PENNSYLVANIA ASSOCIATION OF MATHEMATICS TEACHER EDUCATORS

Newsletter Spring 2013

PRESIDENT'S MESSAGE

Happy New Year!

I have never been one to get hung up on the sentimentality of the New Year's Day traditions, but I do tend to look at every new year as the start of new possibilities. Our careers are frequently defined by change and new possibilities. Every new semester is fresh and new, and exciting. It is like getting two New Year's days (or more) every year. For me, this is a good time to re-prioritize tasks (and to clean the office). The latest – the Common Core State Standards and the Keystone exams – make it necessary for teachers and students to jump through new hoops. I must admit that I was far more excited about the trivial fact of 2013 being the first year since 1987 to use 4 unique digits than I am about standardized testing. However, our task is to prepare future teachers to handle these challenges. How do you do it? What have you changed in your program during the past year or two to meet this challenge? Have you seen any particular "best practices" in your local school districts that are worth sharing? If so, please consider sharing your ideas at our 7th Annual Symposium to be held at Shippensburg University on May 22-23, 2013 (see page 5 for more directions). This is absolutely one of my favorite professional development events every year and comparably cheap with regard to other conferences that I attend. It is small enough to feel like you are catching up with old friends, and yet large enough to have great, quality speakers and meaningful sessions. If you have never attended, please plan to make this year your first. You will not regret it. Prizes will be awarded to first-time attendees! ☺

Speaking of "first timers," have you invited a colleague to join PAMTE? Personally I am making it a point to do this in the New Year. As I write this, I am looking forward to attending AMTE's National Meeting in Orlando, FL. This is a great time to gather with Mathematics Teacher Educators from across the country, and it also reminds me how lucky we are (we are one of only 21 states that have an affiliate organization). This makes me feel very fortunate, because as much as I learn from the national meetings, it Shippensburg University on May 22-23, 2013? Put it on your calendar and make plans to attend (see page 5 for more information)!

Professional Development takes on many forms in our profession, and scholarship is broadly defined across our institutions. Years ago, the concept of a Writer's Cooperative was developed by the leadership of PAMTE. The idea at the time was to develop a pool of individuals from among our membership who would be interested in and willing to review articles and to help colleagues across the state to become better scholars. To get this up and running, this will take a commitment from several of our members who can serve as the initial foundation from the group. We would each identify some areas of interest or expertise and then review articles in those areas for others as time permits. I think that this is a great idea, but due to some leadership changes, this has stalled out. I don't believe that leading this cause will take a great deal of time, but it will require a good deal of organization. So are you organized and looking for a leadership opportunity for our state organization? Could this be ideal for you? Please give it careful consideration – we REALLY need someone to step up and get this moving. Contact me if you have questions, or if you would like to volunteer. It would be great to have this well defined by May 22-23 (Symposium, Shippensburg University).

To keep things fresh, we would like to experiment with a new feature at this year's Symposium (Shippensburg University on May 22-23, 2013). Similar to a book club, we would like to have an informal discussion regarding a common reading in mathematics. Naturally this will require some prep-work prior to the symposium, but we think that this would generate a great discussion and perhaps lead to additional (electronic?) discussions in the years to come. If you are interested in potentially participating in this, please send an email to me or Kate Remillard, KRemillard@francis.edu, who is going to work with me on organizing it. Once I have a list of interested folks then we will pick a book and go from there.

Finally, it is time for elections. This year we are looking for nominations for a President Elect, Treasurer; and Member at Large (public or private institution). If you want to immerse yourself in the organization, and get to know your colleagues better then consider nominating yourself (or ask someone to nominate you.) The newly elected board members will assume their respective responsibilities at the Annual Meeting to be held at the conclusion of the Symposium (which will be held on May 22-23 at Shippensburg University).

I wish you the best of luck in your new year/semester – may it be productive, and filled with inspiration.

***Janet White**, Millersville University,*
PAMTE President

SAVE THE DATE

Apr. 15-17 2013	NCTM Research Pre-session *Denver, CO*
Apr. 17-20 2013	NCTM Annual Conference *Denver, CO*
May 22-23 2013	PAMTE Annual Symposium *Shippensburg University*

Teaching and Learning Mathematics in Virtual Environments

Melissa Boston, *Duquesne Univeristy*

In 2009-2010, 50% of U.S. public schools offered a virtual school option, with 47% using virtual instruction from outside vendors (NCES, 2012). With the increasing availability of virtual learning environments (from full-time schooling to supplemental learning programs), parents, teachers and schools need ways to ascertain the quality of the mathematics instruction and instructional materials utilized in these environments. Recent reports of low performance of students in virtual schools (Miron & Urschel, 2012) mark the importance of evaluating and monitoring the quality of virtual mathematics instruction.

