

# Mathbits

Minnesota Council of Teachers of Mathematics

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

Two of Minnesota's finest math teachers present the keynote address, "Reflections: 35 Years in a Mathematics Classroom," at the MCTM Spring Conference banquet on Friday evening, April 27. On Saturday, April 28, the closing address, "The Development into Mathematical Talent," features Zalman Usiskin.

**Bonnie Hagelberger** is a first grade teacher in the Anoka Hennepin School District. She graduated from Wayzata Senior High School and completed both her undergraduate and graduate work at St. Cloud State University. Bonnie served as Elementary Vice President and Recording Secretary for the MCTM and has been a Spring Conference Co-Chair, Program Committee member, speaker, and presider at MCTM conferences. At the national level, Bonnie has been a member of the NCTM Electronic Resources Committee, Co-Chair of the Session Support Committee for the NCTM National Conference in Minneapolis, and has spoken at national and regional conferences. Bonnie is also a member of the Minnesota Mathematics Best Practice Network and is a national instructor with Teachers Teaching with Technology (T3). Recognized as a Distinguished Alumnus of Wayzata Senior High School, Bonnie is also a Presidential Awardee for Excellence in Elementary Mathematics Teaching.

## MCTM Spring Conference Keynote Speakers

**Jim Foley** is a 35-year MCTM member. A graduate of Cambridge High School, Jim earned his undergraduate degree from the University of Minnesota, Duluth and his graduate degree from Kansas State University. Jim has taught math and coached in Rush City, in Anoka at Fred Moore Junior High School, and at Champlin Park High School. Following his retirement this year, Jim will teach math part-time at Anoka Ramsey Community College. Jim's speaking career spans 18 years and includes presentations at MCTM, NCTM, and SSMA conferences. He was MCTM President in 1996 and served on the Board of Directors for nine years. Jim has been a member of conference planning committees for both MCTM and NCTM and currently serves on the NCTM Affiliated Services Committee. A member of the Minnesota Mathematics Best Practice Network, Jim is also the recipient of a Presidential Award for Excellence in Mathematics Teaching.

**Zalman Usiskin** is Professor of Education at the University of Chicago, where he is in his 32nd year as a faculty member. A product of the Chicago public schools, Zalman completed undergraduate degrees at the University of Illinois, earned a Master's degree at Harvard, and completed his Ph.D. at the University of Michigan. Zalman taught high school math in three states and has been instrumental in developing the curriculum of the University of Chicago School Mathematics Project, which he now directs. Throughout his career Zalman has served on numerous advisory boards. He is currently the chair of the U.S. National Commission on Mathematics Instruction and serves on two committees of the National Assessment of Educational Progress. Zalman has written numerous books and articles about math education and is widely recognized for his leadership in the field.

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# 2 *Mathbits*

## *NCTM Principles and Standards for School Mathematics*

### The Content Standards

#### Number and Operations

This article, the third in a series, briefly describes the five content standards proposed in the *NCTM Principles and Standards for School Mathematics*: Number and Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability. These Standards explicitly describe the mathematical content that all students from grades prekindergarten through twelve should learn. Because many areas of mathematics have rich connections, the Standards are integrated and some concepts overlap. Although each Standard applies to students at every level, the depth of understanding and the emphasis it receives varies within and between grade bands.

Developing number sense is a cornerstone of the Number and Operations Standard. Mathematics instruction should enable students to understand numbers and ways of representing them, both physically and symbolically. As students learn relationships among numbers, they are able to correctly reason about numbers within and between systems. Students also understand operations with numbers, how operations relate to one another, and what constitutes a reasonable result. Developing computational fluency goes beyond learning algorithms—it requires a balance and connection between conceptual understanding and computational proficiency. Part of this fluency means making smart choices about which tools to use and when.

#### Algebra

Algebra is much more than symbol manipulation—algebraic ideas form a major component and unifying theme for the school mathematics curriculum. All students can and should learn algebra, often building on their understandings and experiences with number. Programs should help students identify, understand, and describe patterns, relations, and functions. Using algebraic symbols, students should learn to represent and analyze mathematical situations. Developing and using mathematical models to represent and understand quantitative relationships is key to algebraic competence. Understanding the concept of change in various contexts is fundamental to understanding functions and helps students make sense of their world.

#### Geometry

The study of geometry enables students to describe and analyze properties and characteristics of two- and three-dimensional geometric shapes. Students learn to reason and develop arguments about geometric relationships. Using coordinate geometry and other representational systems, students are able to specify locations and describe spatial relationships. Mathematical situations are analyzed by using the concept of symmetry and by applying transformations. Students develop spatial visualization skills and use mathematical modeling and spatial reasoning to solve problems.

