



Mathbits

Minnesota Council of Teachers of Mathematics

www.mctm.org

MCTM Fall Conference Theme: *Explorations in Mathematics and Science*

**Friday,
19 October 2001**

The 2001 MCTM Fall Conference was held at North High School in Maplewood on Friday, October 19. Over 325 mathematics educators from around the state were in attendance. Particularly encouraging was the presence of a large number of pre-service teachers from a number of the teacher education programs in the state.

On behalf of the membership of MCTM, I want to thank the three conference chairs, Emily Larsen from White Bear Lake High School, Cathy Wick from St. Cloud State University, and Kathy Cramer from the University of Minnesota, for their excellent work in organizing the conference. While many other people contributed to the success of the conference, two in particular deserve special recognition. Peggy Saunders of North High School, served single-handedly as the on-site coordinator. Sue Haller of St. Cloud State University, coordinated over 30 exhibits. Thank you also to Arnie Cutler, Craig Rypkema, and the MCTM District Directors for handling the registration. Finally, thank you to all the speakers who presented over 40 sessions. The conference was a very worthwhile experience for all those in attendance.

Tom Muchlinski
MCTM President

**Keynote
Presentation:
Physics Force**

Jack Netland and John Barber, retired physics teachers from Osseo and Moundsview Schools, presented the keynote address at the 2001 MCTM Fall Conference. The presentation was as informative as it was entertaining. Various principles of physical science were demonstrated while the two presenters light-heartedly bantered with each other. To demonstrate Newton's laws of motion, a tablecloth was pulled out from under a tower of three plates, each separated by a piece of stemware filled with liquid. Bernoulli's Principle was used to show how one could tip the upper-most branches of a tree with the aid of a leaf blower and a roll of toilet tissue. Audience members participated in the presentation, including a center of mass experiment. The finale of Jack and John's presentation included the dramatic collapse of a metal barrel in a demonstration of air pressure vs. atmospheric pressure. The keynote presentation kept audience members laughing and was a great way to kick off the 2001 Fall Conference.

President's Column

As we consider the concept of ALL students learning quality mathematics, one of the first things we need to consider is how do we need to change our practice so as to reach students of all ability levels.

The biggest change for most of us requires giving all of our students the opportunity to learn meaningful mathematics. We need to engage them in robust activities that help them to develop their own understanding of important concepts by connecting new ideas to concepts they have learned previously.

While this sounds easy enough to do, it requires a change in our belief system. For too long we have allowed the belief that some students can do mathematics and others cannot to dictate our practice. Because of this belief, we ask less of our students with more modest ability. We give them more low-level tasks and do not stretch their thinking because we believe they are not capable of learning with understanding.

However, more and more evidence exists that when students of all ability levels are engaged in appropriate activities that are rich in mathematics, they can develop good understandings of important mathematics concepts. Almost all young elementary students are capable of creating strategies for solving real world problems requiring computation even before they study computation algorithms. Almost all middle school students are capable of a deep understanding of the important concept of rate of change. Almost all high school students are capable of describing a relationship between two quantities using a table, graph, and/or equation. However, are we capable of engaging them in activities that will develop that understanding? I believe we are. If we are not already doing so, let's begin by asking all of our students to engage in worthwhile tasks.

In the last issue of Mathbits, Sharon Stenglein, the mathematics specialist at the Minnesota Department of Children, Families, and Learning announced her retirement after eleven years in the position. Sharon mentioned that when she began eleven years ago the first edition of the National Council of Teachers of Mathematics *Curriculum and Evaluation Standards for School Mathematics* was just over a year old, and as she leaves, the second edition, *The Principles and Standards for School Mathematics* is slightly over a year old. These standards, along with Minnesota's state standards, have shifted the focus from what we teach to what students learn. The past eleven years have been exciting and interesting times in mathematics education. Because of Sharon's leadership they have also been positive and productive years. We have made tremendous progress toward reaching the vision of a high quality mathematics education for all students. We still have work to do and the future promises to be every bit as exciting and interesting. As Sharon mentioned, we face a myriad of challenges in mathematics education. What she did not mention, is that because of the leadership she has provided the teachers and the students of Minnesota, we are well positioned to meet those challenges. On behalf of not only the membership of MCTM, but also on behalf of all the mathematics educators in Minnesota, thank you Sharon for eleven years of positive, proactive leadership and best wishes for a relaxing and enjoyable retirement.

In the last issue of Mathbits the MCTM President thanked the outgoing members of the MCTM Board of Directors and welcomed the new members to the board. Unfortunately, he left out Jo Ann Luhtala of the Duluth Public Schools, the outgoing Junior High/Middle School Vice-President. Jo Ann played a key role in organizing the Spring Mathematics Conference in Duluth. She continues to be involved as a member of the program committee for the conference. Jo Ann's successor as Junior High/Middle School Vice-President is Genni Steele of Central Middle School in White Bear Lake. I apologize for this oversight.

