Volume 14, Issue 2—March 2005

Connections

Inside this issue:

You might say, "Wxll, I'm only onx pxrson. It won't makx much diffxrxncx."

"A" is for Association

Sid Rachlin, East Carolina University
AMTE President

As the memories from the AMTE 2005 Conference begin to fade and I settle into the role of AMTE President, I am reminded of an Ann Landers' column from the past. It was a tale of a simpler time when keyboards were connected to metal type.

Am I Really Needed?

Xvxn though my typxwritxr is an old modxl, it works wxll xxcxpt for onx of thx kxys. I'vx wishxd many timxs that it workxd pxrfxctly. Trux, thxrx arx 42 kxys that function, but onx kxy not working makxs thx diffxrxncx.

Somxtimxs, it sxxms to mx that our organization is somxwhat likx my typxwritxr—not all thx pxoplx arx working propxrly. You might say, "Wxll, I'm only onx pxrson. It won't makx much diffxrxncx." But, you sxx, any organization, to bx xfficixnt, nxxds thx activx participation of xvxry pxrson. Thx nxxt timx you think your xfforts arxn't nxxdxd, rxmxmbxr my typxwritxr, and say, "I am a kxy pxrson and thxy nxxd mx vxry much."

—from Ann Landers' column
Honolulu Advertiser, 5/16/89

This little essay drives home the point, in a forceful manner, that each of us is an important part of a bigger picture. With that in mind, I want to thank every one who was involved in making the past year in AMTE's life so rich and full. From the *first* AMTE Monograph, to the index of *fifty* mathematics education doctoral programs generated by the Doctoral Programs Task Force, to the newly enhanced website under the watchful eye of the technology committee, to the incredible slate of candidates put forward by the 2005 Nominations and Election Committee, to the efforts to link AMTE activities with other professional organizations including our sponsored receptions for mathematics teacher educators at the NCSM and NCTM annual meetings and the NCTM Baltimore regional meeting, to the formation of five AMTE affiliate organizations, to the AMTE sponsorship and support of the mathematics section of the *Contemporary Issues in Technology and Teacher Education (CITE) Journal*, to the information and exchanges of ideas provided by *Connections* and finally to the highly successful 2005 Annual Conference — the association demonstrated the accomplishments that can be made through the contributions of its members.

Next time you bump into one of the following people, take a moment to express your appreciation to them for having just completed a term of service to AMTE, either by serving on a com-

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AMTE Business

Election Results

The AMTE Election was held online for the first time this year, and a total of 118 members voted. AMTE's new secretary is Mary Margaret Shoaf from Baylor University. Our two new members-at-large are Tom Bassarear from Keene State College and Barbara Pence from San Jose State University. These newly elected officers began their work at the conclusion of the Business Meeting at the AMTE Conference in Dallas.

AMTE thanks the Nominating and Election Committee for their work on assembling a strong slate of candidates: chair Diana Lambdin, Kathleen Lynch, Sue Mau, Joe Merlino, and Sid Rachlin (ex-officio member).

New Officers

Secretary Mary Margaret Shoaf received her Ph.D. in Mathematics Education from Columbia University where Dr. Henry O. Pollak served as her dissertation mentor. Her areas of specialization and research include the use of technology in the mathematics classroom at all levels of education, the role of spatial visualization in the learning of mathematics, and the challenge of developing and educating women in mathematics and the sciences. She has been at Baylor University for the past eight years where she is the Chair of the Department of Mathematics Education Committee. She has contributed chapters in numerous mathematics textbooks, and authored many papers appearing in refereed journals. Dr. Shoaf's most recent book, *Math Trails*, co-authored with Henry Pollak and Joel Schneider, has just been published by COMAP. She has been awarded several Eisenhower Professional Development Grants, allowing her to share new teaching approaches with inservice teachers.

