



# MathBits

## The Power of a Good Mistake

By NCTM President Linda M. Gojak

(Excerpted from *NCTM Summing Up, January 8, 2013*. Reprinted with permission.)

*“It has been a long trip,” said Milo, climbing onto the couch where the princesses sat; “but we would have been here much sooner if I hadn’t made so many mistakes. I’m afraid it’s all my fault.”*

*“You must never feel badly about making mistakes,” explained Reason quietly, “as long as you take the trouble to learn from them. For you often learn more by being wrong for the right reasons than you do by being right for the wrong reasons.”*

— Norton Juster, *The Phantom Tollbooth*

How often do our students consider their mistakes to be signs of failure? How many students, as well as parents, believe that the goal of learning mathematics is solely to get the correct answer? How often, on arriving at an answer, do students believe their thinking about the problem is finished? In *The Phantom Tollbooth*, author Norton Juster offers a valuable contrasting perspective:

Just as Reason explains to Milo, students can use their mistakes as learning opportunities to develop a deeper understanding of the mathematics that they are doing—although we may need to help them along the way.

Can you recall an experience when an important mistake helped you to understand an idea or a skill that was not clear? For me, it was learning to sail. I took a sailing class in the adult education program at our local high school. No matter how many times I read the explanation, I could not understand the difference between a “tack” and a “jibe”—two methods of turning

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## Plan to Attend—MCTM Spring Conference April 26-27 in Duluth

### Teaching and Learning Mathematics in the Age of Innovation

#### Friday Keynote Speaker

Neurologist and veteran teacher **Dr. Judy Willis** will speak about how teachers can use breakthroughs in neuroscience to harness the stimuli and circumstances that grab students' attention and motivate them. She will also present a session titled: *Motivating Active Learning, Memory, and Perseverance by Harnessing the Power of the Video Game Model*.

#### Saturday Keynote Speaker

**Linda Gojak**, President of the National Council of Teachers of Mathematics will be featured on Saturday. Her 28 years of classroom experience and numerous, successful leadership experiences provide a rich background to share with conference goers. She is author of the book *“What’s Your Math Problem? Getting to the Heart of Teaching Problem Solving.”*

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## Goals of MCTM

- To develop an active interest in the science of mathematics.
- To help provide opportunities for the exchange of ideas and materials regarding instruction in mathematics.
- To further the study of problems relating to the teaching of mathematics at the elementary, secondary, and college levels.
- To work for the improvement of mathematics instruction at the elementary, secondary, and college levels in Minnesota.
- To work for the improvement of employment and service of members of the Council and members of the profession in general.



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A man is like a fraction whose numerator is what he is and whose denominator is what he thinks of himself. The larger the denominator, the smaller the fraction." (Leo Tolstoy)

# President's Message

**Michelle Luke, MCTM President**

This is the time of year to give thanks to all of the wonderful people that surround you! I am particularly grateful to the members of the MCTM Board and Executive Committee for all of the great work they do for us.

The members of the Board and Executive Committee have been working on the strategic plan, a new plan for Teacher Incentive Grants, the budget and goal setting for appointed positions on the Board.

We are in the midst of planning for the Ross Taylor Symposium for Leadership in Mathematics Education and the MCTM Spring Conference (April 25-27). I know they will be fantastic! Please plan to join us.

## **Strategic Plan Update**

We identified four areas of need—Effective Communications, Equity, Professional Development and Mathematics District Leadership. I am including an update of the plan.

### Identified Need: **Communication**

Goal: To effectively connect with mathematics educators in Minnesota

- Objectives:
1. Conduct the annual election electronically
  2. Explore new technologies for communicating with members, for example, an MCTM blog.
  3. Utilize Constant Contact to regularly communicate with the MCTM membership

We have met objectives #1 and #3 and continue to work on objective #2. The Technology Committee is always looking for new ideas and members.

### Identified Need: **Equity**

Goal: To take a leadership role in the area of equity and the role of mathematics in equity.

- Objectives:
1. Create a task force for the purpose of addressing equity issues.
  2. Work to reduce the gap in mathematics.
  3. Write an equity position paper.

The District Math Leaders Task Force will be working on equity issues. We continue to think about how to best address this area of need. Please see the position paper, *Equity in Mathematics Education* at [www.nctm.org](http://www.nctm.org).

### Identified Need: **Professional Development**

Goal: Encourage and promote meaningful and effective teaching and learning for all by providing high quality professional development to members.

- Objectives:
1. Provide regional professional development opportunities.
  2. Inform members of professional development opportunities offered around the state.
  3. Support teachers new to the profession.
  4. Provide resources to members related to Standards and assessment.

This strategy has been assigned to the Board. We are co-offering **Mathematics Informational Webinars** with the Minnesota Department of Education this school year to see if this is a practical venue for professional development. There is a link with more information regarding the dates and sign-up at [www.mctm.org](http://www.mctm.org). Continued work is necessary; please let us know of your needs in this area.

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Identified Need: **Mathematics District Leadership**

Goal: To build district level mathematics leadership in our state.

- Objectives:
1. Provide a network to support district-level mathematic leaders.
  2. Develop state math leaders from across the state.
  3. Create a repository of resources for district leaders.

This strategy has been assigned to the Mathematics Leadership Task Force. The Task Force has identified leaders from across the state and will be planning future activities.