Tom Muchlinski
MCTM President

Candidate Information

Enclosed ballot must be returned by December 21, 2001

Board of Directors Election

Six offices on the Board of Directors of MCTM will be filled in this current election. The members of the Nominations and Elections Committee have nominated candidates for each office. Please read the descriptions of the nominated candidates on the attached pages and complete the enclosed ballot. All ballots must be postmarked no later than December 22, 2001.

Typically fewer than 10% of the membership return their election ballots. **YOUR VOTE IS IMPORTANT.** Complete your ballot and mail it in today.

OFFICE RESPONSIBILITIES:

I. President-Elect:

The president-elect shall serve for one year and then be installed as president. The nominee must have been a member of the Council continuously during the preceding five years and have participated in the activities of the Council. In the absence of the president or in the event that the president is unable to serve, the president-elect or past president shall assume the responsibilities of the president.

II. Vice President at Large:

According to the Constitution, there shall be a vice-president elected from the MCTM membership at large. The vice-president at large serves on various committees of the council including the spring conference committee.

III. Vice President of Senior High School:

The vice-president of senior high school represents senior high school teachers across the state. S/he is also a major committee member for the fall conference.

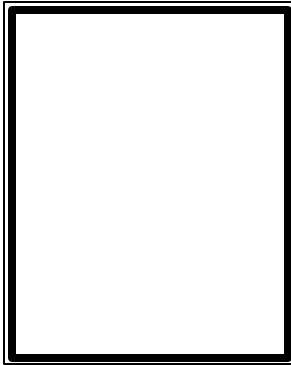
In the event of the president's inability to serve and the inability of the president-elect to assume office, the vice-presidents assume the responsibilities of the presidency by order of their seniority on the board of directors.

IV. District Directors (1, 4, and 7):

District directors represent the members in their congressional district. It is the responsibility of directors to promote membership in MCTM, to serve as representatives of their district's members in the Delegate Assembly, and to identify and work to solve problems that may be specific to mathematics teaching in their district.

Enclosed ballot must be returned by December 21, 2001

Candidate for President-Elect



Susanne K. Westegaard

Current Position:
Mathematics Teacher,
Hopkins Senior High School.

Education:

Mathematics and Education, Yankton College; M.Ed. Mathematics Education, University of Minnesota.

Professional Affiliations:

NEA, Education Minnesota, HEA, NCTM, NCSM, MCTM, CPAM (Council of Presidential Awardees), Woodrow Wilson National Fellowship Foundation.

Previous Involvement with MCTM and Mathematics Education:

MCTM Vice President–Senior High, 1993 –1996; Co-chair Special Events, NCTM National Meeting, April 1997; Secretary, CPAM, 1999 – 2003; Technology Committee Member, MCTM; Speaker at MCTM, regional and national NCTM meetings.

Candidate Statement:

Today, being a mathematics teacher carries responsibilities. Active involvement in the mathematics community at the local, state, and national levels is paramount. Our craft must be practiced in our classrooms and shared with our colleagues. Mentoring young teachers and prospective teachers, and encouraging our students to enter the teaching profession are vital to the continuation of mathematics teaching as we believe it should be practiced. MCTM has been a voice for quality mathematics education for all students, and I would value the opportunity to continue to serve the organization.

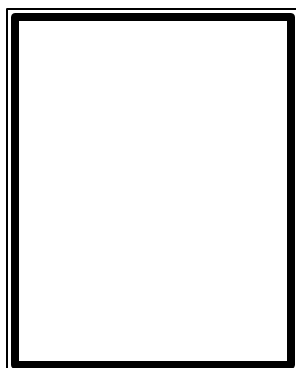
Other Information:

Toyota TIME Grants: reader 1998-2000 and mentor 2000-2002; Media Clips Editor, *Mathematics Teacher*, 1999–2000; Author of "Quilts & Coordinate Geometry," *Mathematics Teacher*, October 1998; Co-Author of "An Agent for Change: The Woodrow Wilson Fellowship Foundation," co-authored with Catherine Wick & Carolyn Wilson, *NCTM 1994 Yearbook*; National Board Certified Teacher, Adolescence and Youth Adulthood/Mathematics.

Candidate Information

Enclosed ballot must be returned by December 21, 2001

Candidates for Vice President at Large



Rosemary Heinitz

Current Position:

Retired from Mankato Public Schools; Mn Dept. CFL Team Leader for the Continuous Improvement Process.

Education:

B.S. Degree Mathematics, Mankato State University.

Professional Affiliations:

NCTM, MCTM, SWMMTA, ASCD, MASCD.

Previous Involvement with MCTM and Mathematics

Education:

Presenter at MCTM fall and spring conferences, MCTM Delegate Assembly, MCTM District 1 Director. Member of the Best Practice Mathematics network, Region 6,8,9 Improvement Support Team, facilitator for Phase II training, facilitator for SciMath Mn Regional Frameworks workshops.

