



Mathbits

2007 Minnesota Spring Mathematics Conference
DECC, Duluth, MN · Friday, April 27 & Saturday, April 28

*The Minnesota Council of Teachers of Mathematics
and Minnesota Mathematics Association of Two-Year Colleges*

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Explore these opportunities for engagement in mathematics at the spring conference:

- Many sessions for Pre-K through post secondary level teachers.
- Keynote speakers:
Francis (Skip) Fennell, NCTM president and Professor of Education
Joseph A. Gallian, MAA president and Professor of Mathematics
- Networking with other teachers during the Friday MCTM reception.
- Special sessions for new teachers and preservice teachers.
- Be part of the future of MCTM by attending the annual Delegate Assembly. Contact your District Director to see how you can get involved.

Featured Keynote Speakers

Francis (Skip) Fennell

Issues In Teaching and Learning Mathematics – Things to Think About!



Francis (Skip) Fennell is the current NCTM president. Dr. Fennell is also Professor of Education at McDaniel College (formerly Western Maryland College) and has more than 35 years of experience as a classroom teacher, principal, supervisor, teacher educator, and author. Dr. Fennell also was president of the Association of Mathematics Teacher Educators 2001–2003.

Fennell received the Glenn Gilbert National Leadership Award from the National Council of Supervisors of Mathematics in 2002. He earned a bachelor's degree in elementary education with an emphasis on mathematics and science from Lock Haven University of Pennsylvania, a master's degree in education

Upcoming Events:

- Symposium on Mathematics Education
- Spring Conference

Mathbits

Greetings from the President

Karen Coblentz
MCTM President

Greetings from the Minnesota Council of Teachers of Mathematics! I hope your winter has gone well and that you are eagerly anticipating the arrival of spring. At the time I am writing this column, the weather has been much warmer than usual, and we haven't seen too much of the snow! However, our school district did get out of school early the day before winter vacation at 1:00 so that was a nice gift!!!

We have many things happening with MCTM. First, Tom Muchlinski has started his work as our part-time executive director. Tom will share this position with Arnie Cutler as he learns about his new position. Tom is handling all spring conference registrations and questions. He has been part of the MCTM Board for many years so he comes with much experience of our organization.

We also held our election during December. We had very strong candidates for each of the positions and thank all members who ran for office. We offer congratulations to the following people who will officially join the MCTM Board during our spring conference:

- Bill Tomhave – VP Math Education
- Michelle Bacon – VP Middle School/Junior High
- Betty Johnston – District 3 Director
- Kathleen Miller – District 6 Director

We thank our Spring Conference Chairs Jeannine Salzer, JoAnn Luhtala, and Patty Wallace. They, along with Denise Anderson, our Program Chair, have been working hard to get ready for a great conference! We hope many of you can make it to Duluth in April and have time to grow professionally and network with math teachers from around the state and nation.

Have a great month!!!

Karen Coblentz
Karen.Coblentz@dc.k12.mn.us



Your \$\$\$\$ Needed—Support the MCTM Foundation

MCTM Foundation

The MCTM Foundation has an endowment fund whose investment returns are used to support activities that promote continued excellence in mathematics education in Minnesota. During the spring conference, the MCTM Foundation will have a table in the DECC exhibit hall. Stop by to visit with members of the Foundation Governing Board. Get acquainted with this year's recipients of Foundation grants for conference participation. Find out how your contribution will be significant for the long-term advancement of mathematics education in Minnesota. Everyone can be a Foundation donor.

Pi Twins celebrated their first birthday on Pi Day, March 14!

Joan A. Cotter shares this pi tidbit with us:

"I have grandnephew twins born March 14, 2006 in Colorado. Their names are Patrick John and Isaac Benjamin."

Science Quotes from Kids regarding the Sun.

For more, visit
www.juliantrubin.com/kidsquotes.html

"Most books now say our sun is a star. But it still knows how to change back into a sun in the daytime."

"The tides are a fight between the Earth and Moon. All water tends towards the moon, because there is no water in the moon, and nature abhors a vacuum. I forget where the sun joins in this fight."

"While the earth seems to be knowingly keeping its distance from the sun, it is really only centrifugating."

(Continued from page 1)

from Bloomsburg University of Pennsylvania, and a doctorate in curriculum and instruction in mathematics education from Pennsylvania State University.



Joseph A. Gallian

Dr. Joseph Gallian, Distinguished Professor of Teaching and Professor of Mathematics at the University of Minnesota-Duluth, is currently president of the MAA. Dr. Gallian has received a host of honors and awards, including the Carnegie Foundation for the Advancement of Teaching Minnesota Professor of the Year Award, MAA Polya Lecturer, MAA Trevor Evans Award for Exposition, and MAA Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching.

Dr. Gallian earned a B.A. from Slippery Rock in 1966, an M.A. from Kansas in 1968, and Ph.D. from Notre Dame in 1971. He has taught at the University of Minnesota Duluth since 1972 and has authored many books and professional papers.

Sampling of Conference Sessions

General Interest

MN Math Standards (3rd Revision)
 Defining a Standards Based curriculum to Use as a Guide in Decision-Making
 Lesson Study Japanese Model
 Minnesota's Math Test for English Language Learners (MTELL)
 What is it good for? Using Mathematics after college
 The NCTM curriculum Focal Points: What They Say – What They Don't Say
 What's New in MN Assessment?

