# *Using Mathematics Teaching in the Middle School in the Classroom*

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# Outline of Presentation

- Overview of MTMS
- Favorite Feature Article
- Yellowstone Problem
- Palette of Problems
- GOHW
- Formative Assessment
- Your questions and comments regarding *MTMS*
- *Write for MTMS*

# Features vs. Departments

## FEATURES

- Contain approximately 2500 words
- cover general or specific topics relating to teaching and learning mathematics

## DEPARTMENTS

- Vary in length, but shorter than a feature
- Conform to a theme or serve a particular function

# Departments

## Cartoon Corner

- Presents math questions related to a cartoon.

## Solve It / Student Thinking

- Highlights creative student solutions to a problem. Teachers send in student work with a description of student thinking.

## Palette of Problems

- Provides problems for classroom use. Teachers are welcome to submit specific problems to the editor.

## Mathematical Explorations

- Presents classroom-tested lessons and activity sheets to use with students.

# Departments

## Informing Practice

- Describes research informing classroom-based questions or issues.

## Quick Reads

- Focuses on a specific topic in a shortened format.

## On My Mind

- Presents a reader's opinion on a topic of his or her choice.

## Math for Real

- Describes a real-life application of a mathematics concept.

## Blogarithm

- Presents a biweekly blog related to a selected theme.

# Favorite MTMS Article

Never Say Anything a Kid Can Say!

STEVEN C. REINHART

AFTER EXTENSIVE PLANNING, I PRESENTED what should have been a masterpiece lesson. I worked several examples on the overhead projector, answered every student's question in great detail, and explained the concept so clearly that surely my students understood. The next day, however, it became obvious that the students were totally confused. In my early years of teaching, this situa-

Before long, I noticed that the familiar teacher-centered, direct-instruction model often did not fit well with the more in-depth problems and tasks that I was using. The information that I had gathered also suggested teaching in nontraditional ways. It was not enough to teach better mathematics; I also had to teach mathematics better. Making changes in instruction proved difficult because I had to learn to teach in ways that I had never ob-

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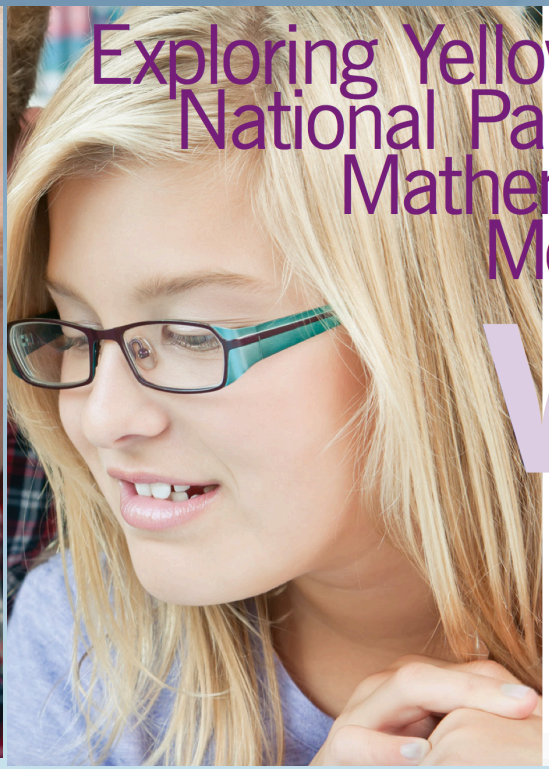
# MTMS Feature Article – Activity

Megan H. Wickstrom,
Ruth Carr, and
Dacia Lackey



## Exploring Yellowstone National Park with Mathematical Modeling

With the 2016 national park centennial and such initiatives as Find Your Park, students and teachers alike are encouraged to explore state and national parks as their outdoor classrooms. From terrain change to average daily temperature, many aspects of the outdoors can be explored through mathematics. Because of our location, several fifth-grade classrooms across our district have the opportunity to visit Yellowstone National Park. Exploring Yellowstone is both relevant and motivating for our students because most have already visited or learned about some features of the park. For these reasons, as teachers, we thought that Yellowstone could act as an ideal context in which to investigate measurement topics and engage in the process of mathematical modeling.