We sponsored a two-day **PRIME Leadership Academy** to train leaders willing to provide a workshop on the principles of the PRIME Leadership Framework (NCSM) in your area. The four principles for math education leaders are: equity, teaching and learning, curriculum and assessment. We hope to follow-up on the Academy for participants from last summer and offer new sessions for math leaders this summer.

We are exploring becoming an affiliate of the National Council of Supervisors of Mathematics. More information will follow. Self-identified leaders will be receiving e-mail summaries of the Mathematics Leadership Task Force Meetings. Join us on Twitter @MNmath4all.

Please let me know if you have feedback on any of the strategies or are interested in working on any of them.

## **Common Core Standards for Mathematical Practice —not official for MN, but yet helpful**

Though Minnesota has not adopted the Common Core State Standards for Mathematics, the work does offer some helpful insights and guidance for Minnesota mathematics educators. The eight Standards for Mathematical Practice in the Common Core build upon the NCTM Process Standards (*Principles and Standards for School Mathematics*, 2000) and the strands of mathematical proficiency as described in the National Research Council's *Adding It Up: Helping Children Learn Mathematics* (2001). They describe the types of abilities and habits of mind that mathematics teachers at all levels strive to develop in their students.

The first of the mathematical practices standards states that students should be able to, “**make sense of problems and persevere in solving them,**” and is elaborated as follows.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need.

Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

This description articulates what many of Minnesota’s mathematics teachers are aiming to develop on a daily basis. Exploring what the remaining seven Standards of Mathematical Practice promote may give you encouragement in the challenging task of developing well rounded and proficient students and may provide you with the language to describe some of the things you are already doing. The mathematical practices can be found at <http://www.corestandards.org/Math/Practice>

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a boat—one much safer than the other. Later, while sailing on Teachers’ Pet, a 22-foot sloop, a heavy wind came up. We needed to head back to the dock. I called out the warning “hard-a lee” as I prepared to tack. Before I realized my mistake, the wind hurled the boom and the mainsail across the cockpit. It was too late. I had pushed the tiller in the wrong direction. Luckily, no one was hurt. Only after this hands-on experience did I clearly understand the sailing phrase “turning on the wind,” the description of tacking that I had read so many times in the textbook. I never confused a jibe with a tack again! I often share this story with my students after telling them they have made an important mistake. I know they don’t understand all of the nuances of sailing, but I suspect they know I had learned something important by making that mistake many years ago.

Helping students to learn from their mathematical mistakes can give us insight into their misconceptions and, depending on our instructional reactions, can enable them to develop deeper understanding of the mathematics they are learning. Meaningful assistance encompasses more than fixing a careless error related to poor study habits, such as misreading directions, miscopying a numeral, or forgetting a sign. Although we can easily and explicitly address careless errors in our instruction, it can be more challenging—but potentially much more rewarding—to address errors that fall into the special category of productive mistakes. These are the mistakes that have the potential to promote rich learning.

How we respond to productive errors can encourage or discourage student thinking and learning. As you reflect on your own instructional practice, which of the following describes your response to productive errors?

Do you—

- ◆ assign a smaller number of carefully selected problems, with the expectation of having students devote more time to reasoning and making sense, rather than requiring them to go through the full litany of exercises found in the text?
- ◆ ask students to explain their reasoning about whether an answer is correct or incorrect?
- ◆ take the time to analyze students’ errors, both written and oral, to determine misconceptions that students might have and how you can address those misconceptions?
- ◆ follow productive errors with probing questions that offer students different approaches for reflecting on their thinking, or do you simply mark errors as wrong and demonstrate the “right way” to do the tasks?
- ◆ provide students with mathematical tasks that—
  - \* are accessible to all students and extendable for those able to go further;
  - \* allow students to use strategies and make decisions;
  - \* involve students in testing, proving, explaining, reflecting, and interpreting to reach and share their solutions;
  - \* promote discussion and communication;
  - \* foster originality; and
  - \* encourage “what if” questions?
- ◆ allocate sufficient class time to discuss students’ strategies and thinking?
- ◆ explicitly work to persuade students and parents that mathematics is more than getting the correct answers?

As you strive to implement standards designed to ensure that students master mathematical practices and mathematical content—whether they are the Common Core or your own state or provincial standards—remember that how you respond to “good” mistakes has the potential to discourage students or to help them become more confident in their ability to do mathematics. This new confidence can transform student attitudes toward learning mathematics.

**“I often share this story with my students after telling them they have made an important mistake.”**

**What “good” mistakes have you responded to recently?**

Along the way, you can share some examples of mistakes that have changed the world. Some of the more notable “mistakes” include Coca-Cola, sticky notes, rubber tires, chocolate chip cookies, and penicillin. You never know what the next great mistake may be!

## Lots of LOTS or Lots of HOTS? That is the Question!

### Christy Hemp, District 2 Director

When I look back on my teaching & learning experiences, I have a very vivid memory of when I discovered the power of questions. I was a 7<sup>th</sup>-12<sup>th</sup> grade math teacher in a very small district in southwestern Minnesota; in fact I was the only math teacher. It was during the fall of 2002 and I had received an assignment from my master's course to document the number of questions and types of questions I used with students over one week in one of my courses. I had a 12<sup>th</sup> grade student help me collect my data during the Geometry course.