Goals as an MCTM Officer:

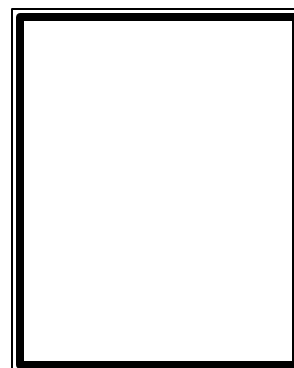
Provide professional materials and activities for MCTM members that reinforce the instructional and assessment strategies advocated by the NCTM Standards. Plan conferences for Minnesota teachers of mathematics at all levels that enable them to translate the NCTM Standards and the Minnesota High Standards into daily teaching practice.

Other Information:

I retired in June after 34 years of classroom teaching. Involvement in MCTM and other professional organizations has made it possible for me to continue to be involved in mathematics education in other roles.

Current Position:

Mathematics Teacher at Brainerd High School.



Don Karlgaard

Education:

AA degree from Fergus Falls Community College, BS-Mathematics from Moorhead State University, MS-Mathematics from St. Cloud State University.

Professional Affiliations:

MCTM, NCTM, NCSM, BUE, EM.

Previous Involvement with MCTM and Mathematics

Education:

Region V Mathematics Best Practice Team, three-time PAEMST state finalist, presenter at several MCTM state conferences, presenter at NCTM national conference, Chairperson of MCTM Technology Committee, helped write Minnesota's Mathematics Standards, helped develop assessment for the Mathematics Standards, trainer/consultant for several school districts and education districts.

Goals as an MCTM Officer:

1) To increase membership; 2) To help the membership improve their teaching, and 3) To work with higher education to improve mathematics teacher education.

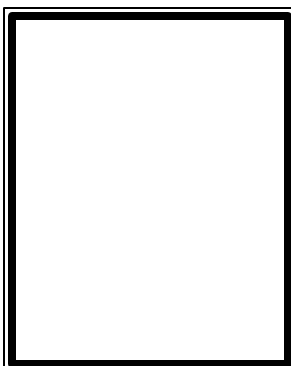
Other Information:

I am excited about continuing to work with Minnesota's mathematics teachers in standards-based education. I have some questions that make me want to keep working hard in teacher education. Some of these questions are: Do our Minnesota students get the mathematics education they need to be successful for the society they will be living and working in? Do our Minnesota mathematics teachers understand the ways that their students learn best?

(Continued on page 10.)

Enclosed ballot must be returned by December 21, 2001

Candidates for Vice President Senior High School



Current Position:
High School Mathematics Teacher
and Department Chairperson,
Owatonna High School.

Bradley Larson

Education:

BS in Mathematics Education, 1966, Concordia College, Moorhead, MN; MS Degree in Mathematics, 1980, Mankato State University; 30 Graduate credits in mathematics at Bemidji State, University of Minnesota, Ohio State University, Carleton College, St. Olaf College (NSF Grant), University of California Berkeley.

Professional Affiliations:

NCTM, MCTM, Education Minnesota, Minnesota State High School League Coaches Association.

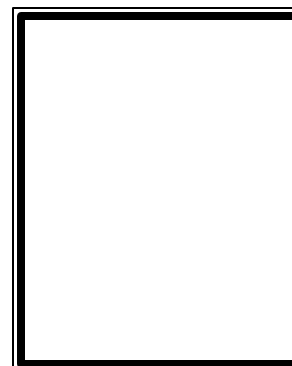
Previous Involvement with MCTM and Mathematics

Education:

Minnesota Honor Roll Teacher of the Year 1998; Regularly attends the MCTM conferences; Recipient of NSF grants to University of Minnesota and St. Olaf College.

Goals as an MCTM Officer:

For 31 years I have been a promoter of teaching mathematics. When I was selected as a Minnesota Honor Roll Teacher of the Year, my equation for the professional teachers in our state was: $L^2 + E^2 + C^2 = E^T + ESY$. This stands for; "Lifelong Learning plus Everyday Enthusiasm plus Concerned Communities equals Excellent Teaching plus Education Sound Youth." Lifelong learning is such an important part of being a teacher. I will strongly promote that the way one stays enthusiastic in this wonderful profession of teaching is to continue to learn. I will promote the great conferences that
(Continued on page 10.)



Current Position:
9-12 Mathematics Teacher
Redwood Valley High School
Redwood Falls.

Judy Zachariason

Education:

BA in Mathematics Education, University of Minnesota, Morris.

Professional Affiliations:

NCTM, MCTM, Education Minnesota, NEA.

Previous Involvement with MCTM and Mathematics

Education:

Member of Project Prime, Member of Mathematics Best Practice Network, Presenter and presider at MCTM conferences, member of the writing team for the Minnesota Mathematics Framework, presenter for (Mathematics) Phase II training, mathematics teacher on the Improvement Support Team, presenter for Chance & Data Summer Institute.