Board Member-at-Large Tom Bassarear has a doctorate from the University of Massachusetts in Amherst (1986) and has been at Keene State College since then. He has taught different mathematics courses, elementary, middle, and secondary mathematics methods courses, and supervised student teachers. He has also taught general teacher education courses which has given him a rich sense of the whole picture of teacher certification. He has done over 100 workshops with elementary, middle, and secondary teachers, worked on several NSF grants, and has been awarded Eisenhower and local grants. He has written two books and several published journal articles. Last year he taught 4th grade mathematics every day for a semester.

Board Member-at-Large Barbara Pence graduated from Stanford University with a Ph.D. in Mathematics Education. Before earning her doctorate, she taught at both the high school and the community college levels. Following her graduate work, she worked at Stanford for six years, and then moved to the mathematics department at San Jose State University where she now teaches. At San Jose State University, she has directed a California Mathematics project, co-directed an NSF project and a Mathematics Professional Development project. In addition to AMTE, she is involved in many professional organizations such as PME, NCTM, NCSM, CMC, and the Santa Clara Valley Mathematics Association. Through the years, her areas of special interest have been algebraic functions, algebra across the curriculum, geometry as supported by a dynamic geometry environment, and classroom coaching.

AMTE Business (cont.)

Treasurer's Report

This report covers the fiscal year from July 1, 2003 to June 30, 2004, as well as providing additional information. Mark Klespis assumed the treasurer's duties from Janet Warfield during this time, and as a result, AMTE's bank account has been shifted from Illinois to Texas.

From the 2004 conference in San Antonio, we had a net income of $19,305.95. Attendance at our 2005 conference in Dallas was an all-time high of 388. Total income for the past year was $106,917.03, and total expenses were $91,137.38 for a net of $15,779.65. We have an additional $30,283.57 in reserve in a savings account. We have two new expenses this year: liability insurance ($3,842.00) and partial expenses for our first monograph ($1,536.85).

Our 2005 conference set another record with 391 registrations, and our membership has increased to 886. The treasurer's office now sends out postcard reminders to members to renew their membership one month before it is due to expire. Please look for these in your mail. JMTE's Volume 8 is available to AMTE members for the reduced subscription rate of $48.00. A subscription form is available on the AMTE web site. If you have a problem or question about your AMTE membership, please contact Treasurer Mark Klespis (klespis@shsu.edu).

Reports from AMTE Business and/or Board Meetings, January 2005

Membership — Joanne Powers, Chair and Peg Smith, AMTE Board Liaison
Peg Smith reported that the current membership is close to 900. The membership committee is seeking ways to find those who may not know about AMTE. She invites members to help.

Technology Committee – Maggie Niess, Chair and Susan Friel, Board Liaison
Maggie Niess reported that the technology committee decided to work on several initiatives. The first one is the development of a position statement on technology use. The committee may extend the position statement by developing an online monograph. In addition, the committee is identifying exemplary web resources to share.

Awards – Beatriz D'Ambrosio, Chair and Gary Martin, Board Liaison
Beatriz D'Ambrosio reported that the committee has been discussing what types of awards to develop. They plan to announce an invitation to submit for an award for excellence in teaching in the June issue of *Connections*.

Nominations and Election – Diana Lambdin, Chair and Sid Rachlin, Board Liaison
Diana Lambdin reported that elections went very smoothly. The volunteer forms (available online) were a great resource for finding new talent to run for the Board. For the first time, voting was online.

Doctoral Task Force – Bob Reys, Chair
Bob Reys and his committee completed a survey with 50 universities responding. This information was shared at one of the AMTE conference sessions and will be compiled and available on the AMTE web site.

Teaching Resource Task Force – Susan Friel and Peg Smith, Co-Chairs/Board Liaisons
This committee is gathering and creating useful resources for teacher educators. The committee met to develop a format for teacher educator resources for using cases, which was shared at the presession. The cases project resources may eventually be published online or in a monograph.

Task Forces and Committees

AMTE's committees and task forces work throughout the year and are always looking for volunteers. For a list of the 2005 committee chairs, see page 11. For a full list of active committees, see the AMTE web site. If any one of these groups captures your interest, contact Sid Rachlin (AMTE president) or contact the chair or AMTE board liaison to find out more.

