooperative kids and you know what it means when there is a full moon and a change in the barometric pressure and when spring break is near and what warm weather means to students and what high stakes testing means and what the reality of the life of a teacher is like. So, yes the class was beneficial and it is needed for all teachers, for ALL subjects!!!”-Monica Gonzalez, MPS teacher

“Truly, it is about engaging the students. Put the ownership on the kids and make it worth their while. I find that one can use the strategies in all content areas. It just is nice to mix things up a bit.”  -Candace Cline, MPS teacher

“Teach me my most difficult concepts in my preferred style. Let me explore my easiest concepts in a different style. Just don’t teach me all the time in your preferred style and think I’m not capable of learning.”
-Virleen Carlson, Center for Learning and teaching, Cornell University
“I like this class because there’s something different going on all the time. My other classes, it’s like peanut butter for lunch every single day. This class, it’s like my teacher really knows how to cook. It’s like she runs a really good restaurant with a big menu and all.”

-Comments from a course evaluation written by a 7th grader, Carol Ann Tomlinson, *The Differentiated Classroom, Responding to the Needs of All Learners*

“Only teachers who utilize a variety of instructional models will be successful in maximizing the achievement of all students . . . Teachers need to “play to” students’ strengths and to mitigate students’ learning weaknesses. This can be done only through the use of instructional variety.” - Thomas J. Lasley and Thomas J. Matczynski, *Strategies for Teaching in a Diverse Society*

“The biggest mistake of past centuries in teaching has been to treat all children as if they were variants of the same individual, and thus to feel justified in teaching the same subjects in the same ways.” - Howard Gardner
Milwaukee Public Schools
Mathematics Framework

UNDERSTANDING
Comprehending concepts, operations, symbols, and procedures

PROBLEM-SOLVING/ APPLYING
Devising strategies for solving problems

ENGAGING
Seeing mathematics as useful and doable

COMPUTING
Carrying out procedures accurately, efficiently, and appropriately

REASONING
Using logic to explain and justify solutions to problems

Learner Communicates Mathematically

Mathematics Proficiency For All Students

References

Available online: http://www.nap.edu/books/0309069955/html/

Available online: http://www.nap.edu/books/0309084318/html/

Available online: http://www.dpi.state.wi.us/dpi/standards/
<table>
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<th>Strategy</th>
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<tbody>
<tr>
<td>Learning Intentions (W.A.L.T.)</td>
<td><strong>Unlocking Formative Assessment</strong>, 2001, Shirley Clarke</td>
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<td>Building Academic Vocabulary: Steps 1-3</td>
<td>Chapter 3, Teaching the Selected Terms, <strong>Building Academic Vocabulary</strong>, 2005, ASCD, Robert J. Marzano, Debra J. Pickering</td>
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<td>Building Academic Vocabulary: Step 6, Talk a Mile a Minute</td>
<td>Chapter 4, Review Activities and Games, <strong>Building Academic Vocabulary</strong>, 2005, ASCD, Robert J. Marzano, Debra J. Pickering</td>
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<td>Cooperative Learning: Jigsaw</td>
<td><strong>The Strategic Teacher</strong>, 2007, ASCD, Harvey Silver, Richard Strong, Matthew Perini</td>
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<td>Think Aloud Strategy for Problem Solving</td>
<td>Developed by the <strong>Milwaukee Mathematics Partnership</strong> (MMP) with support by the National Science Foundation, <a href="http://www.mmp.uwm.edu">www.mmp.uwm.edu</a></td>
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We Are Learning To:

apply appropriate techniques and formulas to determine measurements.

communicate mathematical thinking coherently and clearly to peers.
A Six-Step Process
for Teaching New Terms

**Step 1:** Provide a description, explanation, or example of the new term.

**Step 2:** Ask students to restate the description, explanation, or example in their own words.

**Step 3:** Ask students to construct a picture, symbol, or graphic representing the term or phrase.

**Step 4:** Engage students periodically in activities that help them add to their knowledge of the terms in their notebooks.

**Step 5:** Periodically ask students to discuss the terms with one another.

**Step 6:** Involve students periodically in games that allow them to play with terms.

From ASCD’s Building Academic Vocabulary Teacher’s Manual, Robert J. Marzano and Debra J. Pickering
Talk a Mile a Minute

AREA

LENGTH

CIRCLE

HEIGHT

PARALLELOGRAM

CIRCUMFERENCE
Directions for your EXPERT Group

1) Your assigned SHAPE is on the cover sheet of your packet.
2) Together as an EXPERT group, sketch and label the dimensions of your assigned shape.
3) Calculate the shape’s perimeter and area.
4) Be sure everyone in the EXPERT group understands the material so well they will be able to teach it to others.
Directions for your JIGSAW Group

5) Form a JIGSAW group of 4 people, each with a different shape, but all with the same color paper.