Goals as an MCTM Officer:

To encourage teachers to become more involved in MCTM and NCTM; to promote the strategies and methods outlined in the Principles and Standards for School Mathematics; to support teachers by listening to their problems and concerns as they move toward "mathematics for all."

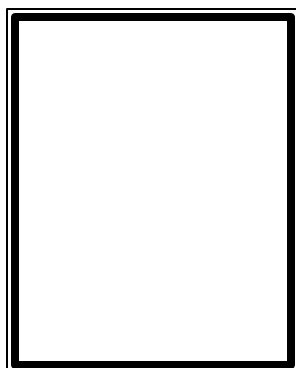
Other Information:

I have taught 7-12 mathematics for 31 years in the Morton and Redwood Falls school districts and have always been proud of the profession I chose. My participation in MCTM and the activities that they have provided have allowed me to network with teachers throughout the state and keep abreast of the cutting edge in mathematics education.

Candidate Information

Enclosed ballot must be returned by December 21, 2001

Candidates for District 1 Director



Jon Arnold

Current Position:

Senior High Math Teacher currently teaching Geometry, Advanced Math and Applied Math. Coach Math League and Cross Country at St Charles High School.

Education:

BS in Mathematics and Physical Education, Winona State University, 1969; Masters in Secondary Education, WSU, 1999.

Professional Affiliations:

MCTM, EM.

Previous Involvement with MCTM and Mathematics

Education:

I have been involved in Secondary mathematics education for 32 years. I helped formulate the Minnesota Math Grad Standards and write some packages while working at a pilot site. I have been a presider and presenter at MCTM for many years, usually discussing activities, projects and Graduation Standards packages. Delegate to MCTM Delegate Assembly.

Goals as an MCTM Officer:

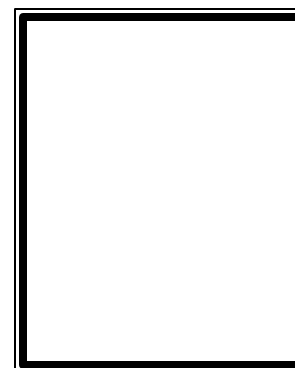
My goals are to improve communication among the math teachers in my area through the use of today's technology. The message that needs to get to all of our teachers is that exposure to new ideas is absolutely necessary if you wish to grow as a teacher and that it is necessary to continue to grow and improve your methods of teaching math. I hope to promote the use of integrated curriculums that apply mathematics during the process of learning the math skill.

Other Information:

After spending at least 20 years teaching math in a traditional fashion I have enjoyed the change to discovery approaches (Continued on page 10.)

Current Position:

Middle school mathematics teacher on sabbatical from Rochester Public Schools.



Michelle Bacon

Education:

BS in Mathematics and German Education, Winona State University; M.Ed. in Curriculum and Instruction, Middle and Secondary Education, University of MN; Actively working on Ed.D. at University of Minnesota.

Professional Affiliations:

MCTM, NCTM, ASCD.

Previous Involvement with MCTM and Mathematics

Education:

Member of Mathematics Best Practice Network; delegate to MCTM Delegate Assembly; participated on item and data review committees for the BST.

Goals as an MCTM Officer:

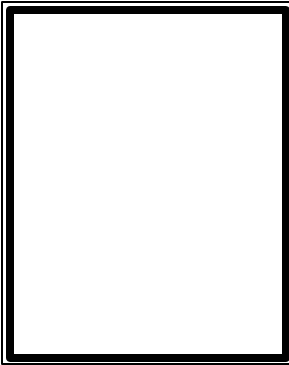
I believe that any organization is as strong as its members, therefore one goal that I have is to encourage teachers in our district to become members of MCTM, thereby increasing MCTM in strength. In addition, an organization best serves its members through efficient communication, so I would work to increase communication among teachers in this district through networking, as well as provide members with current information regarding professional opportunities for growth.

Other Information:

Since entering the teaching profession eight years ago, I have been striving to keep myself in a continuous learning environment. MCTM has been a part of that environment, providing support and guidance through its leadership. I look forward in anticipation to returning that support and guidance to the organization and to other teachers in the profession.

Enclosed ballot must be returned by December 21, 2001

Candidates for District 4 Director



Current Position:
Assistant Professor, Education,
Gordon Sanders Endowed Chair,
Mathematics and Science
Education, Hamline University.

Nancy Desmond

Education:

BS Recreation and Park Management, University of Oregon;
BS Mathematics Education, University of Minnesota; MS
Experiential Education, Mankato State University; PhD
Education, University of Minnesota.

Professional Affiliations:

Minnesota Council of Teachers of Mathematics, National
Council of Teachers of Mathematics, Minnesota Science
Teachers Association.