#### Measurement

Measurement can be as simple as describing the length of a pencil or as complex as citing the consumer price index in describing the economy. Important because of its practicality, the study of measurement enables students to understand the measurable attributes of an object as well as the units, systems, and processes of measurement. Students must also be able to apply appropriate techniques (including estimation), tools, and formulas to determine measurements.

#### Data Analysis and Probability

This Standard recommends that all students formulate questions that can be answered using data and that they learn how to collect, organize, and display relevant data. Choosing and applying appropriate statistical methods to analyze data are skills all students should learn. Students must also be able to develop and evaluate inferences and predictions based on data. In addition, students should understand and be able to apply basic concepts of probability.

## Summer Professional Development Opportunities

The March issue of *MathBits* contained a variety of summer professional development opportunities for teachers of mathematics. If you didn't find a workshop, class, or conference that fit your schedule or interests, perhaps one of the following opportunities will provide the perfect challenge for you. Again, the programs are listed alphabetically by title and include information about the intended audience, date, location, cost, sponsoring institution, contact address or telephone number, and program description. Further information can be obtained by contacting the organization or institution sponsoring the program.

Arithmetic Foundations I; 10 elementary and middle school teachers and 30 paraprofessionals from northern Minnesota; July 2001 with academic year follow-up; Bemidji State University; Eisenhower Professional Development Grant; Dr. Tom Richard; 218-755-2832 or trichard@bemidjistate.edu.

A summer mathematics course, Arithmetic Foundations I will be offered to expand the knowledge of the foundations of arithmetic for teachers and paraprofessionals. Participants will be provided instructional models using manipulatives to explain arithmetic operations and to enhance and improve instruction in the classroom.

Basic Geometry with Geometer's Sketchpad (Math 220); middle school teachers; June 25 - July 6; Concordia College, Moorhead; Bill Tomhave; 218-299-3923 or tomhave@cord.edu.

COMPASS Curriculum Showcase; teacher leaders, school district administrators, state education department personnel, and teacher educators; August 10-12, 2001; Denver, Colorado; www.ithaca.edu/compass or send an e-mail message to compass@ithaca.edu or call 1-800-688-1829.

COMPASS (Curricular Options in Mathematics Programs for All Secondary Students) is hosting a conference that will showcase 5 Standards-based secondary mathematics curricula: Mathematics: Modeling Our World (ARISE), Contemporary Mathematics in Context (CPMP), Interactive Mathematics Program (IMP), MATH Connections: A Secondary Mathematics Core Curriculum, and Integrated Mathematics: A Modeling Approach Using Technology (SIMMS).

Content and Communication: Mathematics Institute for K-6 Paraprofessionals; 30 Paraprofessionals from the Roseville, Minneapolis, and St. Paul Schools; June 15-29, 2001 with academic year follow-up; Eisenhower Professional Development

Grant; Augsburg College; Dr. Jeanine Gregoire; 612-330-1551 or gregoire@augsburg.edu.

The objectives of this institute are to improve content knowledge and conceptualization of K-6 mathematics using constructivist methods and inquiry-based learning, improve communication skills, develop appropriate strategies for adult/student and adult/adult interactions, and engage participants in planning for professional growth.

Investigating New NSF Funded High School Curricula for Years 2, 3, and 4; 80 MASP high school mathematics teachers (year 2, year 3, and year 4); Summer 2001 with academic year follow-up; University of Minnesota and metro area school sites; Eisenhower Professional Development Grant; Dr. Tom Post; 612-625-0069 or masp@tc.umn.edu. Ongoing professional development for high school mathematics teachers who will be teaching years two, three, or four of an NSF sponsored curriculum for the first time. The project will focus on mathematics development, the use of instructional strategies, and the use of technology for teachers in areas consistent with content of new NSF funded curricula.

Mathematics Literacy for Urban Students; 28, 4-6 grade teachers and paraprofessionals of urban students; August 2001 with academic year follow-up; Hamline University; Eisenhower Professional Development Grant; Dr. Dwight Watson; 651-523-2303 or dwatson@gw.hamline.edu.

To help 14 teachers and 14 paraprofessionals integrate the Minnesota Graduation Standards of Read, View, and Listen and Mathematical Application, the summer institute will consist of both theory and practice in which strategies are modeled and then applied in peer groups.