K-2 Interest Level

How Do You Measure Up?
 Exploring Area and Perimeter with Pentominoes
 Learning the Basic Facts: Opportunities to Learn Important Mathematics
 Understanding Place Value
 Ins and Outs of Having a Family Math Night
 Algebra in the Primary Grades? You Bet!
 Every Day Counts Calendar Math: A lot of Math in a little time
 Making Change in Teaching Money

3-5 Interest Level

Practicing Number Facts in Problem Solving Activities
 Real Assessment Through Engaging Activities
 Bloomin' cubes: Folding, Measuring, Estimating, and Predicting
 Preparing Students for Open-Ended Questions on High-Stakes Tests
 Division Strategies and Place Value: Building Multiplicative Reasoning
 Measuring: From Cells to Dinosaurs
 Hands On Fun With 3D Geometry
 Partner Games: Great Math Games for Hands-On Learning

6-8 Interest Level

Multiple Representations: The Power of Dynamic Linking
 Where Are We? Where Are We Going? "BE INSPIRED!"
 Geometry and the Earth: Connect Geometry and the Real World
 Young Minds and Math Principles: Engaging the "Pre-Algebra Mind"
 Using Thinking Maps in the Classroom
 Algebra Readiness: Effective Algebra Prep Over Time
 Best Practice in Mathematics: Calendar Math and Algebra Readiness
 Solving Algebraic Equations: Making it Tangible

9-12 Interest Level

Fractal Dimensions – A Classroom Activity
 Actuarial Science as an Applied Mathematics
 AP Calculus Games and Projects
 Research on Graphing Calculators: Implications For Your Classroom
 Formative Assessment: A Window In To Student Thinking
 HS Curricula and Student Achievement in College Mathematics
 Finding the Deeper Structure in a Prosaic Motion Problem
 Making Secondary Math Visual Using Algebra Tiles

College Interest Level

Teaching Mathematics Methods: Expanding the Conversation
 Creating Truly Interactive Web Pages for Exploring Geometry
 Thinking About Combinations and Permutations
 Lesson Study and the Fundamental Theorem of Calculus

Online conference registration and printable registration forms are available on the MCTM website.

Addressing the Achievement Gap: Algebra Every Year for Every Student
Thursday, April 26, 2007

**Ninth Symposium
on Mathematics
Education**

Algebra has long been regarded as the gateway for students in their study of advanced mathematics. Students' lack of success in their study of algebra as well as a lack of success in their preparation for a formal algebra class is one of the defining characteristics of the achievement gap. Legislation passed by the state legislature and signed by the governor in the spring of 2006 requires the eighth grade students of 2010-2011 to successfully complete the study of Algebra I as defined by the 2007 edition of the Minnesota Academic Standards for Mathematics. In addition, this same group of students will be the first group required to complete an Algebra II requirement (again, as defined by the 2007 edition of the Minnesota Academic Standards for Mathematics) for graduation. These new requirements, by themselves, will not close the achievement gap. In fact, they have real potential to widen it, unless we thoughtfully employ appropriate instructional strategies that are effective in helping all students develop a deep understanding of mathematics.

Who should attend?

- Administrators • District curriculum leaders • Teacher leaders
- Teacher educators • Teams from districts or schools

Why should you attend?

The symposium will provide practical tools and suggestions for addressing the achievement gap by focusing on the teaching of algebraic concepts throughout the grades K – 12. The keynote speaker and grade-level break-out sessions will:

- Examine the K – 12 implications of the new state algebra requirements and how they can help close the achievement gap.
- Actively engage participants in activities that illustrate effective instructional strategies for helping all students develop a deep understanding of important algebraic ideas.
- Discuss the importance of viewing algebra not as a one time course but as a recurring theme throughout the curriculum at each grade level.
- Explore how important mathematics concepts at each grade level, from number and operations in the elementary grades, proportional reasoning in the middle grades, and functions in the high school grades can play a role in preparing students for a successful experience with algebra.

Schedule and registration forms are available on the MCTM website.

**Notes from the
District Directors**

District Meetings will be held at the Spring Conference on Friday following the final afternoon sessions. The program book will list exact meeting locations for each district. Please come and join your district meeting to share your ideas and concerns. We will be asking for resolutions to be considered at the evening delegate assembly. All members are encouraged to attend. Each district will hold a drawing for a Gift Certificate redeemable for NCTM or MCTM materials and attendees will receive a free drink ticket for the evening reception.

The annual **Delegate Assembly** will be held Friday evening at 7:30 pm. Delegates will discuss resolutions presented at the district meetings and will vote on new resolutions for MCTM. A dessert buffet along with coffee and tea will be provided. All delegates in attendance will receive a Gift Certificate to use at the NCTM/MCTM materials booth in the exhibit hall at the Spring Conference.

Each of the eight MCTM district directors is eager to effectively represent mathematics teachers in their respective districts. One of the directors' main goals is to improve communication between the MCTM board and the MCTM membership. We want to know of questions and concerns teachers may have concerning math standards, assessment issues, types of curriculum and its use, etc. Please feel free to contact us at anytime. Each district director's current email address is listed on the website. If you are unsure which MCTM district your school is in, this information is also available on the MCTM website.

Constructing a Response

MDE has received many requests for help with preparing students to answer the constructed response items on the MCA. The example given below is based on Grade 11 benchmarks.

To help students structure their work, look at the Mathematical Reasoning benchmarks.

For grades 9, 10, 11, benchmark I.3 states:

Translate a problem described verbally or by tables, diagrams or graphs, into suitable mathematical language, solve the problem mathematically and interpret the result in the original context.

Problem 39 in the Grade 11 Mathematics Item Sampler can be solved using this approach described in benchmark I.3.