AMTE is always looking for volunteers. If any one of these groups captures your interest, contact Sid Rachlin (AMTE president) or see www.amte.net.

President's Column
(Continued from page 1)
mittee or assisting on a publication.

Outgoing Members of the Executive Board
- President Karen Karp, University of Louisville
- Board Members-at-Large Susan Friel, University of North Carolina, and Peg Smith, University of Pittsburgh
- Secretary Jennifer Bay-Williams, Kansas State University
- *Connections* Newsletter Editor Mark Taylor, University of Tennessee
- NCTM Representative Janet Caldwell, Rowan University

Technology Committee:
- Maggie Niess, Oregon State University, Chair
- Oscar Chavez, University of Missouri
- Virgil Fredenberg, Eastern Washington University

Membership Committee
- Joanne Powers, College of Saint Rose, Chair
- Fran Arbaugh, University of Missouri
- Tim Hendrix, Meredith College
- Iris Johnson, Miami University-Oxford
- Bob Wolffe, Bradley University

Organization Connections Committee
- Carol Malloy, University of North Carolina, Chair
- Kathryn Chval, University of Missouri
- Barbara Dougherty, University of Hawaii

Nominations and Election Committee
- Diana Lambdin, Indiana University, Chair
- Kathleen Lynch-Davis, Appalachian State University
- Sue Mau, Indiana University-Purdue University, Fort Wayne
- Joe Merlino, Math Science Partnership of Greater Philadelphia

Awards
- Mary Garner, Kennesaw State University
- Hank Kepner, University of Wisconsin-Milwaukee
- Kate Riley, California Polytechnic State University

2005 Annual Conference – Dallas, TX
- Mark Klespis, Sam Houston State University, Local Arrangements Chair
- Ralph Connelly, Brock University, Program Co-chair
- Fran Arbaugh, University of Missouri
- Sandi Cooper, Texas Tech University
- Betz Frederick, Grand Canyon University
- Hank Kepner, University of Wisconsin-Milwaukee
- Gladis Kersaint, University of South Florida
- Kathleen Lynch-Davis, Appalachian State University
- Gary Martin, Auburn University
- Doug Owens, Ohio State University
- Connie Schrock, Emporia State University

***CITE Journal* Co-editors**
- Denisse Thompson, University of South Florida
- Gladis Kersaint, University of South Florida

Monograph Editorial Panel
- Tad Watanabe, Pennsylvania State University, Co-editor
- Denisse R. Thompson, University of South Florida, Co-editor
- Susan Beal, St. Xavier University
- Michaele Chappell, Middle Tennessee State University
- Dale Oliver, Humbolt University
- David Pugalee, University of North Carolina at Charlotte

As you can tell, our organization is rich in the willingness of its members to share their time, energies, and expertise.

As you can tell, our organization is rich in the willingness of its members to share their time, energies, and expertise. In addition to the above list, I could add the 244 speakers at the 2005 AMTE annual meeting and the authors of chapters included in the first AMTE monograph, the *CITE Journal*, and *Connections*. I could then continue the list with those members whose committee and leadership assignments continue for another year.

I am currently in the process of filling the committee assignments for this year. If you haven't already done so, take a moment to send in your AMTE Volunteer Form, respond to the call for proposals to speak at the AMTE 2006 Annual Conference in Tampa, or submit a manuscript for Volume 3 in the AMTE monograph series (http://www.amte.net).

You DO count. AMTE succeeds because of your efforts.

Highlights of the Ninth Annual AMTE Conference

Susan Gay and Jennifer Bay-Williams

On January 28-29, 2005 AMTE hosted its Ninth Annual AMTE Conference in Dallas, Texas. A record 388 members enjoyed excellent sessions, rich discussions, and superb meals.

Each year the conference has grown not only in the number of participants, but also in the variety of opportunities offered to participants. This year's preconference included a session on using calculators to teach algebra by Texas Instruments, one on the professional development of professional developers by the Center for Proficiency in Teaching Mathematics, and an NCATE Workshop for Program Reviews. In addition, AMTE sponsored a two pre-sessions: one on technology and another on cases in mathematics teacher education.