The results? My responses to students were in question form only 23% of the time and 97% of those questions were **lower order thinking (LOTS)** questions. WHAT?!? It turned out that when a student wanted me to check their work, my response when they were correct was a statement and when they were incorrect in some manner I asked a question. I had been frustrated for many years that students were so dependent upon me and not very willing to move ahead with work until I'd validated their answer. The results of my assignment told me that I was: 1) training my students to be dependent on my responses; 2) indirectly emphasizing their answer and not their thinking (definitely not what I wanted); and 3) not guiding them in how to think more deeply. Ugh!!

It wasn't easy breaking my bad habits, but I began replacing my old ways with questions. I made a deal with my students that if they caught me responding in any manner other than a question, then they would receive a reward of some type. I needed many reminders! The types of questions I used also became more varied and focused on increasing the **higher order thinking (HOTS)** in my classroom. Since that time, I have found that when a student is guided to think more deeply about their thinking then their learning becomes more focused on the how and why rather than only the what. No longer living in a world of lots of LOTS, I am now addicted to lots of HOTS. I just can't find enough ways to use them!

#### Question Resources:

Question Charts (Q-Charts)

[http://www.educationoasis.com/curriculum/GO/GO\\_pdf/Q\\_Chart.pdf](http://www.educationoasis.com/curriculum/GO/GO_pdf/Q_Chart.pdf)

<http://www.teachersatrisk.com/wp-content/uploads/2006/12/q-chart-version-2.pdf>

<http://www.jillycharts.com/products/Q%252dChart.html>

*Student-Generated Questions in Mathematics Teaching*

<http://www.netm.org/publications/article.aspx?id=30407>

*Are we asking the right questions?*

<http://www.bostonglobe.com/ideas/2012/05/19/just-ask/k9PATXFdpL6ZmkreSiRYGP/story.html?camp=pm>

*How to Use Bloom's Taxonomy in Class*

[http://www.ehow.com/how\\_7807583\\_use-blooms-taxonomy-class.html](http://www.ehow.com/how_7807583_use-blooms-taxonomy-class.html)

Bloom's Taxonomy Questions

<http://www.bloomstaxonomy.org/Blooms%20Taxonomy%20questions.pdf>

Critical Thinking—Lesson Cast

<http://lessoncast.org/lessons/#area=11&grade=all&sortby=date>

The Right Question Institute

<http://rightquestion.org/>

TEDx Video—*Did Socrates Get It Wrong?*

[http://www.youtube.com/watch?v=\\_JdczdsYBNA&feature=youtu.be](http://www.youtube.com/watch?v=_JdczdsYBNA&feature=youtu.be)

**What are your strategies for incorporating HOTS questions in your classroom?**

#### Try this—The Shortest Path Problem

Place three tacks on a bulletin board in a triangle, a reasonable distance apart.

Using string and a ruler, try to determine the shortest path connecting the three points.

This problem is not as simple as it may sound, and may make students more anxious to try.

Actually, the solution is quite surprising...try it...think about it...and stay tuned....

An extension is to consider the shortest path connecting the four vertices of a square.

# A Helpful Resource for Formative Assessment Techniques

Russ Davidson, District 8 Director

We are currently using the book *Mathematics Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning* by Page Keeley and Cheryl Rose Tobey (2011) as a resource in our MSTP (Grades 3-5) Math-Science Academy which is part of the grant we were awarded through MDE. I have written a summary of the contents of the book, an excerpt of which is included here. The full summary is more extensive and I would be happy to provide my entire summary as well as the "10" FACTs that I developed from the book. Please contact me (Russ) by email for more information.

**Purpose and Need** – Formative assessment can significantly improve student learning, but sadly it is missing from many classrooms (Black, et al.) The purpose of this book is to provide teachers with guidance, suggestions, and techniques to improve teaching and learning in the math classroom. This book expands on the theoretical rationale for using formative assessment by identifying and describing content-specific practical techniques teachers can use to build rich formative assessment strategies for the math classroom.

The acronym **FACT** is used to label 75 techniques included in this book. **FACT** stands for **F**ormative **A**ssessment **C**lassroom **T**echniques. Through the varied use of FACTs, explicitly intended to gather information about or promote student's thinking and learning, teachers can focus on what works best for learning and design and modify lessons to fit the needs of the students.

**Chapter 1** – Provides an introduction to formative assessment in the math classroom. It describes the link between assessment, instruction, and learning. It describes what a FACT is and the cognitive research that supports the use of FACTs. It describes the learning environments that support assessment, instruction, and learning. It examines the relationship between teaching and learning and describes new roles and implications for a formative assessment-centered classroom.

**Chapter 2** – Focuses on the use of FACTs to integrate assessment, instruction, and learning. It examines the connection between assessment and instruction and describes a learning cycle model in mathematics called the **M**athematics **A**ssessment, **I**nstruction, and **L**earning (**MAIL**) cycle. It describes how formative assessment promotes learning in the math classroom, including the role of meta-cognition, self-assessment, and reflection.

**Chapter 3** – Addresses considerations for selecting, planning for, and implementing math formative assessment. It also provides suggestions for ways to use this book with PLCs. It includes a matrix for matching FACTs with the main purposes for use in teaching and learning as well as secondary purposes.

**Chapter 4** – Is the heart of the book. It includes a collection of **75 FACTs**. The FACTs are arranged in alphabetical order so that teachers can locate them by name. They are also numbered on the matrix in figure 3.5 in the book. Each FACT uses a common format that provides a description, how it promotes student learning, how it informs instruction, considerations for design and administration, modifications that can be made to a FACT for different types of students or purposes, caveats for using a particular technique, general attributes, and uses in other disciplines besides math. Each FACT includes an example that shows or describes how the FACT is used in mathematics. Space is provided after each FACT to record your notes on how it worked in your classroom and any modifications or suggestions for further use.