Ashley connected the following points to form a triangle: A(-2, 2), B(2, 1), and C(5, 5). She claims that the triangle is isosceles. Draw the triangle on the graph. Then use your knowledge of geometry to prove or disprove her claim.

Translating the problem into suitable math language is accomplished by drawing the triangle on the graph and indicating an understanding of the necessary conditions for the triangle to be isosceles.

Solving the problem mathematically is accomplished by showing a correct application of the distance formula (or other valid means) to find the lengths of the sides of the triangle.

Interpreting the result in the original context is accomplished by explaining how the information gained by solving the problem answers the original claim made by Ashley.

By using the structure of the benchmark, the student has given a complete response to the problem. The scoring criteria and examples of student work provided in the sampler help students see how their work is scored.

I would appreciate feedback from teachers who try this strategy.

Rosemary Heinitz

Rosemary.heinitz@state.mn.us

What's New in Statewide Assessment?

Rosemary Heinitz

Math Content Specialist
MDE Research & Assessment

The American Mathematical Society, the American Statistical Association, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics announce that the theme for Mathematics Awareness Month 2007 is *Mathematics and the Brain*.

One of the most exciting challenges in modern science is to understand the human brain and its mechanisms. Mathematics plays a vital role in the research to understand the mechanisms and function of the human brain, from its smallest components to the brain itself:

- Modeling and computational simulation have complemented laboratory experiments to understand how the brain functions at many levels;
- Theoretical models and computational methods, along with experiments guided by these models, are used to unravel the circuitry of the cerebral cortex;
- Research in the dynamics of networks is helping to understand, at a cellular and network level, how widespread synchronous patterns arise in large non-homogeneous networks, such as the brain; and
- Imaging, which depends heavily on mathematical and computational tools, provides a non-invasive method for gathering information on brain activity, form and function.

Further research in the underlying mathematics of dynamical systems and networks, statistical methods, and mathematical tools for enhancing imaging will continue to help advance our understanding of the closest of all frontiers.

Resources for this year's Mathematics Awareness Month program can be found at www.mathaware.org.

Mathematics Awareness Month

April 2007

Theme:
Mathematics and
the Brain

New Teachers to CONNECT with MCTM at the Spring Conference

Are you new at this job of teaching Math? Is someone in your school in their first few years of teaching Math? Or perhaps you're preparing to be a Math teacher. In any case, does MCTM have a deal for you!

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

On Thursday, April 26, 2007, preservice teachers and those of you in your first few years of teaching are invited to the MCTM CONNECT Session which will be held at the DECC in Duluth. It begins at 7:00 PM so you can teach on Thursday and still make it to Duluth in time. In addition to meeting and networking with other Math teachers who are relatively new to the profession, you will receive an orientation to the program booklet for the MCTM/ MinnMATYC Spring Conference that begins the next morning, April 27. You will meet State and National leaders in Mathematics Education, be eligible for a variety of door prizes and be able to help yourself to books and learning materials in the famous "**Book Giveaway**" portion of the program.

There is no charge for this event and perhaps best of all, **the food is free** courtesy of MCTM and MinnMATYC!

Sponsored by the MCTM CONNECT Committee, the evening is the Committee's biggest project of the year and will include teaching ideas and information about other MCTM services. College students participating in the MinnMATYC Mentoring program will be there along with their mentors in addition to other college/university faculty. Last year, more than 125 people attended a very motivating and useful event.



Although the CONNECT Committee has good communication with college/university faculty in teacher education, it is difficult to get information about this event and other CONNECT services to beginning teachers in the school buildings unless all MCTM members spread the word, so please help us with this. You can find a printable information flyer, that you may distribute to beginning teachers, on the MCTM website.

Reservations are not necessary and drop ins are welcome, but we do appreciate it if you let us know that you're coming or if several people are coming together so that we can pre-register you and plan appropriately. To do this, **contact Stephanie Amberg, CONNECT Session Chair, at ambergps@gmail.com**. When you arrive at the DECC, come to the MCTM Registration area and follow the signs to the CONNECT Session.

Mentors

MCTM's virtual mentoring program, conducted by Ann Sweeney of the College of St. Catherine, provides a bi-weekly email message to beginning teachers that includes teaching suggestions, problem ideas, useful websites and information about upcoming events. The Council also offers one-on-one mentoring with an experienced teacher to those who request it. In addition, we offer our Matt Mentor advice column found elsewhere in this issue of *Mathbits*. But we know that many districts designate mentors for beginning teachers and we'd like to be of service to them as well. If you or someone in your district is in the position of mentor for beginning Math teachers, please let us know so that we can share ideas, information and support.

Note regarding the Future Teachers Conference

Due to unforeseen difficulties, the Future Teachers Conference was not able to be held this year. While this is not an official MCTM conference, the CONNECT Committee has supported and publicized the event and it is our hope that it can be reestablished in 2008.

For any information about mentors or other CONNECT activities, contact Larry Luck at larryluck@aol.com

Hi Matt, I have a question. My school is looking for the BEST computer program that can help our students learn their computation facts in a fun and efficient way. Is there a computer program out there that we can purchase and that is VERY FUN for our students? Please let me know what the leading computer game is so that we can help these kids learn their facts without relying so much on flashcards.

MN upper elementary grade teacher

Dear teacher,

There is probably no single “right answer” for your question. If there were, it would be widely publicized and used by everyone. But here are some suggestions.

Most software comes with a free 30 day trial to test it. You might want to order some programs that look promising, and monitor the reactions and results you observe while your students are trying them out. Using recommendations of organizations and journals that review software, many of which give awards annually, is a good way to narrow your search.