On Friday and Saturday, participants attended 100 regular sessions in a variety of formats, varying in length from 30 to 90 minutes. Speakers addressed many topics including content and methods courses, field experiences, technology, online instruction, lesson study, professional development, English language learners, assessment, and doctoral programs. In addition to the presentations by speakers, breaks and meals provided informal opportunities to collaborate and network with colleagues.

AMTE again piloted session formats in order to maximize opportunities to learn and interact. The two new formats at this year's conference were mini-sessions and talk-time sessions. At each of the 40 mini-sessions, participants were able to overview 8 to 12 posters before deciding which three or four 15-minute presentations to attend. These sessions frequently shared information on funded projects, course assignments or activities, research studies, courses for preservice and inservice teachers, and professional development initiatives. During talk-time sessions of 45 minutes, facilitators guided discussions about selected topics of interest to teacher educators including field experiences, partnerships, equity, technology, methods courses, and NSF programs.

A tradition at AMTE is the annual Judith E. Jacobs Lecture, established in honor of Judith's work in founding AMTE. Each year a distinguished mathematics teacher educator is invited to speak. This year, Glenda Lappan of Michigan State University presented, "Reflections on a Lifetime of Work: Why Curriculum Matters." Through engaging mathematical tasks such as the Frecklehammer problem and anecdotes of her experiences with students, she emphasized the critical need of teaching important mathematics to our students. Her presentation can be found on www.amte.net.

In the closing session on Saturday afternoon, Cathy Seeley, president of the National Council of Teachers of Mathematics, talked about understanding as the heart of teacher education. She challenged members of AMTE to do whatever it takes to develop a new paradigm for teaching mathematics.

The conference concluded with a business meeting, which included the recognition of outgoing officers and board members Jennifer Bay-Williams, Susan Friel, Peg Smith, and Mark Taylor. New officers installed include Secretary Mary Margaret Shoaf, Tom Bassarear, and Barbara Pence. As the meeting concluded, Karen Karp passed the gavel to Sid Rachlin and he assumed the office of president.

Mark your calendars to join AMTE at next year's conference on January 26-28, 2006 in sunny Tampa, Florida. Consider submitting a proposal to speak, or just come and enjoy the many high quality sessions.

Mark your calendars for AMTE's 2006 conference, January 26-28, in Tampa, Florida.

Mini-sessions were a successful new format at the 2005 AMTE Conference. *Thanks to Greisy Winicki-Landman, California State Polytechnic University, Pomona, for sharing the photograph.*

THEORY & PRACTICE:

Mathematical Knowledge for Teaching

What types of mathematical knowledge are necessary for teaching? What have you found to be effective ways to impact that specialized mathematical knowledge?

This Theory and Practice question was sparked by discussions and activities at the Center for Proficiency in Teaching Mathematics 2004 Summer Institute *Developing Teachers' Mathematical Knowledge for Teaching.* Three of the respondents (Allen, Borkovitz, and McDuffie) participated in that summer institute. The perspectives represented here include that of a system level mathematics supervisor, mathematicians, and mathematics educators.

Response by Shelly Allen, *Mathematics Supervisor, Richmond County, Augusta, Georgia*

Teaching mathematics is a complex process. Not only do you have to know and understand the mathematics that you are currently teaching, you must also be prepared for the wide variety of solutions students will have when the task you have selected provides access, engagement, and challenge for ALL students. In addition, a teacher must know what mathematical skills came before and, following the trajectory, what mathematical skills will follow in later grades. Whew!

So what is mathematical knowledge for teaching and how do you approach this issue with practicing teachers? As a district mathematics supervisor, I have been working to first create a community of mathematics teachers who share common goals so that we can begin to work on improving our practice and mathematics content knowledge. In our twelve schools, this work has been centered on student learning of algebra. I believe student content knowledge and teacher content knowledge are intertwined in math classrooms.

