BOXFORD, TOPSFIELD, & MIDDLETON PUBLIC SCHOOLS

PROFESSIONAL DEVELOPMENT NEWSLETTER

LEARNING AND TEACHING TOGETHER

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LESSON STUDY: FOCUSING ON THE MATH

This fall teachers across the Tritown began a new professional development initiative called Lesson Study. During the Lesson Study, regular and special educators work together to learn more deeply about mathematics, their students, and reflect on their teaching.

Lesson Study is teacher-driven and student centered. The study begins by selecting a lesson from the curriculum. A lesson particularly suited to help teachers focus on the mathematical concepts behind the lesson and the "big ideas" in math.

Analyzing how students see the big ideas in math is crucial because understanding these big ideas help students make big leaps in the development of mathematical reasoning.

While improving teaching and learning for all students is always important, our specific goal is to focus on how to support students with disabilities. Lesson study provides us with a special lens on classroom practice and helps us have specific discussions about strengthening all students' understanding of the concepts embedded within the mathematical lesson or unit.

Effective professional development enhances communication among teachers. Learning is reciprocal. Lesson Study provides teachers with the opportunity and guidance to reflect, learn, and improve together. Teaching can be an isolated activity. When you're teaching you may not have time to think beyond the immediate skills you want students to learn that day. Lesson study provides teachers with the time to think more deeply about the mathematics embedded in their lesson.

Connecting concepts and understanding big ideas requires considerable time, planning, and constant reflection. Having time during the school day enables us to draw on expertise within and outside the school, as teachers strive to improve through careful observation of students.

Improving teaching and learning is a continuous goal within a professional learning community. By allocating time and resources to plan, observe, and refine lessons, lesson study recognizes that the classroom lesson is the heart of instructional improvement. Understanding and teaching mathematics effectively requires teachers to continually consider what they want students to know and be able to do, what's come before and after in a spiraling curriculum, and how to use assessment to improve instruction. Hopefully, over time, through lesson study, "the system learns" – not just individual teachers – as teachers continue to improve lessons through careful study of students' thinking, engagement and learning

Special thanks for the teachers who took part in the Lesson Study initiative.

"The cultural activity of teaching- the ways in which the teacher & students interact about a subject- can be more powerful than the curriculum materials that teachers use."
ASCD Stigler & Hiebert, Feb. 2004

Inside this issue:

Special points of interest

Lesson Study Provides Opportunities to

1. Think Deeply About Long-term Goals for Students
2. Carefully Consider the Goals of a Particular Content Area, Unit, and Lesson
3. Study the Best Available Lessons
4. Plan Lessons that Bring to Life both Short-term and Long-term Goals
5. Deepen Subject Matter Knowledge
6. Develop Instructional Knowledge
7. Build Capacity for Collegial Learning
8. Develop the "Eyes to See Students"

PROFESSIONAL DEVELOPMENT

THEN	AND	NOW
Begins with answer		Begins with question
Driven by expert		Driven by participants
Communication is trainer to teachers		Communication is among teachers
Relationships are hierarchical		Relationship is reciprocal
Research informs practice		Practice is research

Unlocking the key to continuous improvement

CONSTRUCTING BIG IDEAS, STRATEGIES, AND MATHEMATICAL MODELS

National research shows that many children in our schools rely on written algorithms and don't consider mental strategies a viable option. Over the past few years our teachers have worked to develop student's flexible use of strategies as they work to become efficient, fluent, competent mathematicians. Developing strong number sense is fundamental during the early and intermediate grades and lays a foundation for important mathematical ideas.

Teaching is grounded in the development of these math ideas as we work to fully understand how students see, organize, and interpret their world mathematically. A student with good number sense has the ability to use numbers and number operations to communicate, process and interpret information. Visual experiences develop number sense and therefore **visualization** should be integral to mathematics teaching and in classroom activities.

Open number lines, ratio tables and arrays are visual tools for thinking rather than models of thinking.

As we work to strengthen students' visualization skills we need to ask the same questions we ask in *Lesson Study*.

- What are the big ideas of mathematics?
- What strategies support students' understanding of the "big ideas?"
- How does an understanding of the big ideas help students to make connections?
- Why are connections so important?
- How can we use our deep understanding of these questions to differentiate and integrate the curriculum?