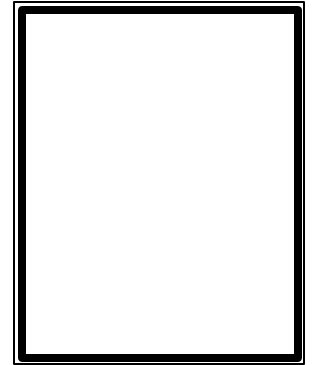
Previous Involvement with MCTM and Mathematics

Education:

Presenter and presider at MCTM, NCTM conferences,
Transforming Teacher Education Committee, CMP trainer,
member of writing/editorial team for the Minnesota
Mathematics Framework, member MCTM professional
concerns committee.

Goals as an MCTM Officer:

- Provide opportunities and support for mathematics educators in the district to network.
- Continue collaborative work with K-12 and college programs to align national and state standards for improving mathematics education.
- Create more opportunities for pre-service and beginning teachers to strengthen their professional involvement and relationship with MCTM.



Current Position:
High School Math Teacher at
Mahtomedi High School.

Donna Forbes

Education:

BS in Math Education at Widener University, Chester, PA;
MA in Curriculum Instruction and Design, University of
St. Thomas.

Professional Affiliations:

NCTM, MCTM, Education Minnesota.

Previous Involvement with MCTM and Mathematics

Education:

Presenter and presider at MCTM fall and spring conferences,
St. Cloud Curriculum Fair and MEA. Member of the Best
Practice Network. Facilitator for MN Framework sessions.
Project 2061 member.

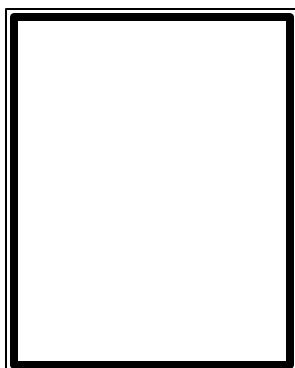
Goals as an MCTM Officer:

As District 4 Director, I will work to promote involvement of all math educators in some aspect of professional organizations. Every one has something to share and add to the MCTM organization. I will work on getting the word out to new teachers and math educators who are new to MCTM; communication is the key to involvement and new ideas. As a District Director I will try to get as many people in our district involved and communicating about new ideas and opportunities available. I have gained new insights and have grown professionally with the help of the members of the MCTM and I would now like to give back to the organization.

Candidate Information

Enclosed ballot must be returned by December 21, 2001

Candidates for District 7 Director



Lisa Conzemius

Current Position:

Senior High School
Mathematics Teacher at
Detroit Lakes Senior High
School, Detroit Lakes, MN.

Education:

BA in Mathematics Education, Concordia College, Moorhead, MN; MA in Curriculum and Instruction, South Dakota State University, Brookings SD.

Professional Affiliations:

NCTM, MCTM, Education Minnesota.

Previous Involvement with MCTM and Mathematics

Education:

Member of Mathematics Best Practice Network, Presenter and presider at MCTM fall and spring conferences, Delegate to MCTM Delegate Assembly, Minnesota Mathematics Frameworks reviewer and trainer, Core Plus trainer, Chance and Data Academy trainer, Presenter for Mathematics Phase II training.

Goals as an MCTM Officer:

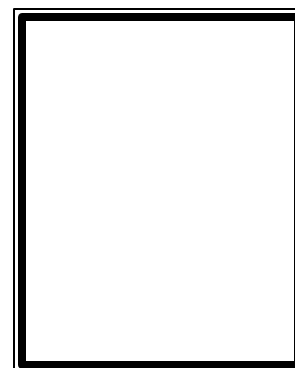
To improve communication and awareness of MCTM and other mathematics activities, to encourage teachers to become more involved in MCTM and NCTM, to promote Best Practices in mathematics education, to encourage networking and communication between teachers of mathematics in my district.

Other Information:

This is my 13th year of teaching. I love math education. I get excited every day to be in the classroom. Being more involved with MCTM is a challenge I welcome. I truly enjoy sharing ideas with others about math education.

Current Position:

Professor of Mathematics,
Chair of the Mathematics and
Computer Science Department,
Concordia College,
Moorhead, MN.



William K. Tomhave

Education:

BA in Mathematics with secondary education, Luther College, Decorah Iowa; MS in Education, Iowa State University, Ames, Iowa; Ph. D. in Educational Research and Evaluation, Iowa State University, Ames, Iowa.

Professional Affiliations:

NCTM, NCSM, MCTM, PDK, AMTE.

Previous Involvement with MCTM and Mathematics

Education:

MCTM representative to NCTM, 1983-1991; MCTM Vice President for Mathematics Education, 1991-1993; Member of Minnesota Mathematics Mobilization Board; Member of Minnesota PRIME team, 1990; Frequent attendee at the MCTM delegate assembly; Frequent presenter at NCTM meetings; Frequent presenter and presider for MCTM meetings; Developer and presenter of mathematics education workshops throughout Minnesota.