Our focus on student learning within this project has provided the group with an opportunity to look at student work together and plan tasks and questions that will help uncover student misunderstanding. Through this professional development, we have uncovered teacher misunderstandings about the mathematics. Saying, "I'm not good at this." "I don't understand how to teach this." or "I need some help." is not a part of the teaching culture so the work of collaborative reflection on our own teaching practice and our own understanding of the mathematical concepts is very slow.

How does the lack of teacher content knowledge surface in a middle grades math class? As teachers begin to understand the meaning of the mathematics they are teaching, the classroom begins to look and sound different because students shift to understanding, inventing, and making sense of the mathematics they are studying. Some of the focus questions teachers in our project are using include

- Do student explanations and justifications emphasize mathematical meanings? Do they show why the students' methods do or don't work?
- Do students determine the validity or correctness of an idea or solution based on the mathematical reasoning presented?
- Are student conjectures, generalizations, mathematical justifications, "what-if" questions, and invented procedures the norm?
- Do students approach problems and ideas in a variety of ways using a variety of representations (visual, verbal, numerical, algebraic, graphical, or everyday contexts)?

This group of middle grades mathematics teachers meets together every month and just recently began planning together and then observing student learning while one member of the group teaches the planned lesson. This adapted lesson study format allows the group to work on their own mathematical content issues as they arise while still focusing on collecting evidence on student learning.

Recently we began our session with the question, "What are my students struggling with right now and what are the ideas and skills that support learning this content?" This question really pushes on one aspect of the specialized mathematical knowledge that teachers must have, being able to listen for understanding when a student is explaining mathematics and posing student questions that foster continued student thinking about the task.

Within my school district, we have chosen to work on enhancing teacher content knowledge through this practice-based professional development model. As we continue this process and as our collegial community strengthens, my hope is that our focus questions begin to shift to include not only questions about students, but also teacher knowledge of mathematics. Some of these questions might include

- Do I pose questions and tasks that foster student conjectures, justifications, and generali-

As teachers begin to understand the meaning of the mathematics they are teaching, the classroom begins to look and sound different.

zations involving core mathematical ideas?
- Do I listen intently to my students' thinking and respond according to the mathematical direction in which we are headed?
- Do I pose questions and tasks that foster access, engagement, and challenge for all students?

These changes within our middle grades math classrooms involve major shifts in the way we have been thinking about mathematical knowledge for teachers and have been providing professional development for our practicing teachers. Mathematical knowledge is clearly not just about the number of college mathematics courses taken.

Response by Debra K. Borkovitz, *Department of Mathematics and Science, Wheelock College, Boston, Massachusetts*

At the Joint Meetings of the American Mathematical Societies in January, I interviewed several recent Ph.D's in mathematics for a faculty position that includes working with prospective K-6 teachers. The conversation often turned to "specialized mathematics knowledge for teaching," a phrase that was new to the applicants.

To explain, I used a canonical example, first asking them to come up with a story situation for elementary students that goes with 6 ÷2 and then asking them to modify their situation to model 6 ÷ ½. I used this same example at Wheelock's summer orientation, and both the first year college students and the job applicants chose partitive interpretations, such as two kids sharing six cookies, and then had trouble adapting them to the second problem. The problem sparked interesting conversations with the job applicants, and it's also nice to reassure the students that even people with Ph.D.'s in math find the problem challenging.

Of course, figuring out how to teach people with Ph.D.'s in math about specialized mathematical knowledge for teaching is different from figuring out how to teach young college students. A mathematician can master the mathematics involved; I'm more concerned that he or she loves math, wants to make math accessible, that he or she is respectful, not arrogant, and has good social and communication skills. Mathematics graduate programs often do not value these traits, but many young mathematicians nonetheless embody them.

In teaching undergraduate pre-service elementary teachers, we could easily spend more semesters than we have on the mathematical technicalities of things like partitive and quotitive division, without exhausting the K-6 curriculum. Thus, we will always be engaged in conversation about what topics are most important to highlight and at what depth. However, what is most important for our students transcends specific topics. They need to learn that mathematics is a connected body of knowledge, not a random assortment of procedures, to see mathematics as something creative, where there are many ways to solve problems, and to gain the confidence to try new problems. They need to develop reasoning skills within themselves rather than relying solely on external authority to evaluate their mathematical thinking. In conducting the job interviews, it was easy to see that the candidates had these dispositions.