While the use of technology to support mathematics teaching and learning is a prominent topic in mathematics education research (e.g., Heid & Blume, 2008), less research and discussion exist on virtual or computer-mediated mathematics learning environments. This research (to be presented at the NCTM Research Pre-Session) examined the teaching and learning of mathematics in three types of computer-mediated environments: 1) full-time virtual schools (e.g., K12 Inc.); 2) web-accessible mathematics support materials (e.g., Study Island); and 3) web-based informal learning programs (e.g., Carnegie Mellon's CS2N).

In this research, we analyzed computer-mediated mathematics instructional materials using existing frameworks for assessing the quality of mathematical tasks and task implementation (Henningsen & Stein, 1997) and the instructional triangle between curriculum, teachers, and students (Stein & Kim, 2012). Project 1 explored computer-mediated mathematics curricula and curriculum supplements; specifically, the level of cognitive demand (LCD) of instructional tasks, students' role, and the use of the computer-environment explicitly to teach mathematics. Computer-mediated curricula were also compared to traditional and *Standards*-based print curricula. Project 2 explored instructional tasks and facilitation materials in a computer-mediated Robotics program intended to enhance students' learning of mathematics; specifically, the LCD of the mathematical tasks, adapting tasks to increase the LCD, the role of the 'teacher' in the computer-mediated environment, and how the teacher could be supported through facilitation materials.

In Project 1, the research team (Melissa Boston, Ahmet Akcay, and Theresa Henderson, Duquesne University) examined consistent grade levels and mathematical topics (e.g., 3rd grade multiplication, 6th grade fractions, and Algebra linear functions) across two computer-mediated curricula, one traditional textbook, one *Standards*-based textbook, and two curriculum supplements. Tasks were rated using the Instructional Quality Assessment rubrics (Boston, 2012), which are based on the Levels of Cognitive Demand. A rubric for "Expected student response" was developed to capture the "students' role" (defined as the elaborateness of students' response) during instructional and independent practice tasks. Scores for 10 consecutive lessons were compared across similar grade levels using descriptive statistics, ANOVAs, and post-hoc tests. Raters also identified whether lessons in computer-mediated curricula utilized the computer-environment (e.g., applets, videos) explicitly to enhance students' learning of the mathematics.

While we are currently in the initial stages of analysis, some preliminary results include:

- In grade 3, the Expected Student Response for the traditional curriculum was significantly lower that the Standards-based curriculum and both computer-mediated curricula. This was the only significant difference regarding the learning environment in Grade 3. Qualitatively, the Grade 3 computer-mediated curricula, traditional curriculum, and Standards-based curriculum presented multiplication using similar representations and instructional tasks (equal groups, arrays, story situations, pictures, and patterns); however, the traditional curriculum required lower levels of response from students.
- Grade 6 and Algebra appear to have greater differences amongst the curricula, with both computer-mediated curricula appearing more consistent with the traditional text than the *Standards*-based text;
- In the computer-mediated curricula, 0% of 3rd-grade lessons, 30% of 6th-grade lessons and 80% of Algebra lessons utilized computer-enabled features to enhance students' learning of mathematics.
- Computer-mediated curriculum supplements varied greatly from each other in LCD and expected student response.

The Project 2 team (Mary Kay Stein and Aaron Kessler, University of Pittsburgh; Melissa Boston, Duquesne University) rated the LCD of mathematical tasks in the initial version of the "Robots in Motion" cognitive tutor program. Results indicated that the tasks were consistently at low-level demands; hence, tasks were revised by attending to features of high-level demands and declarative (rather than procedural) knowledge. The revised tasks were recoded again using the LCD, and the redesign was shown to significantly increase the demand level. More importantly, the level of students' engagement with the tasks was shown to increase as the designed level was increased for tasks originally classified as procedures-without-connections ($r = 0.52$, $p<.05$) and procedures-with-connections ($r=0.55$, $p<.01$).