Goals as an MCTM Officer:

As District 7 Director I will work to expand the impact of MCTM into schools throughout my region by sharing information with area colleagues and encouraging their attendance at MCTM meetings. I will encourage MCTM to consider the particular needs of teachers in small, rural schools when planning and offering professional development opportunities. I will work to make MCTM a "big tent" for mathematics education where committed professionals can gather to discuss and debate important issues in mathematics content and teaching that are not tied to a particular (Continued on page 10.)

10 *Mathbits*

Candidate Information, continued

(Karlgaard, continued from page 5.)

Do our Minnesota mathematics teachers understand what content should be de-emphasized and what new content is more important for their students?

(Larson, continued from page 6.)

our MCTM has. I will promote the mentorship programs in our schools so that we can help the new teachers to better understand the complexity of teaching.

(Arnold, continued from page 7.)

and group work. I sometimes miss the feeling of being the math guru in the front of the room but fully realize the need to facilitate learning with multiple methods.

(Tomhave, continued from page 9.)

curriculum or viewpoint. I will work with MCTM and Minnesota's CFL to help improve the transition of beginning teachers into our profession.

Other Information:

I have been a mathematics teacher for over 30 years. I have worked as a 9-12 classroom teacher, a college teacher of lower division mathematics, and a mathematics teacher-educator. I welcome this opportunity to return to the MCTM Board as a representative of west-central Minnesota. Together we can make this fine organization even better.

A Winner!

The winner of the "Where's Arnie" web site competition is Susan Weberg of Academy of Holy Angels. Sue gets a one-year free MCTM membership. The "Where's Glen" competition has begun. Visit the MCTM web site (www.mctm.org) to enter the competition.

EdSTAR Minnesota

The EdSTAR Minnesota web site is a comprehensive site that provides substantive help and professional development in implementing Minnesota Graduation Standards. Designed for teachers, it is a collaborative effort of the Minnesota Department of Children, Families and Learning, the North Central Regional Educational Laboratory, and the North Central Mathematics and Science Consortium. Minnesota teachers developed a majority of the content and resources are provided for both students and teachers. Visit the site at <http://edstar.ncrel.org/mn>.

Principles and Standards for School Mathematics

Process Standards

This article is the fourth in a series on the NCTM *Principles and Standards for School Mathematics*. The focus of this article is on the five Process Standards: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation. Much of the material here is taken from NCTM summaries of the standards. Earlier articles addressed the six Principles that form the foundation for the standards and the five Content Standards.

Problem Solving

Problem Solving

Problem solving is an integral part of all mathematics learning, and must be both a goal and a means of learning mathematics. Instruction at all levels should equip students to: build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems and monitor and reflect on the process of mathematical problem solving.

Problems are not exercises: rather problem solving means engaging in a task for which the solution is not known in advance. Mathematical concepts can be introduced with meaningful problems and students can learn problem posing and problem solving strategies as they learn and use mathematical concepts. To embed problem solving in the mathematics curriculum, teachers will choose problems that engage students and create an environment that encourages students to explore, take risks, share failures and successes, and question one another.

Reasoning and Proof

Reasoning and Proof

Systematic reasoning is a defining feature of mathematics and it is through the use of reasoning that students learn that mathematics makes sense. Mathematical instruction at all levels should enable all students to: recognize reasoning and proof as fundamental aspects of mathematics; develop and evaluate mathematical arguments and proofs; and select and use various types of reasoning and methods of proof.

Reasoning mathematically is a habit of mind that is developed through consistent use in many contexts and from the earliest grades. Students can learn to reason inductively from patterns and specific cases, beginning at the earliest school levels. As they mature, they can use mathematical truths they establish in class to make effective deductive arguments. By the end of secondary school, students should be able to appreciate, understand and produce some mathematical proofs--logically rigorous deductions of conclusions from hypotheses.

Communication

Communication

Students who communicate mathematics to others gain insights into their own reasoning and learn to organize and consolidate their thinking about mathematics. Mathematical instruction at all levels should enable students to: organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; and use the language of mathematics to express mathematical ideas precisely. Students
(Continued on page 12.)

Connections

should be asked to communicate both orally and in writing. They can justify their reasoning, explain a concept, or formulate a question about a situation or idea that is puzzling. They should learn to express themselves clearly and coherently. Students who work on problems cooperatively will learn to understand and evaluate the thinking of others and to build on ideas of other students.

Connections

An emphasis on mathematical connections helps students recognize how ideas in different areas are related. Mathematical instruction at all levels should enable students to: recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; and recognize and apply mathematics in contexts outside of mathematics.

Students need to see mathematics as an integrated field of study, not just a set of separate topics. Viewing mathematics as a whole also helps students learn that mathematics is not a set of isolated skills and arbitrary rules. Students will come to recognize how ideas in different areas are related, and to expect and exploit mathematical connections. Students must also experience mathematics in context. Students should connect mathematical concepts to their daily lives, as well as to situations from other areas such as science, the social sciences, medicine, and commerce.