6) One at a time, each EXPERT should explain how to draw the shape. Describe it! Don’t show it! You are responsible for teaching!!

7) Then, teach the group how to determine the perimeter and area of your shape.

8) Be sure everyone in the JIGSAW group understands before going to the next shape.
Think Aloud
A Problem Solving Strategy for Mathematics

The Think Aloud strategy helps students develop independent thinking during problem solving situations through the use of questioning. Effective questioning will help students to:
- Visualize the situation
- Develop important mathematical concepts
- Clarify vocabulary
- Develop points of entry
- Focus on what is needed for an answer

Setting the Stage
- Read the problem (whole group, pairs, or independently)
- Visualize the situation
- Restate the problem (not focusing on the answer)
- Connect to real-life situations

Clarification of Concept and Context
- Clarify vocabulary specific to the mathematics concepts
- Clarify vocabulary related to the context of the problem
- Connect the mathematical ideas to previous work

Where To Start
- Discuss various approaches for entry into the problem
- Share reasoning on approaches

Thinking about the Solution
- Redefine the question in the problem
- Survey students for models of what the answer might look like
- Relate connections between the answer and the problem

Developed by the Milwaukee Mathematics Partnership (MMP) with support by the National Science Foundation
The Fencing Task

Ms Brown’s class will raise rabbits for their spring Science fair. They have 24 feet of fencing with which to build a rectangular rabbit pen to keep the rabbits.

a. If Ms. Brown’s students want their rabbits to have as much room as possible, how long would each of the sides of the pen be?

b. How long would each of the sides of the pen be if they had only 16 feet of fencing?

c. How would you go about determining the pen with the most room for any amount of fencing? Organize your work so that someone else who reads it will understand it.
1) How often do you incorporate instructional strategies into your math lessons?

**AVERAGE 4**

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<td></td>
<td>Rarely</td>
<td>Daily (several strategies per lesson)</td>
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2) Do you believe that using instructional strategies has helped to increase student engagement in your math class?

**AVERAGE 4.57**

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<td>No</td>
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3) Do you believe that using instructional strategies has helped to increase student achievement in your math class?

**AVERAGE 4.4**

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<td>Absolutely!</td>
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4) As you reflect on your experience in our class, what has had the biggest impact on your classroom practice?
AN OVERVIEW OF COOPERATIVE LEARNING

Without the cooperation of its members society cannot survive, and the society of man has survived because the cooperativeness of its members made survival possible.... It was not an advantageous individual here and there who did so, but the group. In human societies the individuals who are most likely to survive are those who are best enabled to do so by their group. Ashley Montagu, 1965

How students perceive each other and interact with one another is a neglected aspect of instruction. Much training time is devoted to helping teachers arrange appropriate interactions between students and materials (i.e., textbooks, curriculum programs) and some time is spent on how teachers should interact with students, but how students should interact with one another is relatively ignored. It should not be. How teachers structure student-student interaction patterns has a lot to say about how well students learn, how they feel about school and the teacher, and how they feel about each other.

BASIC DEFINITIONS

There is a difference between simply having students work in a group and structuring groups of students to work cooperatively. A group of students sitting at the same table doing their own work, but free to talk with each other as they work, is not structured to be a cooperative group, as there is no positive interdependence.

ELEMENTS OF COOPERATIVE LEARNING

All healthy cooperative relationships have these five basic elements present. This is true of peer tutoring, partner learning, peer mediation, adult work groups, families, and other cooperative relationships. This conceptual "yardstick" should define any cooperative relationship.

It is only under certain conditions that cooperative efforts may be expected to be more productive than competitive and individualistic efforts. Those conditions are:

- Clearly perceived positive interdependence
- Considerable face-to-face interaction
- Clearly perceived individual accountability and personal responsibility to achieve the group’s goals
- Frequent use of the relevant interpersonal and small-group skills
- Frequent and regular group processing of current functioning to improve the group’s future effectiveness
As you reflect . . .

- An idea that squares with my beliefs...
- A question or concern going around in my head. . .
- A point I would like to make. . .