Software, however, cannot take the place of an effective teacher, who is able to diagnose student difficulties and misconceptions, and provide sufficient conceptual background and thoughtful practice. No software, no matter how fun, can do those things as well as a good teacher.

Much research indicates that students will reach quick recall by making sense of computation, often in a problem solving context. Practice with flash cards emphasizes memorization. We know many students are not good at memorizing. So using other strategies is a better way of helping them develop quick recall. For example, skip counting is a quick means of generating multiplication facts, and strategies such as using doubles, doubles + 1, etc, can be effective for learning and remembering addition facts. Having students measure their progress against themselves gives them encouragement, and takes away the stress that sometimes accompanies timed tests.

By the upper elementary grades, valuable class time should be spent on topics at the grade level, such as decimals, dividing multi-digit numbers, and 2- and 3-dimensional shapes. However, since single digit facts are such a foundation for these advanced skills, students with gaps in these facts could use a calculator during regular grade level math lessons, while they use time outside of mathematics class to work on their single-digit facts.

Good luck as you continue to work to help all your students learn powerful mathematics!
Sincerely, Matt Mentor

Dear Matt Mentor: I am a first grade teacher in a Minnesota school district. We currently have a task force looking at nationally normed assessments for kindergarten and first grade. I am wondering if you know of assessments that other districts in Minnesota are using with success. I have found many electronic assessments for specific lessons on the NCTM website, but no specific information about nationally normed assessments for these specific grade levels. All of the information I've found pertains to grades 3 and above for electronic assessments. Any thoughts?

Thanks for your help, First Grade Teacher

Dear First Grade Teacher,

I am not aware of any nationally normed assessments for kindergarten and first grade students. More importantly, if there were a national assessment available, I would not recommend its use. There are reasons why state and national assessments typically start at grade three.

The purpose of a nationally normed assessment is to evaluate the system, not the students. That is, is the math instruction delivered in this school/district at kindergarten and first grade providing opportunity for students to achieve?

Kindergarten and first grade students are developing the core of their mathematical under-

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Ask Matt Mentor!!



Have a Question for Matt?

Send your questions about teaching math topics to MattMentorMCTM@aol.com and watch for Matt's response in the next issue of *Mathbits*.

Focus on the Middle Grades

Anne Bartel
Minneapolis Public Schools
(Retired)

Who Says Middle School Students Can't Focus?

There has been a good deal of school bashing in the news lately. It seems there is little trust in the media (or at the water cooler) that our schools can provide students with the attitudes and skills they will need to successfully compete in the 21st century. This is occurring at the same time that most teachers are working even longer and harder at their profession, facing increasingly greater challenges.

Many of the problems we face in ratcheting up student achievement are shared by teachers, classrooms, schools and districts across the country. They are systemic – not local. They cannot be fixed by changing grade-configurations, textbooks, or reward systems. They cannot be fixed by teaching algebra to all 8th graders.

The attempt to write standards both at the national and state levels has created a maze of teaching and testing targets. Textbooks are still attempting to meet all the outcomes listed in national standards, state standards, and national assessments' test specifications, including NWEA and the Iowa Test of Basic Skills. Is it any wonder that teachers and students alike are confused about what content to cover and how to interpret test results?

The National Council of Teachers of Mathematics has recognized this issue in mathematics and made recommendations to focus the teaching of mathematics at each grade level preK-8. The *Curriculum Focal Points* identify important content at each grade level that, if taught well, can build a coherent and connected mathematical foundation for students across the grades.

Consider the grade-level focus points for middle school:

Grade 6:

- ♦ Developing an understanding of and fluency with multiplication and division of fractions and decimals.
- ♦ Connecting ratio and rate to multiplication and division.
- ♦ Writing, interpreting, and using mathematical expressions and equations.

Grade 7:

- ♦ Developing an understanding of and applying proportionality, including similarity
- ♦ Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes
- ♦ Developing an understanding of operations on all rational numbers and solving linear equations

Grade 8:

- ♦ Analyzing and representing linear functions and solving linear equations and systems of linear equations
- ♦ Analyzing two- and three-dimensional space and figures by using distance and angle
- ♦ Analyzing and summarizing data sets

To be included in the list above, a focal point had to pass three rigorous tests:

1. Is it mathematically important, both for further study in mathematics and for use in applications in and outside of school?
2. Does it 'fit' with what is known about learning mathematics?
3. Does it connect logically with the mathematics in earlier and later grade levels?

This effort by the NCTM to provide a coherent and connected set of content recommendations is the closest thing we have yet to meeting the needs previously identified from the TIMSS international test results. The list isn't perfect, but with support from other national groups, it could provide the impetus for a national curriculum in mathematics.

Most teachers and middle school students could focus on three big ideas a year, supported by

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Air Traffic Control

The class was Algebra One and we had visitors. Martha Wallace and her math methods students from St. Olaf were spending the day in my classroom.

The topic was an introduction to simultaneous solutions of linear functions. Previously they had experienced graphing and solving single linear functions.

While my students were taking their seats I started a video clip from the wonderful PBS weekly show "Newton's Apple." Peggy was checking in at the Minneapolis St. Paul Terminal when she was told her flight was delayed. Asking why, she was told she could check at the tower. At the tower she watched the frenzied activity of the flight controllers. Again when she wanted to know why her flight was delayed she was told she would have to go to the ATC Center south of Farmington.

I told the class to pay close attention now and they might be able spot their homes as the taxi whisked Peggy through Burnsville, Eagan, and Rosemont on the way to Farmington.