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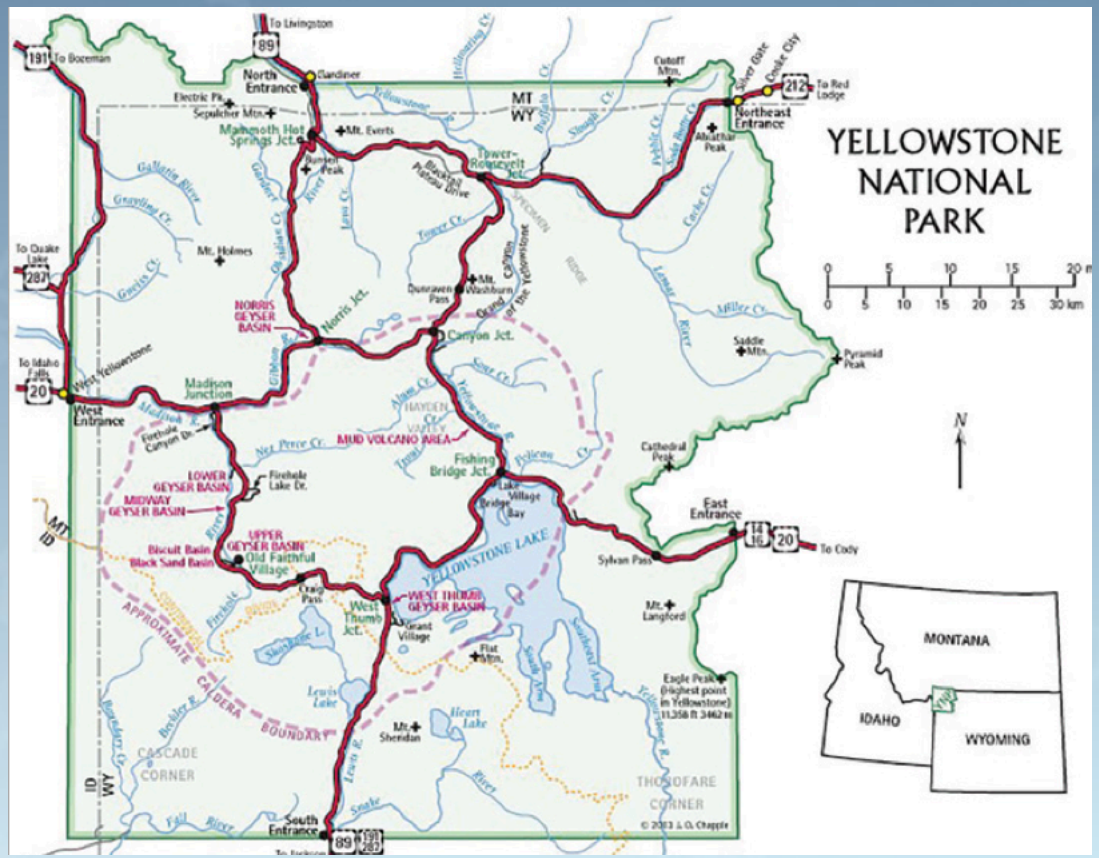
# How big is Yellowstone?