To examine the role of the teacher, teachers in multiple settings were observed as they implemented the Robots in Motion cognitive tutor program, and an *interaction tracker* (informed by the instructional triangle from Stein and Kim, 2012) was developed to represent the observed interactions between teachers, students, and the Robots in Motion program. Qualitative findings indicate that teachers who engaged students in mathematical conversations outside of the computer-mediated environment maintained students' opportunities to make connections to meaning and understanding and supported students' engagement in high-level mathematical thinking and reasoning. Teacher-facilitation materials were then designed to promote this type of interaction. We continue to gather data in additional settings regarding the effectiveness of the revised Robots in Motion program and teacher facilitation materials.

I invite you to attend our session at the NCTM Research Pre-session to learn more about our final results and to engage in a discussion around the following questions:

- What other indicators should researchers attend to when evaluating computer-mediated mathematics learning environments?
- How do we communicate research on effective mathematics curricula to the developers of computer-mediated learning environments (i.e., what is the best vehicle for connecting research to practice)?
- What tools would allow stakeholders (parents, teachers, school administrators) to evaluate the quality of computer-mediated mathematics learning environments?

The session is titled, *Teaching and Learning Mathematics in Virtual Environments*, and will be held on Wednesday, April 17, 3:00–4:30 PM, Colorado Convention Center, Rooms 205/207.

References:

Boston, M. D. (2012). Assessing the quality of mathematics instruction. *Elementary School Journal, 113,* 76-104.

Heid, M. K. and Blume, G. W. (2008). *Research on technology and the teaching and learning of mathematics: Syntheses, Cases, and Perspectives.* Reston, VA: National Council of Teacher of Mathematics

Henningsen, M. & Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education, 28*, 524-549.

Miron, G., and Urschel, J. (2012). Understanding and Improving Full-Time Virtual Schools. National Educational Policy Center. Retrieved from http://nepc.colorado.edu/publication/understanding-improving-virtual, August 1, 2012.

National Center for Educational Statistics. (2012). Table A-15-2. Percent of public school districts that offered distance education, by locale and selected characteristics: School years 2004-05 and 2009-10. Retrieved from http://nces.ed.gov/programs/coe/tables/table-ths-2.asp August 1, 2012.

Stein, M. K., & Kim, G. (2012). The role of mathematics curriculum materials in large-scale urban reform: An analysis of demands and opportunities for teacher learning. In Remillard, J. T., Herbel-Eisenmann B. T., & Lloyd, G. M. (Eds), *Mathematics teachers at work: Connecting curriculum materials and classroom instruction,* (pp. 37-55). New York, NY: Routledge Taylor &Francis Group.

Call for Nominations!

In May, the terms for 3 board members will end, and it is time now to nominate candidates to fill these important positions. We are seeking individuals interested in running for the following offices: **President-Elect**, **Treasurer** and **Member-at-Large** (either Public or Private).

You may self-nominate or recommend someone for these positions. This call for nominations has a deadline of **Friday, February 22nd**. Please send your nominations to kremillard@francis.edu. After which time, the Nominations & Elections committee will prepare a slate of candidates and ballot.

Check out the PAMTE website at www.pamte.org

Mark your calendars!

The 7th Annual PAMTE Symposium

May 22-23, 2013 at Shippensburg University

- From 11:30AM on May 22 until 1:00PM on May 23 (Note this is a Wednesday and Thursday session).
- Registration: $60 for members, $80 for non-members (includes membership in PAMTE) or for members who wish to their renew memberships.
- Cost includes lunch both days, afternoon break on Wednesday and light breakfast on Thursday.

Keynote Speakers:

Opening Session: Nadine Bezuk, San Diego State, former Executive Director of AMTE

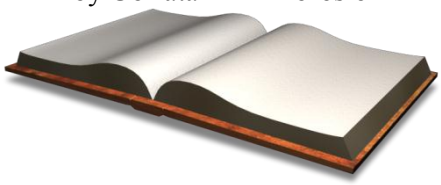
Closing Session: Fran Arbaugh, Penn State, current AMTE President

Full Registration information will be available on www.pamte.org soon, and announcements will be sent through the email listserv as the details are finalized.

Questions? Or for more information, contact:
Janet White at: jwhite@millersville.edu, and our Program Chair, Judy Werner at Judy.Werner@sru.edu

Ethnomathematics: Link between Traditions and Modernity

by Ubiratan D'Ambrosio



Review by **Katherine S. Remillard,** *St. Francis University*

Ethnomathematics: Link between Traditions and Modernity is the first work in English by the world-renowned Brazilian mathematics educator Ubiratan D'Ambrosio. Originally published in Portuguese in 2001, the book is an overview of D'Ambrosio's most current ideas on ethnomathematics, a field for which he is widely considered a founding father. The (research) Program of Ethnomathematics seeks to "understand mathematical knowing/doing throughout the history of humanity, in the contexts of different interest groups, communities, peoples and nations" (p. 8). As such, it draws on wide range of disciplines, such as anthropology, history, biology, philosophy, and cognitive science, and has an inherent political dimension.