Soon Peggy was examining Air Traffic Control screens. After watching for awhile she was asked if she would like to direct a pilot around a thunderstorm in the vicinity. As she gave the detailed instructions to the pilot I froze the image on the screen and handed out a worksheet.

The next time they looked at the screen they could watch a loop showing some information on two flights. Northwest #451 and United #78. The rectangular coordinates of two points on the linear flight paths of both planes appeared on the screen. This was a simplified version of the ATC flight information from the video. A more realistic model would use Polar Coordinates.

The work sheet directed them to record the points on the flight paths for both air craft . . . assume Farmington Center at (0, 0) with the coordinates in miles . . . use ANY method to determine the EXACT location of the possible disaster if both planes were at the same altitude . . . and write the instructions for the Search/Rescue team.

They were hooked and attacked the problem with paper and pencil, graph paper and rulers, graphing calculators, computer software or INTERNET graphing applets.

They had only been working for a few minutes when I could see trouble. I had made a 'dyslectic' mistake reversing the coordinates of the second point for United flight #78. The solution would not be a neat integer location . . . but would involve messy fractions or decimals.

I was sweating buckets as the students from St. Olaf were now also deep into the problem helping out where needed.

"Just a minute" I interrupted. "We're going to have to change the coordinates of the second point on the United flight." Silence . . . then Bill raised his hand. "What is it Bill?" "Don't do that Mr. Hanson . . . LET'S GO FOR IT!"

He knew I had cooked the data so the solution would be easy, and he didn't want any part of that simplification.

"OK. Good Luck!" They continued to work at the problem and some came up with the solution.

Before the bell rang Judy asked, "What is the chance that two flight paths would intersect precisely at a point over any integer grid on the ground anyway?"

Wonderful stuff and we would have missed it if I had insisted on my easy route.

The Storal to the Morey:

We should never underestimate the abilities of our students. And do not succumb to the temptation to dumb down the problems we ask them to attack.

What Students Teach Us

Sharing the Stories
Dick Hanson



He knew I had cooked the data so the solution would be easy, and he didn't want any part of that simplification.

Seven Students Earn Scholars of Distinction in Mathematics

A Scholars of Distinction Program in Mathematics for 2005-06 was initiated following the receipt of funding in the spring of 2005 and an ad hoc committee headed by Wayne Roberts was formed to determine how to set up and administer this program. Although the time allotted for carrying out the task was much shorter than considered ideal, the committee managed to launch the program in time for eligible students to be notified and to apply. As a result, nine highly talented students, all of whom had already distinguished themselves mathematically, were eventually accepted as candidates.



Three conferences were held during the school year for the purposes of promoting the program, attracting students, and giving prospective candidates unique opportunities. The opportunities for the students included attending lectures presented by mathematicians on a current mathematical topics, meeting other talented mathematics students, and presenting their own work on their upcoming Scholars of Distinction projects.

The first of the conferences was held in Duluth on December 2-3 featuring Professor Joe Gallian of UMD, current president of the MAA, speaking about "Breaking Driver's License Codes." The second conference was held in St. Cloud on February 10-11 at which Professor Steve Walk of St. Cloud gave the featured lecture. At this conference the candidates for the Scholars of Distinction in Mathematics awards also talked about their projects and described their progress. During the third conference, held at Macalester College on April 21-22, eight students gave their final presentations of their projects and Professor David Bressoud lectured.

The participating students and their project topics were:

Barrett Anderson, Shakopee Senior High—*The Relationship Between Marathon Times and Temperatures: Grandma's Marathon and the Twin Cities Marathon*

Andrew Chen, Moorhead Senior High—*Application and Calculation of Probabilities in the Game of Risk*

Jean Huang, St. Cloud Technical High—*Napoleon's Theorem: Generalization and Related Problems*

Peter Lofgren, Marshall Senior High—*Using Newton's Method to Create Fractals*

Dan Moore, Marshall Senior High—*Simple Groups of Order Less Than 400*

Christopher Reiderer, Rochester Lourdes—*The Sudoku Solver*

Kevin Yang, Duluth East Senior High—*The New York Times Newspaper Circulation Volume: Modeling and Prediction via the Time Series Analysis*

Tyler Ueland, Shakopee Senior High—*Solving Sudoku Puzzles*

The first seven students listed above received \$500 scholarships and were recognized as Minnesota Scholars of Distinction in Mathematics for 2005-06 at a Scholars of Distinction program May 13 at the Minnesota State Capitol Rotunda. The eighth student was recognized with a certificate of participation and a \$100 scholarship.

Members of the steering committee for the program included Professor Wayne Roberts of Macalester (chair), Bill Boulger of St. Paul Academy, Professor Joe Gallian of University of Minnesota—Duluth, Kristin Johnson of St. Louis Park, Tom Kilkelly of Wayzata Senior High, Tom Muchlinski of the MN Dept of Education, and Jack Sorteberg (retired).

This feature story was contributed by Jack Sorteberg.

Marginal math humor:

Natural numbers are better for your health.

Decimals have a point.

Calculus has its limits.

Geometry is just plane fun.

Polar coordinates aren't just arctic fashions.

Learning about teaching through writing simulations

I'm always thinking about teaching. But recently I've been thinking about it in a new way. I'd like to share with you in case you can provide some insights.

The thinking has come in the context of developing video games of teaching mathematics. (I'm sorry; I shouldn't call them video games. Many people, at least of my age, think video games must include mind-numbing violence, and you won't see that in our product. Nor will you see much animation. So I'll call them simulations.)