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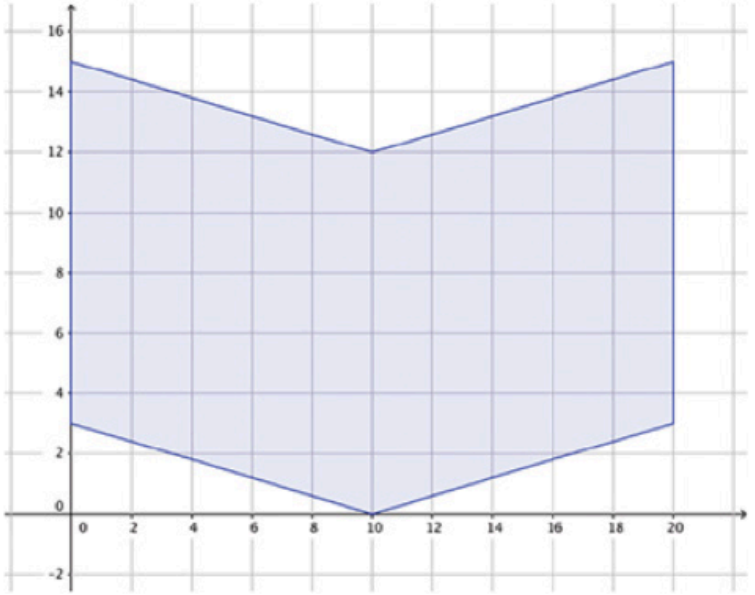
# MTMS Department – Problems

palette of problems

Stephan Pelikan, Anna F. DeJarnette, and Stephen Phelps

**2.** Find the area of the figure below.

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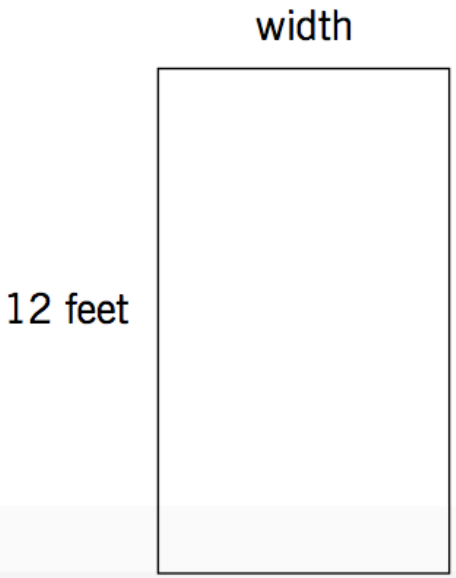
# MTMS Department – Problems

palette of problems

Stephan Pelikan, Anna F. DeJarnette, and Stephen Phelps

**16.** Jake's rectangular bedroom has a perimeter of 42 feet. He knows the length of the room is 12 feet, but is uncertain about the width. If he would like to put in new carpet, how many square feet will he need?



# MTMS Department – Problems

palette of problems

Stephan Pelikan, Anna F. DeJarnette, and Stephen Phelps

**14.** Kaden constructed an isosceles triangle with an area of 36 $cm^2$. What are *all* the possible whole-number heights of his triangle if the measurement of the base is a whole number as well?

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# MTMS Feature Article – Teaching Techniques

## Making the Most of Going over

Samuel Otten, Michelle Cirillo, and Beth A. Herbel-Eisenmann

According to two studies of middle school and high school mathematics classrooms, 15 to 20 percent of class time tends to be spent reviewing homework (Grouws et al. 2010; Otten, Herbel-Eisenmann, and Cirillo 2012). So how can class time spent going over homework (GOHW) provide students with rich opportunities to learn from their homework? What are some ways that go beyond the opportunities embedded in the assignment itself?