The appendix contains an annotated list of resources referred to in Chapter 4, as well as additional resources useful for expanding your knowledge of formative assessment, building a repertoire of strategies and accessing ready-made probes. In addition, several websites are provided that focus on formative assessment.

Here is an example of one of the 75 FACTs #1 Agree or Disagree?

Statement	How can you Find Out
1. $9/16$ is larger than $5/8$ . __ agree __ disagree __ it depends on __ not sure	
2. Denominators must be larger than numerators. __ agree __ disagree __ it depends on __ not sure	
3. Decimals can be written as fractions __ agree __ disagree __ it depends on __ not sure	
4. Dividing a number by a fraction makes a larger number __ agree __ disagree __ it depends on __ not sure	

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**How this FACT Promotes Learning:** A & D statements provide an opportunity for students to practice meta-cognition (thinking about their own understanding). In addition, this FACT “primes the pump” for mathematical inquiry by having students describe how they could prove each statement using concrete or virtual manipulatives or math procedures, or identify information sources that would help them determine the validity of the statement. When used in small groups, A & D statements encourages math discussion and argumentation. Through the process of defending their ideas or challenging the ideas of others, students may solidify their own thinking, consider the alternative views of others, or modify their own thinking as new information.

**How This FACT Inform Instruction:** A & D statements can be used at the beginning of the learning cycle to elicit students’ ideas about a math topic. The information helps teachers identify areas where students may need targeted instructional experiences that will challenge their preconceptions and increase confidence in their own ideas. The results can be used to differentiate instruction.

**Design and Administration:** Select A & D statements that focus on specific concepts or procedures that students must master as part of their grade level benchmark/s. Develop statements that can launch into mathematical inquiry using manipulatives, learned algorithms and procedures, or use of various information sources. Examine the MN Math Frameworks to find common errors and misconceptions related to the topic.

**Modifications:** The FACT can be modified for younger students by focusing on one statement at a time that connects to the grade level mastered benchmark, rather than a set of statements.

**Keeley, P., & Tobey, C. R. (2011). *Mathematics formative assessment: 75 practical strategies for linking assessment, instruction, and learning.* Thousand Oaks, CA: Corwin.**

**Use with Other Disciplines:** This FACT can be used in science or language arts or social studies, or visual and performing arts or .....NOW – STUDY SOME OF THE OTHER 74 THAT WILL WORK FOR YOU!

## **CONNECT**

### **Committee to Orient and Network New/Novice Educators into a Community of (math) Teachers**

#### **A resource for beginning teachers**

The future of our profession rests in the hands of our newest teachers. They have come into the profession having learned from the best research about instructional strategies, building understanding and reasoning and the use of technology to enhance learning. It is essential that those of us who are more experienced share our expertise but at the same time enable beginning teachers develop their enthusiasm and passion as they struggle to balance management, assessments and motivation.

MCTM attempts to assist both beginning and experienced teachers through the activities of MCTM CONNECT. Valuable sessions about mathematics and instructional practices are offered at MCTM conferences, the Dear Matt Mentor column appears in each issue of Math Bits, Virtual Mentoring is emailed every 2-3 weeks (contact Ann Sweeney@ajsweeney@stkate.edu to be included), live mentoring is available, plus other resources listed on the CONNECT button at [www.mctm.org](http://www.mctm.org). Our major activity for pre-service and teachers in their first few years is the CONNECT dinner and session at the DECC in Duluth on Thursday, April 25 at 7:00PM, the evening before the start of the Spring Conference.

If you are a pre-service or beginning teacher, CONNECT to MCTM through us. If you’ve been around a while, help your new colleagues to get CONNECTed

**MCTM CONNECT is an initiative of MCTM that attempts to reach out and support pre-service Math teachers and those in their first few years.**



## Ask Matt Mentor!



Dear Matt:

My school district requires that each class start with a math review of topics prescribed by the district. Our middle school has 46 minute periods and the math review sometimes takes 15 of those, which doesn't leave much time for a new lesson that includes an activity. I end up doing direct instruction most of the time and I know that's not the best practice but it seems like I don't have much choice. How can I better engage students? ~ *Crunched for Time*

Dear Crunched:

Whether or not this is a mandate there are many strong pedagogical reasons to build such a start to your lesson into your planning. Among these reasons:

- Ongoing cumulative review helps students remember what they have learned and keeps it fresh.
- Having 2-6 questions prepared and ready for students as they arrive in class helps them settle and use the first few minutes productively, a goal that is especially important if you have short class periods.
- A few brief questions can help you ascertain the readiness of students for what you plan for the day's lesson, or whether students have now grasped an idea from recent lessons some may have struggled to understand.
- Questions may sometimes extend beyond what students already know and lead to the new learning planned for the day, thus serving to whet the appetite and motivate them toward new ideas.

In other words, some questions on a daily warm up may look back to prior learning, either to keep it fresh or to give you a quick read on what students remember. Or, the questions may look ahead to topics or concepts that are coming, serving as a launch to the lesson. Meanwhile, since you will have prepared the questions ahead of time and projected them on a classroom device, you can check attendance, homework completion, or other needed tasks without eating into your valuable lesson time.