The thinking our Teaching Simulator™ requires of you is similar to what you'd do if you were playing a more traditional video game: You are put in a situation (such as a classroom), given some goal (learning objectives), and offered a choice about how to proceed. You see the results of your choice on the behavior and learning of the virtual students. You make another choice. And so on. Scores keep you informed of your progress.

And it's the scoring on which I want to focus here. Rather than giving a single numerical score to indicate how well players are performing, we have parameters that show how well you're accomplishing different aspects of teaching. To decide on those aspects, we tried to classify all of the choices we were asking players to make over some 20 simulations. Thus the categories grew out of best-practice teaching, so I believe they're relevant to your real classroom as well as your virtual one.

What are these categories? Our current model is known to its friends as ICE-KAP. Go ahead, laugh; I don't care. The I, C, and E parameters measure the state of the learning environment that you as a teacher have established. The K, A, and P parameters represent your students' learning. Here are more details:

I: Independent thinking and learning. The I environmental parameter measures how independent of you your students are in their thinking and learning. Independent learners think of questions, come up with ideas, and scrutinize other's claims. In the Teaching Simulator, you can increase the I parameter value by eliciting and respecting students' opinions. The parameter is decreased when you take on the role of a judgmental authority who emphasizes answers over thinking and meaning-making.

C: Comfort. Even if students think of good questions, they won't express them publicly unless they are emotionally comfortable. Our Comfort parameter reflects the quality of your relationships with students. You increase the environmental parameter C by respecting your students and their ideas. In contrast, publicly embarrassing a student will decrease the C parameter dramatically!

E: Engagement. This environmental parameter measures your students' attentiveness and motivation. I am coming to believe that this is the most important of the three ICE parameters; after all, if students aren't paying attention, then it doesn't much matter what else you do! Introducing new ideas in the context of interesting problems, asking open-ended questions, and appealing to a variety of learning styles and intelligence types are good ways for you to raise the E parameter. You can lower the parameter by being the center of attention in the classroom.

K: Knowledge. This objective parameter measures content knowledge of the students. Higher values indicate more depth of understanding. The K parameter embraces the content objectives of the lesson, both conceptual knowledge (knowing that) and procedural knowledge (knowing how to). For example, two K aspects of one simulation are "Know that right angles are those formed by perpendicular lines" and "Know how to use a protractor to measure an angle."

A: Attitudes. The A parameter measures your success in instilling attitudes toward mathematics, knowledge about mathematics, and habits of mind. For example, here are three of many

Guest Column

Larry Copes

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objectives that might be included in the A parameter of a particular simulation: “Mathematicians value different approaches and perspectives,” “It’s possible for mathematics to make sense through reasons and connections,” and “Look for shortcuts if an answer is surprising.”

P: Problem Solving. The Teaching Simulator simulations are based on the assumption that problem solving skills can be integrated into all teaching. For example, you can transform the rudimentary problem “What is $52 - 13$?” into “How many ways can you find the result of subtracting 13 from 52?” To solve this problem, students can exercise numerous problem-solving techniques: Draw a diagram, act out the situation, use tables, guess-and-check, learn from simpler problems, etc. The P parameter measures the extent to which you have encouraged practice and articulation of such problem-solving strategies.

If you’re still Engaged at this point, and you’re an Independent thinker, you may be asking yourself a host of questions, such as “Can’t each of these categories be broken down?” and “Does every aspect of teaching really fit into one of these categories?” and “To bring about high levels of Independence, don’t you have to lower the Comfort level?” Feel free to ask me! I’m also interested to know if you find this scheme helpful in your own teaching. If you’re Comfortable enough, just send me an email. And if you want to play a sample simulation at www.edmath.org/MATtours/simulations, I’d love to hear your impressions.

Larry Copes, Consultant in Educational Mathematics
copies@edmath.org

(Continued from page 8)

appropriate text materials, technology tools, and assessments. We would be happy to greet students in middle school who were products of a more focused elementary mathematics program. A mathematics curriculum for preK-8 based on the big ideas outlined in the NCTM’s *Curriculum Focal Points* could provide our students with a solid foundation for high school mathematics and for the mathematical understanding that they will need to flourish in our increasingly technological society.

For more information on the *Curriculum Focal Points*, go to <http://www.nctm.org/focalpoints/>

Free preview articles from recent NCTM journals, March 2007

No Tears Here! Third-Grade Problem Solvers—Kim Hartweg & Marlys Heisler

This article describes a year-long professional development project involving the integration of problem solving into the third-grade mathematics curriculum and implications for learning and teaching elementary mathematics. It can be downloaded from the NCTM website at <http://www.nctm.org/publications/> by following the links for *Teaching Children Mathematics* and then *Back Issue*.

The Algebra of the Arches—Margaret Buerman,

Finding real-world examples for middle school algebra classes can be difficult but not impossible. As we strive to accomplish teaching our students how to solve and graph equations, we neglect to teach the big ideas of algebra. One of those big ideas is functions. This article gives three examples of functions that are found in Arches National Park, Utah. Follow the links for *Teaching Mathematics in the Middle School* and *Back Issues*.

What Else Can You Do with an Open Box?—Catherine M. Miller & Douglas Shaw

Starting with the classic Open Box problem, the authors present extensions of this problem that can be used in high school mathematics classes and also challenge high school teachers to use this process of problem analysis in their own practice as a way to enrich the content of their lessons and as a means of individualized professional development. Follow the links for *Mathematics Teacher* and *Back Issues*.