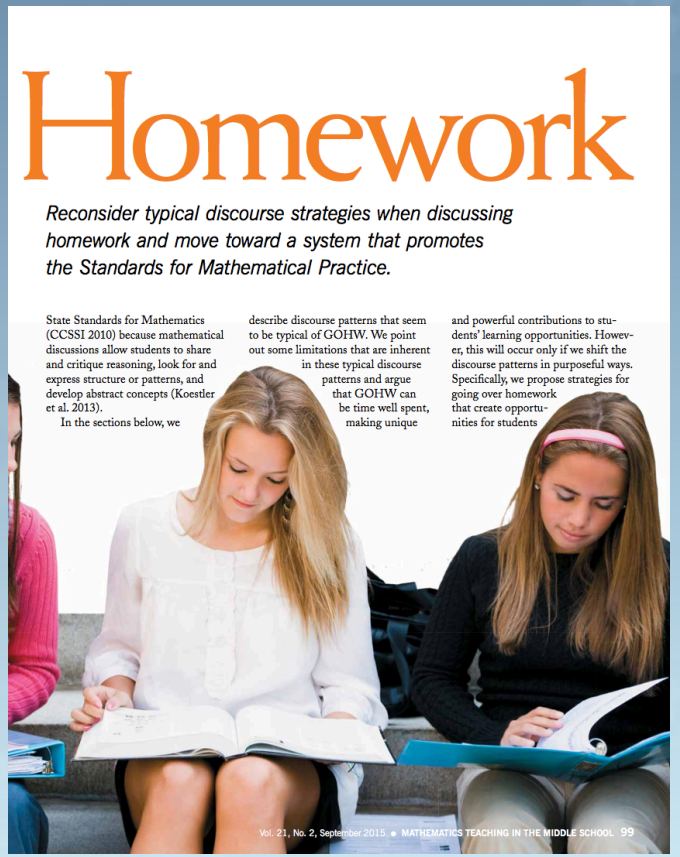
An important characteristic of homework is that it provides each individual student with the opportunity to develop skills and to think about important mathematical ideas (Wieman and Arbaugh 2014). In class, GOHW provides the complementary opportunity to discuss those ideas collectively. This article focuses on the discourse—the use of spoken or written language as well as other modes of communication to convey meaning—of GOHW.

As pointed out by NCTM, students' active engagement in mathematical discourse is especially important because collectively developing meaning supports learning (NCTM 2014; Cirillo et al. 2014; Smith et al. 2009) and distributes mathematical authority to the students (Webel 2010). Moreover, rich discourse goes hand in hand with the Standards for Mathematical Practice (SMP) from the Common Core









## Homework

*Reconsider typical discourse strategies when discussing homework and move toward a system that promotes the Standards for Mathematical Practice.*

State Standards for Mathematics (CCSSI 2010) because mathematical discussions allow students to share and critique reasoning, look for and express structure or patterns, and develop abstract concepts (Koestler et al. 2013).

In the sections below, we describe discourse patterns that seem to be typical of GOHW. We point out some limitations that are inherent in these typical discourse patterns and argue that GOHW can be time well spent, making unique and powerful contributions to students' learning opportunities. However, this will occur only if we shift the discourse patterns in purposeful ways. Specifically, we propose strategies for going over homework that create opportunities for students



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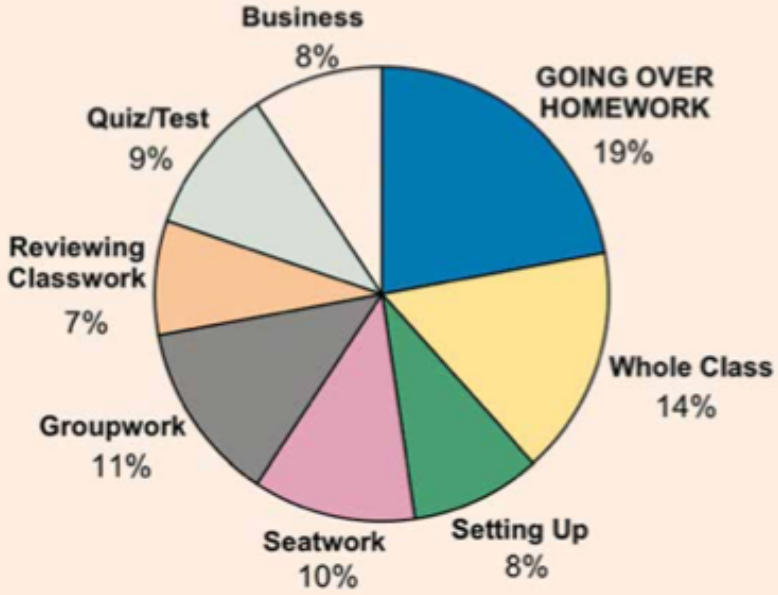
**Fig. 1** The percentage of class time spent in various classroom activities is clearly delineated.