So, how do we best help our students learn to "think like mathematicians," especially when many of them do not enter college with such a personal goal? Clearly, the details of such a task are a lifelong conversation for those of us involved in mathematics teacher education, but for a start, our classrooms need to promote and model mathematical exploration, reasoning, creativity, and understanding. We need to frame mathematical learning as a lifelong process, a process for which students can take responsibility. We need to help them learn

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THEORY & PRACTICE question for the next issue of AMTE *Connections*:

Using Video to Support Teacher Learning

Although reviewing video of their teaching is a traditional assignment for student teachers, additional research on teacher development with video, as well as changing technologies, provide opportunities to deepen teacher reflection and learning from video. How can video support inservice and preservice teacher learning?

AMTE members are encouraged to respond to this question with an essay of 600-1000 words. Submit your response to *Connections* Editor Lynn Stallings (lstalling@kennesaw.edu) by May 1 to ensure consideration for the June issue.

Mathematical Knowledge for Teaching
(Continued from page 7)

to reflect, to continually integrate new knowledge, so that they can better learn from books, other teachers, each other, children, and life in general.

The phrase "specialized knowledge for teaching" frames mathematics for preservice teachers in terms of their existing, deep motivation to be good teachers, which for many prospective elementary is initially much stronger than their motivation to learn mathematics for itself. I sometimes use the metaphor of a taxi driver with my students – that if you are new to a city, you might know how to go from home to school and to the store, but if you are a taxi driver, your knowledge of the streets is much more connected, you can take shortcuts and detours or the scenic route. Perhaps specialized knowledge for teaching is more like simultaneously being a taxi driver, pilot, and deep-sea diver of elementary mathematics. Certainly, acquiring such knowledge is difficult, but, as I also tell my students, they can do difficult things.

Perhaps specialized knowledge for teaching is more like simultaneously being a taxi driver, pilot, and deep-sea diver of elementary mathematics.

***Response by Larry Lesser**, Department of Mathematical Sciences, University of Texas at El Paso*

To be effective, teachers of mathematics need to know not only the immediate topics they are teaching, but also how those topics connect to other rungs of the ladder of PreK – college mathematics, and a nice example of this is the book for preservice high school teachers by Usiskin, Peressini, Marchisotto, and Stanley (2003). Other features of this book include examination of alternate definitions, alternate approaches (with and without technology), applications, and historical context. Cuoco (2003) discusses how prospective teachers "at the right level of abstraction and in the right contexts" would be well served by courses organized by central themes in mathematics, such as decomposition, representation, reduction, localization, completion, and extension. A trio of big themes (for elementary, middle and high school mathematics, respectively) offered by Seeley (2005) are equivalence, proportionality, and function.

Rather than just list more types of PCK or MKT teachers need, let us examine a concrete mathematical example which could be encountered by a broad range of grade levels, from upper elementary through college. Teachers certainly have the knowledge to work numerically with a three-way contingency table of data, but may not realize there is a possibility that a comparison may be reversed upon aggregation of categories, a possibility which is listed as essential to citizenship by NCED (2001). Even teachers who are aware of this possibility (Simpson's Paradox) in the abstract may not know the necessary numerical condition (Cornfield's condition) or how to readily track down specific real-life instances that could trigger an animated classroom discussion of how best to interpret this dataset. Knowing how to find or make such connections beyond the math classroom is vital to make mathematics "come alive" for students with poor motivation. (Some of the articles on curricula I have created to share with my students connect mathematics to diverse areas such as ethics, lotteries and music!) And finally, few teachers

may be aware of how to constructively utilize such counterintuitive results in the classroom and what alternative, non-numerical representations are available (e.g., Lesser, 2001) to make more intuitive when the phenomenon occurs.

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National Council on Education and the Disciplines. (2001). *Mathematics and Democracy: The Case for Quantitative Literacy*. Princeton, NJ: Woodrow Wilson National Fellowship Foundation.