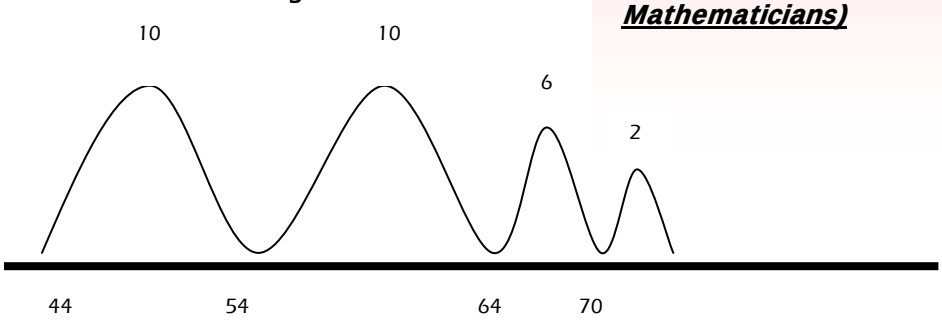
Student's ability to visualize math is an important component in developing strong number sense. One strategy aimed at helping students develop strong number sense is to use the open number line and arrays to help student see the relationship between numbers in a visual way. Open number lines, ratio tables and arrays are visual tools for thinking. As students deepen their understanding of number sense by seeing relationships between numbers, they can better understand place value, algebra, and the connection between algebra and geometry. Ask a colleague involved in the lesson study for more information about these strategies, research the Young Mathematicians at Work

BIG IDEAS (CONT.)

series from Heinemann, or go to http://www.madison.k12.il.us/handouts/Joan/default.htm. Several teachers and principals already have these books. Perhaps one of them might lend them out or maybe a group of teachers might form a study group to learn more. Feel free to contact Debbie Hale for further support; 978 887-1008 or debbiehale@tritownschoolunion.com

"The purpose of models is NOT to fit the data, but sharpen the question." (Young Mathematicians)

Using an Open Number Line as a tool for thinking.

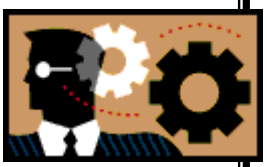


UNDERSTANDING CHILDREN'S THINKING

During the second round of *Lesson Study* teachers are learning about Cognitively Guided Instruction. CGI is the study in how children acquire reasoning. Studies have shown that teachers who understand the development of reasoning help guide student's planning and can better understand where students are developmentally. Helping students to more clearly understand the language of mathematics and solve word problems presents many challenges. A mathematical problem is something you do when you <u>don't</u> know what to do. Both ***Trailblazers*** and ***Impact*** math have advanced or challenging word problems. By using a strategy such as CGI a teacher might better understand where a student is developmentally. Cognitively Guided Instruction provides students with a system for organizing and integrating what they know so they can understand the "big picture." It shows what math students know and how they create a path to the answer, which is a very different approach from a standard algorithmic approach. This in-depth knowledge makes for a powerful math instructor who is in-line with the classes' needs and strengths and therefore enables differentiation of instruction. A wealth of knowledge about CGI is available on the web. <u>Children's Mathematics,</u> (Heinemann) outlines this strategy in greater detail. Once again, if you are interested in participating in a study group or a "Teacher to Teacher" initiative now or in the summer contact Debbie Hale.

"It's the questions that drive mathematics. Solving problems and making up new ones is the essence of mathematical life."

Reuben Hersh, What is Mathematics Really?



Future Professional Development

Look for upcoming information, available shortly, from your principal, on professional development in mathematics scheduled for our Professional Development day on February 28th.

Mikki Murray will speak about developing math vocabulary in context and Jon Manon, from the University of Delaware, will speak about how to engage students through listening. More info to come.

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Debbie Hale
978 887-1008
debbiehale@tritownschoolunion.com

How can I use this information to help all learners become proficient mathematicians?

For more information go to:

David Geary's website
www.missouri.edu/~psycorie/index.html

or the National Dyslexia Association's website

www.interdys.org

3 Types of Learning Disabilities (Mathematical Disorders)

David Geary, Stern Center for Language and Learning

Semantic Memory	Procedural	Visuospatial
Cognitive & Performance Features: A. Low frequency of arithmetic fact retrieval B. When facts are retrieved, there is a high error rate C. Errors are frequently associates of the numbers in the problem D. Solution times for correct retrieval are unsystematic *Genetic Features:* Appears to be inheritable *Relationship to reading disorders* Appears to occur with phonetic forms of reading disorder	*Cognitive & Performance Features:* A. Relatively frequent use of developmentally immature procedures B. Frequent errors in execution of procedures C. Potential developmental delay in the understanding of concepts underlying procedural use D. Difficulties sequencing the multiple steps in complex procedures *Genetic Features:* Unclear *Relationship to reading disorders* Unclear	*Cognitive & Performance Features:* A. Difficulties in spatially representing numerical information such as the misalignment of numerals in multicolumn arithmetic problems or rotating numbers B. Misinterpretation of spatially represented numerical information, such as place value errors C. May result in difficulties in areas that rely on spatial abilities, such as geometry *Genetic Features:* Unclear *Relationship to reading disorders* Does not appear to be related

Questions to consider when assessing a math lesson

What did I do?

How did I make it work?

What questions did I ask?

How did I use guided questions to encourage students to think aloud?

How did I get there?

How was my teaching conceptually based?

How did I encourage students to use math vocabulary?

How did I assess students' learning?

What might I do next?

What might I do differently next time?