The Mathematics Within—University of Minnesota

The Institute of Technology Center for Educational Programs will offer two teacher professional development courses in the summer of 2007. These intensive courses aim to help teachers (grades 3-7) recognize the “language of mathematics,” deepen their math content knowledge, and connect new math knowledge not only to a teacher’s school curriculum but to the bigger picture of middle school math content. Participants will work with an instructional team to develop concept-specific mathematics enrichment units adaptable for a wide range of student skills, and comprehension levels.

Algebraic Processes and their Connections to Geometric Structures, June 18-29

Spend two weeks deepening your knowledge of algebraic foundations and key concepts by discussing and exploring topics such as subtraction and negative numbers, fractions, and the Pythagorean Theorem. Discover new connections between division, multiplication, and addition using geometric ideas. Learn to analyze place value and different algorithms for computing. Delve into visual representations and manipulatives that help students (and teachers) understand foundational math concepts. Units are aligned with state and national standards for grades 3-6 mathematics curricula. Participants will earn 2 mathematics graduate semester credits.

Geometric Structures and their Connections to Algebraic Processes, July 23-August 3

This continuation course will further enhance your insight and comfort with teaching geometric aspects of mathematics. Investigate mathematical situations through pattern, symmetry and transformations, and study both algebraic and geometric relationships between two and three dimensional shapes. Discuss the geometric applications of division and fractions, study distance and vectors through experimentation, and explore representational systems for shape, position and movement. Units are aligned with state and national standards for grades 3-7 mathematics curricula. Participants must have completed “Algebraic Processes and Their Connections to Geometric Structures” or an equivalent course and obtain permission through ITCEP.

Tuition and fees as well as daily lunches, a parking stipend, and all books and materials are funded by a grant from the Minnesota Department of Education Math-Science Partnership. Univ. of MN, Twin Cities, East Bank Campus. For more information regarding academic requirements, please contact ITCEP at 612-625-2861 or itcep@umn.edu or visit <http://www.itcep.umn.edu/teachers/profdev/>

Summer 2007 Math Offerings at Bemidji State University

Programs for teachers and highly qualified paraprofessionals:

Foundations of Arithmetic I, July 23–31, 9:00–2:30 Mon. through Fri.

Foundations of Arithmetic II*, August 2–10, 9:00 – 2:30 Mon. through Fri.

Each course is three graduate semester credit hours. Participants pay NO tuition or fees – completely covered by grant funding. The grants also provide a \$140 stipend for each participant as well as a noon meal each day. (* Must complete Foundations of Arithmetic I.)

To apply for the Foundations of Arithmetic grant complete the form available at:

<http://www.bemidjistate.edu/grichgels/Eisenhower/SummerAppForm.html>

Programs for teachers only:

Number Sense and Number Theory for Elementary and Middle School Teachers,

June 11– June 29, 8:30 – 3:00 Mon. through Fri.

Data Investigations and Assessment in the Mathematics Classroom,

July 2 – July 20 , 9:30–3:30 Mon. through Fri.

Each summer math institute provides seven graduate semester credit hours. Participants pay half of tuition and fees – remaining half covered by grant funding. The grants also provide a \$300 stipend for each participant. Projected participant costs: Tuition ~ 1,000 and fees ~ 250 for total \$1250.

To apply for the Number and / or Data Project grant complete the form available at:

<http://www.bemidjistate.edu/grichgels/Eisenhower/SummerAppForm.html>

Special Offer: Teachers who participate in BOTH “teacher only” sessions above will get tuition and fees waived for the second program. Thus, 14 graduate semester credit hours for a projected total cost of \$1250.

Professional Development and Education Opportunities

Programs for paraprofessionals too! Pass the information along to your colleagues and staff.

Professional Development Opportunities (Continued)

Best Practices Summer Workshops—U.S. Department of Education—various locations

The U.S. Department of Education has named 22 cities as sites for its annual summer regional workshops for teachers to learn best practices from fellow educators successful in raising student achievement. This year's co-hosts include two federal government agencies -- the National Park Service (NPS); the National Aeronautics and Space Administration (NASA); a number of TechNet partners, including Microsoft, EMC, AMD, Symantec, the University of Nevada, and Motorola; as well as Target, General Motors Corporation, Siemens Foundation, and MATHCOUNTS. The workshops are part of the Department's Teacher-to-Teacher Initiative, which supports teachers in a variety of ways, including keeping them informed about the latest strategies and research for closing the achievement gap and helping all students meet high standards. Each workshop will include numerous breakout sessions featuring effective teachers and practitioners sharing strategies that have been successful in their classrooms, schools and districts. Workshop dates, locations, and subjects covered are available at <http://www.ed.gov/teacherinitiative>

GEMS: Girls Experiencing Mathematics in the Summer

June 24-June 29, 2007

The sixth annual GEMS (Girls Experiencing Mathematics in the Summer) Camp for mathematically talented high school girls will be held June 24 – June 29 at the **University of St. Thomas (UST)** in St. Paul. During the residential camp, sixteen girls participate in two mini-courses, attend a career panel and banquet where local professional women share how they use mathematics on the job, enjoy special presentations on mathematics such as the topology of the Four Canoes sculpture on campus and Actuarial Science, and present their own explorations into mathematics at a family reception at the end of the week. Participants will also visit the Science Museum and enjoy fun recreational activities.