Representation**Representation**

In order for students to achieve the other four Process Standards, as well as the five Content Standards, they must make effective use of representations. Representations are necessary to students' understanding of mathematical concepts and relationships. Representations allow students to communicate mathematical approaches, arguments, and understanding to themselves and to others. They allow students to recognize connections among related concepts and apply mathematics to realistic problems.

Mathematical instruction at all levels should enable all students to: create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; and use representations to model and interpret physical, social, and mathematical phenomena.

The emphasis on representation is new to the *Principles and Standards* document: the other process standards also appeared in the 1989 NCTM *Curriculum and Evaluation Standards*. The integration of technology into mathematics instruction increases the need for students to understand and use new mathematical representations. Further, some forms of representation, such as diagrams, graphical displays, and symbolic expressions have often been taught and learned as ends in themselves, limiting their power and utility as tools for learning and doing mathematics. Finally, while it is important to encourage students to invent sense-making ways to represent their mathematical ideas, students should learn conventional forms of representation in ways that facilitate their learning of mathematics and their communication with others about mathematical ideas.

Minnesota Spring Mathematics Conference

Catch the Excitement

-
- | | | |
|----------------------|------------------------|-------------|
| - LEARNING PRINCIPLE | - CURRICULUM PRINCIPLE | - STANDARDS |
| - REASONING & PROOF | - PROBLEM SOLVING | - GEOMETRY |
-

Join hundreds of Minnesota educators

March 22-23, 2002

DECC • Duluth Entertainment Convention Center
Duluth, MN

Jointly sponsored by:

MCTM • *Minnesota Council of Teachers of Mathematics*

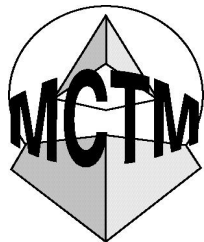
MinnMATYC • *MN Mathematical Association of Two Year Colleges*

Get rejuvenated with

- ideas to improve the teaching and understanding of mathematics
- effective ways to help students achieve state and national standards for mathematics
- information and ideas about what works in other schools to share with colleagues back home
- an opportunity to enjoy a great area of Minnesota and learn in the company of great educators



Register Early!



*For registration, further
conference information and
program updates access*

www.mctm.org

*For information about Duluth
call 1.800.438.5884
or access*

www.visitduluth.com

Still have questions? Contact one of the following: Arnie Cutler, 612.626.8326, cutler@tc.umn.edu;
Karen Coblenz, 320.286.4100x1500, karen@de.dc.k12.mn.us; Glen Richgels, 218.755.2824,
grichgels@bemidjistate.edu; Genni Steele, 651.407.7535, gsteele@wbl.whitebear.k12.mn.us

Minnesota Spring Mathematics Conference

Catch the Excitement


DECC, Duluth, MN - Friday, March 22 & Saturday, March 23, 2002

Program includes over 150 sessions covering the six strands of the conference and features exemplary educators from throughout Minnesota and across the nation.

1	LEARNING PRINCIPLE The National Council of Teachers of Mathematics (NCTM) in its <i>Principles and Standards for School Mathematics</i> emphasizes that conceptual understanding is an important part of proficiency. Gain ideas for improving student learning at all levels in your school.	2	CURRICULUM PRINCIPLE Rather than just a mere collection of activities, in <i>Principles and Standards for School Mathematics</i> , NCTM calls for a curriculum that is coherent, focused on important mathematics, and well articulated across levels. Explore how to better shape the curriculum in your district or institution.
3	STANDARDS Minnesota's Graduation Standards and NCTM's revised national standards are changing teaching, learning and assessment. Come find out how to keep your school up-to-date and increase student achievement aligned with standards.	4	GEOMETRY Shape, space and measurement is the one Minnesota standard that exists at all levels. Geometric modeling and spatial reasoning offer ways to interpret and describe the physical environment and solve problems. Discover teaching strategies and resources for improving student learning in this area.
5	PROBLEM SOLVING From a focus in the 80's to the heart of today's mathematics, problem solving shapes the curriculum. Investigate what mathematics is accessible to students, what mathematical habits they acquire, and what is retained in a problem-centered curriculum.	6	REASONING & PROOF Central to mathematical thinking, reasoning and proof moves from informed guessing and exploring ideas to systematic exploration and making conjectures to formal ways of expressing reasoning and justification. Explore what might be done at your instructional level to help students develop their logical thinking.

Arrange your own lodging . . .