In reading this book, the expression "losing the forest for the trees" came to mind. In today's educational milieu, mathematics educators have little choice but to spend much of their time among the trees. In day-to-day practice, mathematics education is, arguably, narrowly defined. Think: 5.OA. 1. I suspect most readers recognize, in this series of numbers and letters, the fifth grade *Common Core Standard* for Operations and Algebraic Thinking. And perhaps even some know that it pertains to the use of grouping symbols! Point taken?

Reading D'Ambrosio is a welcome step back from this math ed minutia —a wide lens view of the forest. He is interested in the adventure of our species, that is the "acquisition of knowledge and practices that allowed [us] them to survive and transcend through ways, modes, techniques and arts of explaining, knowing, understanding, and coping with, of living together with, the natural and sociocultural reality in which [we] they are inserted" (p. 46). The word ***ethnomathematics*** is D'Ambrosio's purposeful composition of the roots *tics, mathema,* and *ethno.* He defines ***tics*** as the material and intellectual instruments created and developed by people for reflection and observation. ***Mathema*** means to explain, understand, come to know, learn to know, and do in response to the needs for survival and transcendence. And ***ethno*** refers to the different natural, social, and cultural environments in which survival and transcendence occur. As both a concept and a research program, the essence of ethnomathematics is in its approach to distinct ways of knowing.

A principal argument of the book is that different forms of mathematics have developed as a result of human interactions with their environment. D'Ambrosio begins with the basic human need for nourishment and its connection to human understanding of space and time. From the organization of hunting groups (the first societies) to the advent of agriculture, human survival is a matter of "where" (space) and "when" (time). The answers to the problems, for example, of where and when to plant, harvest and store, depend on the environment. Hence the construction of calendars for agrarian purposes is an ethnomathematics. So too is the development of fishing schedules by the Eskimo, which depend not on where and when to plant crops but rather on hours of light and dark in the Arctic. Professional environments also yield unique ethnomathematics.

Consider a heart surgeon's topological notions of her suture knots or her criteria for time and risk. The "knowing and doing" of heart surgeons is very different from the "knowing and doing" of juice vendors, who must make probabilistic decisions on the quantity of different fruit juices to meet customer demand.

Different environments, whether geographical or professional, rear different ethnomathematics. The discipline of mathematics as we know it (henceforth called academic mathematics), then, is *one of many* ethnomathematics. Its roots are European with Indian and Islamic influences. Crystallizing into its current form in the 16th and 17th centuries, just as the great maritime expeditions got underway, academic mathematics [tools for knowing and doing in natural reality] benefited, like Christianity, from early globalization. Yet unlike Christianity, which achieved remarkable variety (as would be expected in a multitude of environs), academic mathematics attained an incredible universality.

D'Ambrosio, then, challenges readers to consider the role that colonization played generally in academic

mathematics and specifically in its infallible character. He encourages readers to contemplate a corollary—that is the privilege that academic mathematics has bestowed on intelligence and rationality—and its historic consequences.

D'Ambrosio uses strong language purporting that academic mathematics has been used as an instrument of domination to the detriment of the "less rational." And his gravest concern is the displacement and elimination of "mathematics in everyday life."

Within this framework, we come to understand the Program of Ethnomathematics as integral to the project of humanization. D'Ambrosio rejects the prevalent notion of "Education for All" on the grounds that this approach erodes student identity. He instead makes an impassioned plea for "Education for Peace." The book's conclusion leaves the reader to connect the dots between mathematics education and D'Ambrosio's ideal education, one that has as its focus a better quality of life and greater dignity for humanity as a whole.

Lest this review has led you astray, it is important to note that this short read is *not* a manifesto against academic mathematics. D'Ambrosio finds value in academic mathematics. Rather, his aim is much larger in scope—it is utopian. The mathematics teacher educator will thus find this a worthwhile read if willing to reflect on the role of his/her work in advancing the good of humankind. In the words of D'Ambrosio:

"There is, effectively a morality that is intrinsic to knowledge, and in particular, to mathematical knowledge. Why insist on education and mathematics education, and on doing mathematics itself, if we do not perceive how our practice can help to achieve a new organization of society, a planetary civilization anchored in respect, solidarity, and cooperation?" (p. 68)