Above all, these warm-ups should be kept to no more than 5 minutes for the questions, with 2 more minutes for correcting and collecting. This is not the time to explain to individuals the ideas from the warm up, though a quick poll may suggest topics for whole class review, where many are confused. For example, after students exchange papers for correcting, you could ask: "How many do not have (correct answer) for number 3?" This tells you immediately whether only a few students, half the class or nearly all are missing the concept. Unless this is a crucial prerequisite for the day's lesson, you can note this for later individual attention to students, or a class review or re-teaching. That is, one purpose of a Warm Up activity may be to help you differentiate instruction, either in today's lesson or later.

Assuming you have some choice in determining the daily questions, vary the topics across strands (number, measurement, geometry, algebra, chance and data), and across types of responses (estimation, computation, visual representation, definitions, mental strategies, measurement, explain reasoning). If you are new to teaching, you can also discuss with your more experienced colleagues which topics are frequently forgotten by students to help you determine priorities and approaches.

You can decide on the number of questions for a day based on the types of questions. For short factual questions you could include four to six. For more complex questions, or ones requiring an explanation, you may have only two or three. The important thing is to keep this review segment of class short, and to have it ready and viewable as students enter. Set a timer if necessary, to keep you and the students aware of time.

With careful planning, this should still leave enough time to for the day's lesson. Some days this lesson may be an activity, and other days direct instruction or another instructional strategy. In each case, however, the type of strategy should be selected on the basis of what is most effective for accomplishing the day's goal, not because you run out of time. Some activities may need to be planned over two class periods. Though this may seem to take "too much" time, the yield in learning is greater if the activity is a good match with the goal. And remember, you can include a lead in or a look back to the activity in your warm-up or review questions.

So keep it short, plan it carefully, have it ready, make it a routine, expect students to begin immediately, and limit the entire process to 7 or fewer minutes. Good luck and Keep the Warm Ups short and to the point!

**Keep it short,  
plan it  
carefully, have  
it ready, make  
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expect students  
to begin...**

**Financial Assistance for Professional Development—Grants and Scholarships funded by the MCTM Foundation**

The **Arnie Cutler Scholarship for Mathematics Course Work for Middle Grades Teachers** provides funds to grades 6-8 teachers for mathematics content course work. Additional information and an application form are available on the MCTM website at <http://www.mctm.org/grants.php>. Apply by **March 31, 2013**.

The **Conference Support Grant** is available to beginning and midcareer teachers to support their attendance at the MCTM Spring Conference in Duluth on April 26-27, 2013. Additional information and an application form are available on the MCTM website. The deadline for applying for funds for the Spring 2013 Conference is **February 15, 2013**.

Teachers who receive Conference Support Grant from the MCTM Foundation to participate in the MCTM Spring Conference are asked to prepare a report on the conference experience. In this issue of *MathBits*, we share two more of these reports with you. Your contributions to the Foundation make possible the Spring Conference Support Grants that were so important for these teachers.

**Getting Answers for Puzzling Math Questions****Mardi Knudson, Instructional Coach, Sauk Rapids-Rice**

It was my first time attending the Minnesota Spring Mathematics Conference. As an instructional math coach for Sauk Rapids-Rice, I wondered what information I could gain and bring back to my district. It was exciting to attend sessions and to hear keynote speakers that both inspired me and had answers for my puzzling problems!

The Frameworks Symposium on Thursday was the resource piece to the puzzle of Minnesota assessments that I needed. Being able to go on the website for a scavenger hunt and to discuss what we were finding with colleagues helped me gain the confidence I needed to be able to work with our math staff. While I had explored this site in a limited way previously, I was reminded that the misconception, parent and differentiation pieces have a lot to offer and would be great resources for our staff.

Dan Meyer's keynote presentation kept me in awe and I identified several tips to keep in mind as we work through our puzzling technology pieces in Sauk Rapids-Rice. "Make sure there is a reason for technology," was a phrase that stuck with me. While we struggle with how to spend our limited technology dollars, this quote can help guide our decisions. I also wrote down the tip to send myself a message when I run across a perplexing problem that I want to investigate further.

**"It was my first time attending... I wondered what information I could gain and bring back to my district."**

A session I will share with my math staff was one on formative assessments. We are trying to get our assessment pieces put together so we have a clear picture of what each one is for and to identify the different forms assessment can take to collect data. The analogy about the formative assessment being the doctor diagnosing you and the summative assessments being the autopsy telling you how healthy you were will definitely make it into our district discussions!

An iPad presentation gave me many resources and ideas to take back to my math teachers. I now know to check out Notability and Air Sketch. We have some technology savvy math teachers that will appreciate being able to look up the information that will be posted to the MCTM website.

While we are coming to the last couple weeks of MCA testing in our district, the session on AIR, the test vendor for our state assessments, helped answer some questions. I will be giving teachers their class benchmark report and the grade level benchmark report. This will lead to some great reflection and dialogue. This opportunity was a great way to help us transition into the Resource tab on Learning Point Navigator or the Frameworks.

I was also moved by the presentation from the Byron staff. The similarities in our district with limited funding and needing updated algebra and geometry curriculum struck a cord. They reinforced my belief that indeed it is usually a small group of people that figure out how a perplexing puzzle can be solved with a little ingenuity and collaboration.

That is exactly what MCTM figured out for this year's conference, "Framing the Future of Mathematics in Minnesota." It was a small group of people that worked out the logistics to bring a large group of math enthusiasts together to share knowledge and collaborate. I am grateful that I was provided the opportunity to participate!