Consider bringing family or friends and extending your stay through the weekend to take advantage of the Duluth area. Information on hotels and Duluth is available at www.visitduluth.com or www.mctm.org. Special conference rates (\$72-\$99 + tax/night/room) have been negotiated with the following hotels until the blocks of rooms run out. Mention the MATH conference and confirm rates for conference dates and any extended stay (rates may change for extra days, suites, location of room, extra guests, etc.).

 www.visitduluth.com	Best Western Edgewater 218.728.3601; 800.777.7925 Comfort Suites 218.727.1378; 800.228.5150 Hampton Inn 218.720.3000; 800.HAMPTON Hawthorn Suites 218.727.4663; 800.527.1133	Holiday Inn 218.722.1202; 800.477.7089 Inn on Lake Superior 218.726.1111; 888.ON THE LAKE Radisson Harborview 218.727.8981; 800.333.3333
---	---	---

Register early . . . To register, send in the attached form or obtain a form or register online at www.mctm.org. Note: register by Feb. 28, 2002 to avoid a \$15 late fee.

Friday/Saturday registration fee with 3 meals:	\$130 MCTM members, \$145 non-members
Full time students:	\$ 65 MCTM members, \$ 72.50 non-members
Saturday only registration fee with 1 meal:	\$ 80 MCTM members, \$ 95 non-members
Full time students:	\$ 40 MCTM members, \$ 47.50 non-members

MCTM Minnesota Spring Mathematics Conference Registration Form

Catch the Excitement

DECC, Duluth, MN - Friday, March 22 & Saturday, March 23, 2002

Name _____

Mailing Address _____

City _____ State _____ Zip _____

If you are a new member OR if any of the following has changed, fill in the information requested below.

Home phone (include area code) (_____) _____ Work Phone (_____) _____

Fax (_____) _____ E-mail _____

District Office City _____ School Building _____

Circle one: teacher supervisor student retired other _____

Circle one: elementary jr. high/middle high school post secondary other _____

Spring Conference Registration Fees

Regular Friday & Saturday registration fee includes 3 meals. Regular Saturday only registration fee includes 1 meal.

NOTE: Registrations on-site or those postmarked or sent after Feb. 28, 2002 will be charged a \$15 late fee.

	Fri.&Sat.	Sat. only	Special Meal Requests
MCTM Member	_____ \$130	_____ \$ 80	_____ vegetarian meals required
Non-member	_____ \$145	_____ \$ 95	Meal Tickets for Speakers or Non-registered Guests:
Student Member	_____ \$ 65	_____ \$ 40	_____ tickets for Friday lunch @ \$15 = _____
Student non-member	_____ \$ 72.50	_____ \$ 47.50	_____ tickets for Friday banquet @ \$25 = _____
Speaker	Registration fee waived – select and pay for meals using the table at the right		_____ tickets for Saturday lunch @ \$15 = _____

Individuals should make their own lodging arrangements.

MCTM Dues

Circle one: new renewal do not need to renew

Indicate membership category:

_____ One year regular \$15
 _____ Two year regular \$25
 _____ Student \$ 7.50
 _____ Retired \$ 7.50

NCTM Dues (optional)

Circle one: new renewal do not need to renew

Indicate membership category:

_____ Membership with one teaching journal (choose below) \$65
 _____ Additional teaching journal(s) (choose below) @ \$28
 _____ Journal for Research in Mathematics Education \$50
(Full time students may join NCTM at half the cost of memberships above)

Circle choice of teaching journal(s):

Teaching Children Mathematics (K-6) Mathematics Teacher (8-14)
 Mathematics Teaching in the Middle School (5-9)

Amount Due **Method of Payment:** _____ credit card _____ check _____ p.o. # _____
 (copy of p.o. must be attached)

Conference Registration/Meal Fee _____ credit card number _____

Membership MCTM _____ expiration date _____

Membership NCTM _____ type of card _____ Master Card _____ Visa

Additional NCTM journals _____ Signature _____

Total Due _____

Mail to: MCTM, P.O. Box 120418, New Brighton, MN 55112
or register online at www.mctm.org

For information about lodging and events in Duluth call 1.800.438.5884 or visit www.visitduluth.com

Mark Your Calendar

	<u>2002</u>	
	3/22 – 3/23	MCTM Spring Conference, Duluth, Minnesota
	4/21 – 4/24	NCTM Annual Meeting, Las Vegas, Nevada
	4/26	World's Largest Math Event 8, "Entertaining Mathematics"
	6/20 – 6/22	NCTM Regional Leadership Conference, Minneapolis

People in the News

Congratulations to Emily Larsen who recently received a Christa McAuliffe Fellowship.

Election Issue	Ballot Included
Ballot must be returned by December 21, 2001.	

Mathbits

Published by

Minnesota Council of Teachers of
Mathematics

P.O. Box 120418
New Brighton,
MN 55112

www.mctm.org

Tom Muchlinski, President
507-537-6082 – W
763-475-3168 – H
muchlinski@southwest.msus.edu

Arnie Cutler, Exec. Dir.
612-626-8326 – W
651-631-2136 – H
cutler@tc.umn.edu

Pam Brethorst, Editor
651-690-9075 – H
pambrethorst@aol.com

Forwarding and Return Postage
Guaranteed
Address Service Requested

Non-Profit
U.S. Postage
PAID
Permit No. 1967
Minneapolis, MN