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Usiskin, Z., Peressini, A., Marchisotto, E.A., Stanley, D. (2003). *Mathematics for High School Teachers: An Advanced Perspective*. Upper Saddle River, NJ: Prentice Hall.

***Response by Amy Roth McDuffie**, Department of Teaching and Learning, Washington State University, Tri-Cities*

As teachers take on the goals of teaching for students' understandings, they are faced with new questions and dilemmas in planning, implementing, and reflecting on lessons. Many of these questions are either directly or indirectly related to understanding mathematics from a learners' perspective while at the same time knowing how mathematical concepts and procedures connect and sequence to form a coherent system.

In my work with accomplished teachers who have developed Standards-based practices and in my reading of professional development literature (e.g., Carpenter, Fennema, Franke, Levi, & Empson, 1999; Schifter, Bastable, & Russell, 1999; Smith, 2001), I have compiled questions for teachers to consider that draw upon their mathematical knowledge for teaching. While the list below is certainly not exhaustive, the questions illustrate some of the ways teachers need to use mathematics in teaching for students' understanding.

1. What are the key mathematics concepts and processes my students need to learn?
2. Are these concepts and processes appropriate for my students to take on now or must other ideas be understood first (i.e., how do concepts and processes build on one another relative to particular students' learning)?
3. What "activities" (mental or physical actions a student might experience, see Simon & Tzur, 2004) will promote students' development of key concepts and processes? How might a student come to understand the mathematics through these activities?
4. How are key concepts and processes represented in my instructional materials? How do my instructional materials provide opportunities for students to experience these activities? Do I need to find or design alternative materials?
5. What are key questions I need to ask to facilitate students' understanding of a particular concept or process? What numbers or representations might I use for students to confront an idea? What examples and non-examples might help students to form an understanding? What mathematical terms are appropriate to use or to introduce? How can I describe these terms in language familiar to students and remain mathematically valid?
6. What are ways in which students might solve a problem (anticipating both correct and flawed methods prior to teaching)? Given a seemingly correct student's solution, will the methods work every time (i.e., is the approach generalizable)? Given a flawed solution, is part of the work mathematically valid? Why might a student have reasoned through a problem in a particular way?

When teachers incorporate these types of questions into planning, implementing, and reflecting on lessons, they are drawing on mathematical knowledge in a way that "end users" of mathematics do not encounter. By asking questions such as these, teachers bring mathematics to the forefront of their work.

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When teachers incorporate these types of questions into planning, implementing, and reflecting on lessons, they are drawing on mathematical knowledge in a way that "end users" of mathematics do not encounter.

April is Mathematics Awareness Month. The theme this year is "Mathematics and the Cosmos" of interest to educators, students, societies and scientists across many disciplines. Please visit the web site at http://www.mathaware.org to see the theme poster, essays, related resources and more.

Mathematical Knowledge for Teaching
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Consequently, I regularly include these questions in working with preservice teachers for activities such as viewing classroom video, studying student work, and designing and reflecting on lesson plans. Additionally, in my work with practicing teachers, I ask these questions as we co-plan and reflect on lessons. I have found that after asking questions such as these, preservice and practicing teachers begin to ask these questions of each other and of themselves. By considering these questions and discussing responses, teachers can develop their mathematics knowledge through situations that are most meaningful to them: learning mathematics through teaching students.

References

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Smith, M. (2001). *Practice-based professional development*. Reston, VA: National Council of Teachers of Mathematics.

I would like to focus on three aspects of mathematical understanding that are not "specialized," but pervasive in mathematics.

Response from Martha K. Smith, *Department of Mathematics, University of Texas*

I would like to rephrase the question to address aspects of mathematical *understanding* and to focus on three aspects of mathematical understanding that are not "specialized" but *pervasive* in mathematics. These understandings are

1. *Mathematics is about figuring things out*.
2. One important part of mathematics is *expressing information*.
3. Many mathematical problems have *many correct methods of solution, and even more incorrect methods* (some of the latter being only slightly incorrect and others being way off base.) Consequently, a teacher needs to be willing and able to listen open-mindedly to different approaches, able to distinguish correct methods from incorrect ones, and (ideally) able to give hints that will help students progress from their own approach when possible.