**Source:** Adapted from Otten, Herbel-Eisenmann, and Cirillo (2012)

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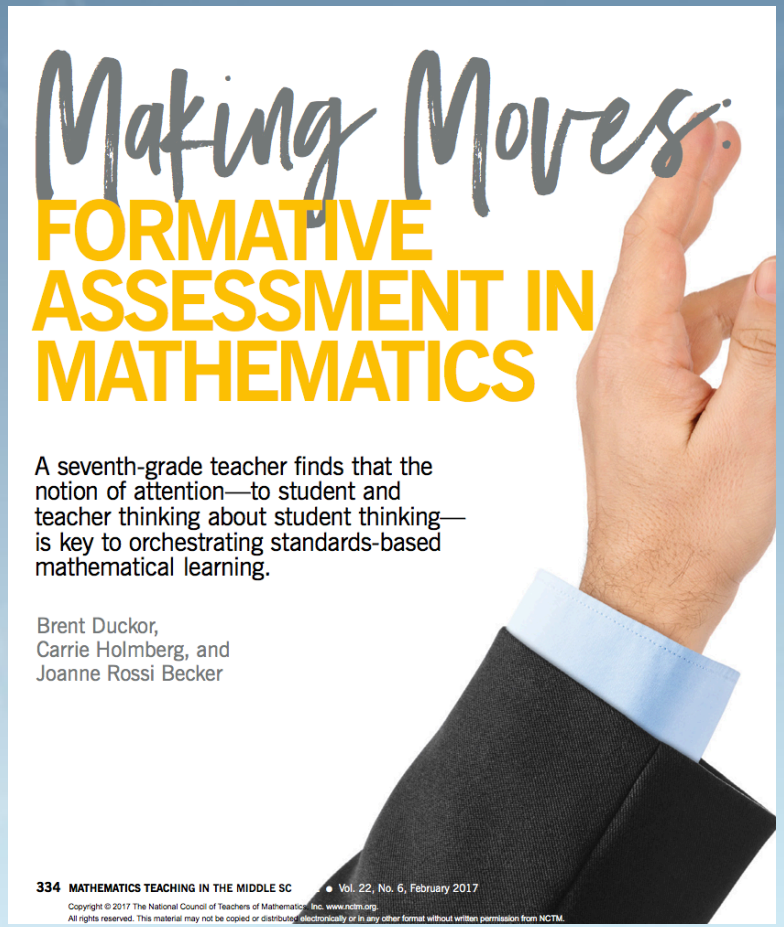
**Table 1** Possible discourse patterns are analyzed for their implications.

| Discourse Patterns | Implications |
|---|---|
| Talking over individual problems, one at a time | • Focus is on the mechanics of one problem rather than big mathematical ideas.<br>• Student discourse is limited to calling out problem numbers or simply describing what students did on a specific problem. |
| Talking across problems | • Focus is on big mathematical ideas or connections and contrasts between problems.<br>• Student discourse can involve the SMPs, such as problem solving, looking for structure or regularity, or reasoning abstractly. |
| Talking about correct answers/ explanations | • Focus is on correct thinking.<br>• Ideas and approaches previously taught are repeated.<br>• The importance of correctness in mathematics is emphasized. |
| Talking about student errors/difficulties | • Focus is on students' actual thinking.<br>• Ideas previously taught may be complemented or clarified.<br>• The importance of careful reasoning and the SMP of persevering, constructing and critiquing arguments, or attending to precision are emphasized. |

# MTMS Feature Article – Pedagogy

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# MTMS Feature Article – Pedagogy

**Fig. 1** A teacher can orchestrate formative assessment (FA) moves in myriad combinations.


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# MTMS Feature Article – Pedagogy

**Fig. 4** "Materials = Cardboard —> Surface Area" episode. The teacher uses FA moves in combination to support students in connecting language to mathematical concepts.