## So Much I Want to Do With What I Learned

**Joel Hogberg, Isle High School**

Headache. That's always my first feeling when I get back into my classroom after attending conferences like this year's MCTM Spring Conference. No, it is not because of the piles of work I have when I get back, but it's because there's so much I want to do with what I've learned!

I always enjoy listening to what other schools are doing. Whether it's simply asking different questions, implementing student-centered assessments, or completely flipping a classroom, the ideas I get are endless! I very much appreciate the variety of speakers with different backgrounds that present at the conference. Anyone from an experienced college professor to a first year algebra teacher has presented his or her perspectives on teaching math; each of which is equally valuable.

To name a few specific presentations, I was able to glean some great ideas from the math gurus at Mounds View High School on gateway exams, Sara VanDerWerf on important questions and effective test prep, Dan Meyer on perplexity and resources, the Byron Schools classroom flippers (and budget crunch survivors) on the flipped classroom and education transformation, and many more. And to the many other speakers I did not have the opportunity to hear, thank you for your time and efforts to communicate what you do in your classrooms.

So, now what? Well, I now have this urge to flip all of my classrooms; but I probably will start with just one or two. There are so many students that could benefit from this model that I can see it being worth the effort. I have often found my lessons often to be dry and dull to the point of boring even myself. The opportunity to spend more time with the kids and help them succeed is what drives me to do this. I know the challenging work put in to this project will be vastly outweighed by the outcomes!

I am very excited to have been awarded the chance to go to this year's MCTM conference. I believe that the best way to improve education is to communicate about it. Let's keep meeting together and sharing ideas to help us continue to provide a great education for our students!

**"Headache...  
there's so much  
I want to do  
with what I've  
learned!"**

## Additional Grant and Scholarship Opportunities

### Teacher Incentive Grant

Do you have an innovative idea that would help raise student achievement in your classroom? If funding is an obstacle, the MCTM Teacher Incentive Grant Task Force is authorized to award \$1500 to Minnesota K-16 mathematics teachers to support educators desiring to implement projects in mathematics. Application criteria may be found at <http://www.mctm.org/incentivegrant.php>. The application deadline is **February 15, 2013**.

#### Selected FAQs

Q: What are the expectations if I receive the grant?

A: If you receive the grant, it is expected that you would complete the project and use the money as outlined in your application. It is also expected that you would write a report at the completion of the project. If possible, your report would be made available to other MCTM members so they could duplicate your ideas in their own classroom.

Q: What kinds of equipment can I request?

A: Any equipment is fair game. However, the project must have a plan for the equipment. Other educators must be able to replicate your project. The focus of the grant project is on the project, not just a piece of equipment. Equipment does not meet the standards or use best practices. In your application, portray your ideas and innovations which will use the equipment, but also meet at least one standard and use best practices.

Q: What kinds of projects have been funded in the past?

A: In past years, projects have included: 1) a sewing machine for a geometry quilt project ; 2) supplies for an after school math club with a geometry focus for grades 3-6; 3) Projects for Geometry and Algebra involving Visual, Auditory, and Kinesthetic learning styles.

*(Continued on page 12)*

(Continued from page 11)

### **The Ross Taylor mathematics Education and Leadership Scholarship**

The Ross Taylor Mathematics Education and Leadership Scholarship is awarded by the Minnesota Council of Teachers of Mathematics to a mathematics educator for the purpose of attending the annual Ross Taylor Mathematics Education and Leadership Symposium in Duluth on April 25, 2013.

Questions on the Nomination Form include:

- ♦ What contributions has the nominee made to mathematics education at the school, district or state level, especially in the last year?
- ♦ How has the nominee furthered one or more of the stated purposes of MCTM?: Promoting an active interest in mathematics; Providing opportunities for the exchange of ideas and materials regarding instruction in mathematics; Furthering the study of problems related to the teaching of mathematics; Working for the improvement of mathematics instruction.
- ♦ In what ways does the nominee demonstrate knowledge of current issues and problems in mathematics education?
- ♦ In what ways does the nominee encourage and support fellow mathematics educators? How has s/he created a positive culture for mathematics education?
- ♦ In what ways does the nominee use self-evaluation for continued professional growth?

Nominations can be made for a colleague or for oneself by **March 15, 2013**.

## **2013 MCTM Ross Taylor Symposium for Mathematics Education and Leadership**

### **Learning to Love Math: Teaching Strategies that Change Student Attitudes and Get Results**

#### **Thursday, April 25, 2013—Workshop Presented by Judy Willis**

Judy Willis completed a medical residency and neurology residency, including chief residency at UCLA. She practiced neurology for 15 years before returning to the university to obtain her teaching credential and master's of education from the University of California, Santa Barbara.

She has taught in elementary and middle school for the past 10 years. She reluctantly left the teaching profession to devote herself full-time to teaching educators. Dr. Willis is a presenter at educational conferences and conducts professional development workshops nationally and internationally. She writes extensively for professional educational journals and has written six books about applying the mind, brain, and education research to classroom teaching strategies.

With a straightforward and accessible style, Dr. Willis shares the knowledge and experience she has gained through her dual careers as a math teacher and a neurologist. In addition to learning basic brain anatomy and function, participants will learn how to

- Improve deep-seated negative attitudes toward math.
- Plan lessons with the goal of “achievable challenge” in mind.
- Reduce mistake anxiety with techniques such as errorless math and estimation.
- Teach to different individual learning strengths and skill levels.
- Spark motivation.
- Relate math to students’ personal interests and goals.
- Support students in setting short-term and long-term goals.
- Convince students that they can change their intelligence.