Math Matters: Institute for Title I Paraprofessionals; 35 Title I Paraprofessionals; June 11-14, 18-21, 2001 with academic year follow-up; Ridgewater College, Hutchinson Campus; Eisenhower Professional Development Grant; Cindy Salfer; 320-234-0366 or csalfer@ridgewater.mnscu.edu.

Thirty-five Title I Paraprofessionals will have 48 hours of classroom instruction and 16 hours of Internship experience over 12 months to help them develop an understanding of mathematical concepts, pedagogical skills, problem solving strategies and techniques to collaborate effectively with classroom teachers regarding the math needs of the students and the activities used.

NCTM Academy --Five-Day Summer Institutes; \$495 for NCTM members, \$595 for non-members (group rates available); 800-235-7566, academy@nctm.org or nctm.org/academy. Each institute helps teachers learn effective instructional practices, deepen their understanding of the NCTM *Principles and Standards for School Mathematics*, expand their problem-solving skills, and develop personal action plans.

Grades 9-12 Teachers; June 17-22;

Little Rock, Arkansas

Grades 6-8 Teachers; June 26 - July 1;

Atlanta, Georgia

Grades Pre-K-2 Teachers; July 15-20;

Cincinnati, Ohio

Grades 3-5 Teachers; July 31-August 5;

Buffalo, New York

New NSF Funded Middle School Curricula Years 2 and 3; 100 middle school mathematics teachers preparing to teach year 2 or year 3 of NSF funded curricula (STEM, CMP and MathScape); Summer 2001 with academic year follow-up; University of Minnesota and metro area school sites; Eisenhower Professional Development Grant; Dr. Tom Post; 612-625-0069 or masp@tc.umn.edu.

To assist teachers preparing to teach NSF curricula that is new to them. This summer session will provide mathematics content emphasis consistent with the Minnesota Graduation Standards as well as instructional strategies to be used as the delivery model of the NSF curricula.

Probability and Statistics using Workshop Statistics (Math 215); middle school teachers; June 11 - 22; Concordia College, Moorhead, Bill Tomhave; 218-299-3923 or tomhave@cord.edu.

Summer Mathematics Institute; 34 elementary and middle school teachers in northern Minnesota; July 2001 with academic year follow-up; Bemidji State University; Eisenhower Professional Development Grant; Dr. Glen Richgels; 218-755-2824 or grichgels@bemidjistate.edu.

To enhance mathematics instruction, the summer project will provide content in the areas of discrete mathematics and probability while modeling

instructional practices that enhance learning and motivation. The project will provide instruction and assessment consistent with the Minnesota Graduation Standards and include a seminar on becoming a mathematics teaching professional.

Summer Teaching Institute: Calculus; secondary teachers; June 17-22, 2001; Carleton College, Northfield; \$690 (State scholarships for \$540 available); 507-646-4038 or summer@carleton.edu; www.carleton.edu/campus/sap.

Major topics included in the first two college-level introductory calculus courses are considered.

Attention is given to teaching strategies dealing with topics such as limits, proofs, and problem solving. Classes offered: Calculus AB for First-Time AP Teachers, Calculus AB, Calculus BC, and Calculus with Graphic Calculators.

Summer Teaching Institute: Statistics; AP Statistics teachers; June 17-22, 2001; Carleton College, Northfield; \$690 (State scholarships for \$540 available); 507-646-4038 or summer@carleton.edu;

www.carleton.edu/campus/sap.

The structure, philosophy, and content of the AP Statistics course are examined. Review of topics and teaching methods are addressed. This is a revised course and may be taken by previous participants.

Weaving the Strands: Mathematics Institute for Elementary Teachers, Inservice Projects for K-12 Teachers; 20 teachers of grades 1 through 6 in northeastern Minnesota; August 2001 with academic year follow-up; The College of St. Scholastica, Duluth; Eisenhower Professional Development Grant, Dr. Alice Guckin; 218-723-6389 or aguckin@css.edu.

Participants will examine state, national and international influences that have resulted in changes in the mathematics curriculum, graduation standards, and associated instructional assessment methods. Participants will investigate recently developed mathematics curricula for elementary students. Mathematics content will focus on number sense and emphasize the mathematics process standards.

## Summer Professional Development Opportunities (continued)

## Classy Tips

“Classy Tips” is a monthly feature in the *Mathematics Teacher*. The current “Classy Tips” editor is soliciting responses to the following questions:

- How do you successfully move both students and teachers from a layered curriculum to an integrated curriculum?
- Did you start with inservice for teachers or mandated curriculum?
- How has it been successful?

- What pitfalls did you encounter?