*Teacher:* [*Priming,* saying to both Ornetta and the entire class] That's a great question! Why don't we ask that of everybody? That'll help. [*Bouncing* Ornetta's one-on-one question out to the entire class, *posing* it to everyone] This team asks, "Didn't all of our boxes have the same amount of material?"

[*Pause* 3+ seconds]

*Brianne:* Yeah. [Teacher *bins* this response as an incorrect response/misconception.]

*Nadia:* They all had 24 blocks.

*Teacher:* They all had 24 blocks. [*Posing*] Did anything change as you changed your arrangements?

*Matteo:* No. [Teacher *bins* this as incorrect response/misconception.]

[*Pause* almost 3 seconds]

*Teacher:* [*Probing*] What changed as you changed your arrangements? [*Bouncing* to Abby] Abby, what changed?

*Abby:* The surface area.

*Teacher:* [*Posing* to all] The surface area changed. So, when we think of surface area changing, what materials might we associate with the surface area of a box?

[*Pause* of 11 seconds]

*Teacher:* [*Bouncing* to Jack] Hey Jack, if you had to guess, what material would you associate with the surface area of a box?

*Jack:* The walls.

*Teacher:* The walls. [*Probing*] Jack, what are the walls of the box made out of?

*Jack:* Cardboard.

*Teacher:* Cardboard. So let's come to an agreement as a group. When I talk about material, let's say that material means cardboard. [*Tagging* by writing "material = cardboard" on whiteboard.] Right? Material means cardboard. And when we're talking about the cardboard of a box, the mathematical concept that we're focused on is…

*Several students:* Surface area. [*Tagging* by writing " —> surface area"]

*Teacher:* [*Priming out*, supporting FA class culture] Ornetta, I'm so glad you asked that question because it seemed like maybe some other people had the same question.

***Unpacking Student Misunderstandings: One Move at a Time***

**Figure 4** is a transcript of Sevan's response to Ornetta's question, coded with FA moves. It illustrates Sevan's using the moves to discover academic language and conceptual challenges that students were having concerning volume, surface area, and the word *materials,* and how Sevan addressed these issues as a class before releasing students for teamwork.

Sevan used FA moves to widen access to the curriculum. He took up Ornetta's "me-and-you" question, about the boxes having the same amount of material; *primed* the class for it; *bounced* her question to the entire class; *posed* further questions to everyone; *probed*, *paused*, and *tagged* the class responses on the SMART Board™; and then *primed* again by explicitly reinforcing the importance of Ornetta's question. Each move reflects Sevan's appreciation for students' levels of mathematical understanding as "progressions," not merely pacing challenges to be overcome.

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# MTMS Feature Article – Pedagogy

The middle school mathematics teachers in this study saw the language, concepts, and use of the seven FA moves as practical, accessible, and concrete. Sevan told us, "If formative assessment equals listening, FA moves help you listen further. More student voices are heard and heard better." The notion of atten-

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# Contribute to MTMS

- Readers write
- Solve it
- Cartoon Corner
- Palette of Problems

# How to get published in -


**Preparation**

- Develop a lesson that uses one or two activity sheets
- Use the lesson with your students

**Writing your lesson**

- Identify clear mathematical objectives
- Suggest lesson introduction
- Describe pitfalls experienced by students

# How to get published in -


When you find a real-life application of a math concept:

- Provide 1000-1500 word introduction
- Construct 4 – 8 mathematics questions

The entire article should fit on one journal page (~300 words, not including solutions).

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# If you feel that you're not a writer

think about becoming a referee for *MTMS* or any of the other journals.

- Your opinion matters
- You can help steer the direction of the journal
- Anyone who is a member can register to be a referee:

http://mtms.msubmit.net