The best way I have found to help impart these understandings of mathematics is through a problem-solving course that I have taught off and on for about 15 years. Most students in the class intend to teach secondary mathematics, but a few are preparing to teach elementary school, middle grades, or two-year college mathematics. In addition to practice solving problems, the class includes discussion of problem solving methods, emphasizing what is often called the "understanding" or "analyzing" stage of problem solving.

The idea that mathematics is about figuring things out permeates the whole class. Sadly, many students who take the course have previously experienced "problem solving" only as following procedures that have been taught to them.

Emphasizing understanding and analysis helps students understand how mathematics can express information, and helps them progress in the skill of expressing information mathematically and using that skill to solve problems. This emphasis is addressed largely through work on carefully designed exercises in small groups, followed by whole class discussion. Many of these exercises serve as scaffolding for assigned problems.

The third understanding is fostered by whole class discussion of problems students have solved. I routinely ask after a student has presented a solution, "Did anyone solve it another way?" Usually the answer is yes. We sometimes spend more than an hour discussing different solutions of the same problem.

AMTE Events at NCSM and NCTM

AMTE Special Interest Session at NCSM
Wednesday, April 6th
2:30-4:00 PM
201A Convention Center

AMTE Reception at NCTM
Thursday, April 7th
6:00-7:30 PM
Salon J-K
Anaheim Marriott Hotel

See http://www.amte.net for details.
Wear your AMTE pin!

AMTE 2005 Committee Assignments

COMMITTEES	CHAIRS	BOARD LIAISON
Standing Committees		
Technology	Maggie Niess (2005–07)	Gary Martin
Membership	Tim Hendrix (2005–07)	Mark Klespis
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Constitutional and Bylaws	Bill Speer (2004–06)	Susan Gay
Nominations and Election	Denise Mewborn (2005)	Karen Karp
Awards	Beatriz D'Ambrosio (2004–06)	Tom Bassarear
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Call for Proposals

Tenth Annual Conference • January 26-28, 2006
Tampa, Florida
Deadline: May 27, 2005

All proposals will be submitted online using the online submission server, located at www.coedu.usf.edu/amte/. Please see http://www.amte.net for more information. If you have questions regarding proposal topic, format, or submission, contact Program Chair Gladis Kersaint (813-974-1644 or amte2006@coedu.usf.edu).

Call for Manuscripts

AMTE's 2006 Monograph
Deadline: June 1, 2005

Working Title: The Work of Mathematics Teacher Educators: Continuing the Conversation

Please see http://www.amte.net for further information. Any questions about possible topics for inclusion may be directed to one of the co-editors of the monograph: Kathleen Lynch-Davis (lynchrk@appstate.edu or 828-262-7247) or Robin L. Rider (rider@mail.ecu.edu or 252-328-9369).

AMTE Online Member Database

The AMTE Online Member Database is operational. It's featured on the home-page of http://www.amte.net. Soon it will include members' institutions and positions. To use the database, you need the following username and password:

username: amte
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Dates to Remember

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Membership/
Renewal Forms

Position Papers

Position Listings

Resources

Forum for
Members

Other
Opportunities

2005

April 4-6	NCSM Annual Conference, Anaheim, California
April 4-6	NCTM Research Presession, Anaheim, California
April 6-9	NCTM Annual Conference, Anaheim, California
April 11-15	AERA Annual Meeting, Montréal, Canada
May 27	Deadline for AMTE Conference Proposals
August 4-6	MAA MathFest, Albuquerque, New Mexico
October 6-8	NCTM Regional, Hartford, Connecticut
October 20-22	NCTM Regional, Birmingham, Alabama
November 10-12	SSMA Annual Conference, Fort Worth, Texas
November 10-12	NCTM Regional, Denver, Colorado

2006

January 26-28	AMTE Annual Conference, Tampa, Florida

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