The GEMS Camp has been supported by the UST Center for Applied Mathematics, the Tensor Grant Foundation through the Mathematical Association of America, the UST Department of Mathematics, and the UST College of Arts and Sciences, and St. Paul Traveler's Insurance Company. Past camp fees have varied from free to \$350. The fee for 2007 will be determined after news of grant applications has been received. Faculty involvement includes Brenda Kroschel, Melissa Loe, Jeff McLean, Lisa Rezac, Cheri Shakiban, and Heekyung Youn. Undergraduate assistants are an important component of the program, and most recently Amanda Thompson and Jena Grieg, along with Rezac, presented a poster on the program at the Joint Mathematics

Meetings in New Orleans.

Participant reactions from their camp evaluations:

"Wow! What an awesome experience! The camp was fantastic and I will recommend this camp to any girl with a strong interest in math."

"This camp was a great way to spend a week, learn some math, have a taste of college life, and make new friends."

"I loved meeting all of the people who decided to come to this camp. It was great to see young women as interested in math as I am."



For more information about the GEMS Camp, please visit

<http://www.stthomas.edu/gemscamp> or contact Lisa Rezac at lmrezac@stthomas.edu. Applications and updated information will be available late March on the website.

Journey to Pharmacy—April 21

Do you have students that are interested in a career in healthcare, how about a student who excels in Math and Science? We have a program for you. The College of Pharmacy, Nursing, and Allied Sciences at **North Dakota State University** is hosting the Second Annual Journey to Pharmacy on Saturday April 21st in conjunction with Discover days hosted by the NDSU Office of Admission.

The Journey to Pharmacy program is an opportunity for high school juniors and seniors from culturally diverse backgrounds to explore a career in pharmacy. The Second Annual Journey to Pharmacy

Opportunities for your Students

gives high school students the opportunity to meet with current pharmacy students, talk with a pharmacist about the career, meet and greet the Deans of the college, and participate in an interactive activity in our concept lab.

We have also developed a track for school counselors and teachers as part of the Journey to Pharmacy program. This track will allow school counselors and teachers the opportunity to participate in similar activities while learning about the pharmacy admissions process, curriculum and expectations.

If you have, any questions please feel free to contact Robert Jones, Recruitment Coordinator at 701-231-7837 or by email Robert.t.jones@ndsu.edu; or Dr. Kimberly Vess Halbur, Associate Dean of College of Pharmacy, Nursing, and Allied Sciences at 701-231-7601 or by email kimberlyv.halbur@ndsu.edu.

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standing in ways that are very difficult to assess with a paper and pencil (or computerized) test.

- A. They are sorting materials, looking for similarities and differences, and building patterns. Which bottle caps have dents in them? Which have writing on them? Which are all one color?
 - B. They are developing language skills in order to name and compare objects and sets. Which is longer? shorter? heavier? larger? etc.
 - C. They are beginning to develop a concept for number...Which set has 4? How do you know? Is this more or less than the set that has 6?
 - D. They are beginning to develop one-to-one correspondence by recognizing the importance of touching each object as they count.
 - E. They are exploring and comparing shapes in their world. Which cereal boxes are rectangular prisms? Which cereal boxes are cylinders? Which blocks stack easily? Which shapes roll on the floor?
 - F. They are beginning to develop conservation of number and create and solve simple addition and subtraction stories.
 - G. They are beginning to read, write and build larger numbers and beginning to explore the "ten-ness" of our number system.
- (I know that you know these examples but I list them in case you need to have conversations with others.)

A better way to assess the "system" in delivering a quality mathematics program is to compare the mathematics outcomes at each grade with other districts and to document the ways in which teachers at those grade levels assess and document student learning. While it may be helpful to be able to identify K-1 students who struggle with mathematics early in the primary grades, a better assessment tool to do this is a one-on-one interview by the teacher or a trained volunteer. There are some districts that regularly release their K-1 teachers in order to do a district-wide hands-on assessment.

So, if your concern (related to standardized tests) is to assess individual students, I would recommend using some strong primary math resources to compile a manageable yet helpful set of interview questions, along with a protocol for recording student responses. After completing the interviews, holding team meetings/discussions to study this data and its implications for individual students might help you identify students who need both remedial as well as more challenging work.

If your concern is more closely related to evaluating your program of instruction, I would suggest that your 3rd grade testing results are as good an indication of the foundation your primary students are achieving in your kindergarten and first grade classrooms as you can find. Studying the areas of difficulty experienced by your third grade students and attempting to backmap those areas has the greatest potential for strengthening your primary curriculum and instructional program.

Sincerely, Matt

Matt Mentor's advice
continued

**Kindergarten and first
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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.

Mark Your Calendar

March 21-24	NCTM Annual Meeting & Exposition, Atlanta, GA
April 26-28	MCTM Spring Conference, Duluth, MN
May 1	Presidential Awards nominations due
October 19	MCTM Fall Conference, Lakeville South HS
November, 2009	NCTM Regional Conference, Minneapolis, MN

Do we have your correct address?

**Check the mailing label for your membership renewal date.
Renew online at www.mctm.org**

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. Is your correct address printed on the label of this issue of *Mathbits*? If not, contact Co-Exec. Director Tom Muchlinski at 763-475-3168 or muchl002@umn.edu or visit the MCTM web site (www.mctm.org) membership page to make your change. Student MCTM members and members in transition are encouraged to provide a permanent address. Newsletters mailed to student members will not be forwarded. Thank you for helping us stay in touch! FYI: In an effort to be cost effective, MCTM sends newsletters at USPS bulk rate. As a result, delivery times may vary between postal districts.

Please submit items for publication in the Summer issue of *Mathbits* to tlgonske@nwc.edu by May 15, 2007. Email or call 651-631-5228 with any questions. - Teresa Gonske, Editor