#### **Who should attend?**

Administrators, district curriculum leaders, teacher leaders, teacher educators, and teams from districts or schools.

Attendees will receive a copy of the ASCD book *Learning to Love Math* by Dr. Judy Willis.

Registration information at [www.mctm.org](http://www.mctm.org)

## Resources, materials, and more...

### Free Curious George STEM Guide for K–1 Students

Just like the beloved children’s book character Curious George, children are endlessly curious about the world and how things work. They are natural engineers, mathematicians, and scientists. A new [Curious George Family Activity Booklet](#) (PDF) invites adults to join younger children in exploring math, science, technology, and engineering through play. The booklet can be used as a handout for children to bring home and share with their parents and siblings.

[http://www-tc.pbs.org/parents/curiousgeorge/activities/pdf/CG\\_ActivityGuide.pdf](http://www-tc.pbs.org/parents/curiousgeorge/activities/pdf/CG_ActivityGuide.pdf)

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### New Report on Mathematical Education of Teachers

What mathematics do teachers need to know? How can mathematicians aid teachers in learning mathematics, in collaboration with others responsible for teacher education? Current research and expertise are synthesized to answer these questions in a new report, *The Mathematical Education of Teachers II*, from the Conference Board of the Mathematical Sciences. This report updates *The Mathematical Education of Teachers*, published in 2001, and extends its scope from preparation to professional development in the context of the Common Core State Standards for Mathematics. Download the complete report for free at

<http://cbmsweb.org/MET2/>

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### Trouble with Math

It’s not surprising to many math teachers that it appears many Americans can’t find  $x$  in an algebraic equation. A Harvard study finds that the United States lags behind dozens of other countries in math. Why do we struggle so much? And what are educators doing to change the trend? NCTM President **Linda Gojak** answered these questions and more on “The Sound of Ideas” radio show. Listen to an archived recording of the broadcast at <http://www.ideastream.org/soi/entry/49294>

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### Why should I study math?

Profiles of real people who use math and related skills in a wide variety of careers. Most of those profiled use mathematics on a daily basis, while others rely on the general problem solving skills acquired in their mathematics courses. <http://www.maa.org/careers/profiles.html>

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### MAA Found Math Gallery

New math related photos posted every week, plus galleries from 2007 to the present. Interesting images from all over the world. Each is accompanied by a brief description of the math that appears. <http://www.maa.org/FoundMath/fmgallery.html>

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### Mathematical Art Galleries

Mathematical art exhibition. Art in many forms and media. Begin with the 2013 exhibition and then view previous years. Amazing! <http://gallery.bridgesmathart.org/exhibitions/2013-Joint-Mathematics-Meetings>

<http://bridgesmathart.org/bridges-galleries/art-exhibits/>

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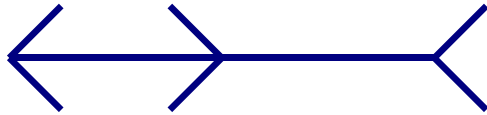
### Share your interesting mathematical finds and favorite math resources!

Briefly describe what it is, why you like it, and how you use it. Provide a link of a reference.

Submit for inclusion in *MathBits*—see *submission instructions on the last page*.

### Multiplication Mix-Up

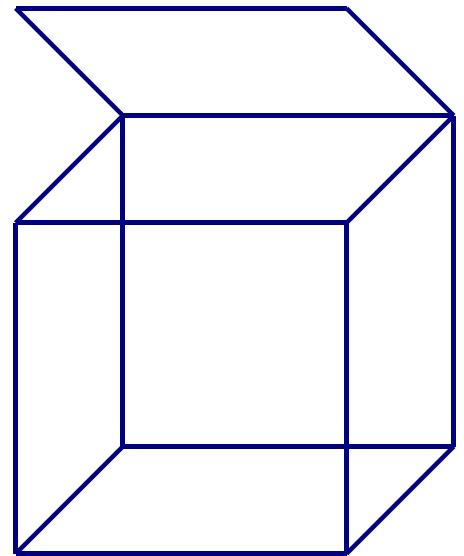
Your multiplication tables are "scrambled." The columns and rows have been moved around to different positions. Use your knowledge of multiplication and good reasoning to fill in all the blank cells in the tables.



Which horizontal section is longer?  
Guess, and then check it.

<b>x</b>			<b>5</b>						<b>2</b>	
<b>10</b>										
										<b>24</b>
					<b>7</b>			<b>63</b>		
		<b>6</b>					<b>8</b>			
					<b>8</b>	<b>64</b>				
			<b>18</b>							
	<b>63</b>									
								<b>4</b>		
<b>3</b>										

<b>x</b>	<b>7</b>					<b>9</b>			
<b>5</b>	<b>35</b>								
						<b>9</b>			
			<b>7</b>						<b>21</b>
		<b>48</b>							
					<b>45</b>			<b>54</b>	
					<b>20</b>				
			<b>32</b>				<b>16</b>		
<b>4</b>									<b>12</b>
		<b>80</b>							
					<b>30</b>			<b>18</b>	



Is the lid on the box tilting backward or forward?  
Can you see the box with either square face in front?