Responses to these questions must be received by 6/1/01. Forward all responses to: Willard H. Blaskopf, Jr., c/o Newark Academy, 91 South Orange Avenue, Livingston, NJ 07039; (email) wblaskopf@newarka.edu; (fax) 973-691-0279.

Selected responses will appear in the February 2002 issue of the *Mathematics Teacher*.

Are you looking for a way to incorporate NCTM *Principles and Standards for School Mathematics* into your department's staff development plan? The following article, submitted by Emily Larsen, describes how the high school math department in the White Bear Lake School District accomplished this.

Recently we had a Staff Development day in our district and half of the day was allocated to staff development in our department. For three hours in the afternoon, our department investigated the *Principles and Standards for School Mathematics* (PSSM). The workshop was designed to review or introduce the three components of the document: the content standards, the process standards, and the principles.

## PSSM and Staff Development

The first discussion revolved around the Geometry Standard for Grades 9-12. This standard is divided into four big ideas:

- Analyze characteristics and properties of two and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems.
- Apply transformations and use symmetry to analyze mathematical situations.
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

We recently had discussions about the strengths and weaknesses of the Geometry strand of our curriculum, so we used the PSSM document to critique our current materials. Working in groups, our teachers read the section about high school geometry and identified the strengths and weaknesses of our curriculum materials. We found

some concepts included in our curriculum, such as surface area, volume, and properties of shapes, that appear in the Grade 6-8 Geometry Standard. We also identified some ideas, such as polar and spherical systems and the use of dynamic geometric software, that are not currently covered in the first three years of our curriculum.

As part of the second discussion, we did a jigsaw of the five process standards. The process standards are: Problem Solving, Reasoning and Proof, Communications, Connections, and Representation. Two people read each of the standards and paraphrased their responses to these two questions:

- What should "the process standard" look like in grades 9-12?
- What should be the teacher's role in developing "the process standard" in grades 9 through 12?

Each person then went back to her/his base group and shared information about the process standards.

The final discussion was about the principles. The six principles are the Equity Principle, the Curriculum Principle, the Teaching Principle, the Learning Principle, the Assessment Principle, and the Technology Principle. Each pair of teachers was asked to read the one principle that most interested them and create a representation, as a poster or a skit, of that principle. We had some very creative representations that were shared with everyone at the end of the session.

In the course of three hours, our teachers developed sound background knowledge of the PSSM document. In our district, the next step will be to have a dialog with our middle school teachers and determine if there are any changes that can or should be made in what we are currently teaching.

*Emily Larsen*  
*Vice-President, High School*

## What is TIG?

In 1995 MCTM announced the first Teacher Incentive Grant program for MCTM members. It is often referred to as the TIG program. At that time MCTM set aside \$1500 to fund the grant program. The program was designed to assist MCTM members, pre-K to post-secondary, who are working on new or current projects as they implement standards-based teaching in their classrooms. This program continues to be one of the projects supported by MCTM for its members. Today its purpose is to assist and encourage innovative standards-based teaching practices and assessments.

All proposals are examined for their creativity, their connection to the standards, and the impact they will have on the students. A major emphasis of the TIG program involves sharing (dissemination) of the proposals with other Minnesota teachers. This is done through presentations or poster sessions during fall or spring conferences.

Since 1996 over a dozen teachers have been recipients of a Teacher Incentive Grant. Applications are available at the MCTM website or in the March issue of *MathBits* and are being accepted through June 30, 2001 for next year's awards.

## Mark Your Calendar

November 1–3, 2001

100th Anniversary and Annual Conference of the School Science and Mathematics Association, Downers, Grove, IL. Visit <http://www.ssm.org> for further information.

July 1–6, 2002

2nd International Conference on the Teaching of Mathematics at the Undergraduate Level, Crete, Greece. For more information go to <http://www.math.uoc.gr/~ictm2/index.html>.

### Mathematics Challenges for Families of Middle School Students

Figure This! middle school math initiative illustrates the excitement, energy, and true problem-solving nature of mathematics all in real-world contexts. The campaign centers on 80 mathematical challenges, printed in hardcopy booklets (five challenge books consisting of sets of 16 challenges) and posted on the web at [www.figurethis.org](http://www.figurethis.org).

## Figure This!

Teachers interested in promoting the campaign to their middle school students and their parents can download the activities from the Web and send them home with their students. Families can access the Figure This! materials directly by visiting [www.figurethis.org](http://www.figurethis.org); hardcopies of all materials may be ordered by calling the Figure This! toll-free number at (877) GO-SOLVE.

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