# 2013 SPRING MATHEMATICS CONFERENCE

April 26 - 27, 2013

Duluth Entertainment Convention Center (DECC)  
Duluth, MN

# "Teaching and Learning Mathematics in the Age of Innovation"

- Assessment
- Technology
- Curriculum
- Number and Operations
- Algebra

## ADVANCE REGISTRATION FORM

### SPRING CONFERENCE REGISTRATION RATE INFORMATION

- Friday and Saturday registration fee includes two lunches and the Friday evening President's Reception
- Saturday only registration includes one lunch - There is no Friday only registration
- Non-member and local speaker registration fees include a one-year MCTM membership fee. After this date, no refunds will be given.
- For online requests received by April 19, 2013, MCTM will refund 50% of your registration fee. After this date, no refunds will be given.
- Register by Friday, April 5, 2013 to receive the "Early Bird" discount rate
- Advance registration closes Friday, April 19, 2013. After this date you may register on-site

### PERSONAL INFORMATION

NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 HOME PHONE \_\_\_\_\_  
 WORK PHONE \_\_\_\_\_  
 EMAIL \_\_\_\_\_  
 SCHOOL \_\_\_\_\_

### POSITIONS LEVEL

- Teacher/Professor/Instructor
- Specialist/Coach/Supervisor
- Administrator
- Undergraduate Student
- Other
- Retired

- Elementary
- Junior High/Middle School
- High School
- District
- Post Secondary
- Other

### MEAL INFORMATION

- Vegetarian meals requested
- Gluten free meals requested

### CONFERENCE REGISTRATION FEES

	Early Bird	Regular Rate (After 4/5)	Saturday Only (No Discounted Rate)
MCTM Member	\$175.00	\$190.00	\$120.00
Non-member	\$200.00	\$215.00	\$140.00
Student Member	\$ 90.00	\$105.00	\$ 60.00
Student Non-member	\$100.00	\$117.50	\$ 77.50
Local Speaker	\$ 60.00	\$ 75.00	\$ 40.00
Retired Member	\$ 90.00	\$105.00	\$ 60.00
Retired Non-member	\$100.00	\$117.50	\$ 77.50

### MCTM MEMBERSHIP RENEWAL (Optional)

- Regular Membership
- Student/Retired Membership
- 1 Year - \$25.00
- 2 Year - \$40.00
- 1 Year - \$12.50
- 2 Year - \$20.00

### CONFERENCE LOGGING

For information about conference logging in Duluth see [www.mctm.org](http://www.mctm.org)

### PAYMENT INFORMATION

Amount Due \$ \_\_\_\_\_

Registration Fee \$ \_\_\_\_\_

Membership Dues \$ \_\_\_\_\_

Foundation Contribution \$ \_\_\_\_\_ (Optional)

TOTAL DUE \$ \_\_\_\_\_

Method of Payment

Credit Card \_\_\_\_\_ VISA \_\_\_\_\_ MasterCard \_\_\_\_\_ American Express \_\_\_\_\_ Discover \_\_\_\_\_

Card Number \_\_\_\_\_

Expiration Date \_\_\_\_\_ Security Code \_\_\_\_\_ Billing Zip Code \_\_\_\_\_

Name on Card \_\_\_\_\_

Check payable to MCTM

PO Number \_\_\_\_\_ (Purchase order must be attached)

Mail to: MCTM  
 PO Box 289  
 Wayzata, MN 55391

Questions concerning registration or payment?  
 Contact: Tom Muschinski  
 612-218-1428  
[mctm@mctm.org](mailto:mctm@mctm.org)

Minnesota Council of  
Teachers of Mathematics  
P.O. Box 289  
Wayzata, MN 55391

Michele Luke, President  
michele\_luke@hopkins.k12.mn.us

Tom Muchlinski, Exec. Director  
612 - 210 - 8428  
mctm@mctm.org

[www.mctm.org](http://www.mctm.org)



## UPCOMING EVENTS:

**MCTM BOARD OF DIRECTORS ELECTION**

**2013 MCTM Ross Taylor Symposium for Mathematics Education and Leadership, April 25**

**2013 MCTM Spring Conference, April 26-27**

## Mission Statement

The MCTM is an organization of professionals dedicated to promoting the teaching and learning of meaningful mathematics for all students by supporting educators in their efforts to improve mathematics education.

The MCTM strives to provide membership with current information regarding mathematics education in the state of Minnesota. To accomplish this goal, we need an accurate, permanent address for each member and a correct email address. To update your address information contact Exec. Director Tom Muchlinski at 612-210-8428 or [mctm@mctm.org](mailto:mctm@mctm.org) or visit the MCTM website ([www.mctm.org](http://www.mctm.org)) membership page to make your change.

**If you received a paper copy of *MathBits*, it was a result of one of the following:**

- 1) You explicitly requested to receive a hard copy through the USPS mail by contacting the executive director at [mctm@mctm.org](mailto:mctm@mctm.org)
- 2) Messages sent to your email address have come back to MCTM as undeliverable.

If you did not make a direct request for a hard copy, it is important that you contact MCTM to verify a correct email address. Please check that messages from the address [mctm@mctm.org](mailto:mctm@mctm.org) are not being blocked by your server or being sent to your spam folder.

Submit items for publication in the next issue of *MathBits* to [tgonske@nwc.edu](mailto:tgonske@nwc.edu). Many types of contributions are welcomed. Email or call 651-638-1967 with questions or comments. Thank you. Teresa Gonske, Editor.