

Points & Angles

Newsletter of the Metropolitan Mathematics Club of Chicago
Volume XLIV No. 3, November 2009

“Nspired” Connections from Outside the Box: Uncovering New Ideas with Technology

Todd Edwards
Miami University, Ohio

Steve Phelps
Madeira City Schools, Ohio

BY DON PORZIO

This month, Steve Phelps and Todd Edwards from Ohio, will describe to us how a seemingly simple observation made with virtual algebra tiles on an interactive whiteboard led to a surprising connections among quadratics, mathematical envelopes, tangent lines, and tangent parabolas. Once their students began to generate conjectures and test hypotheses with the TI Nspire CAS, the students made connections between early grade, secondary, and university-level mathematics in a manner that would be impossible to uncover with pencil and paper methods alone. This investigation provided the speakers with new insights into a seemingly traditional, skill-oriented topic.

Steve Phelps has 18 years of mathematics teaching experience in grades 7-12, with the last nine years as the geometry teacher in the Madeira City Schools (Ohio). He is a frequent presenter at Teachers Teaching with Technology and an occasional instructor of methods and content courses for teachers. Todd Edwards teaches mathematics and mathematics education courses at Miami University in Oxford, Ohio, and serves as a co-editor for the *Ohio Journal of School Mathematics*. Todd and Steve are interested in the use of technology in the teaching and learning of school mathematics with particular emphasis on computer algebra systems (CAS), dynamic geometry software (DGS), and pencasting technology. They are co-directors of the Geogebra Institute of Ohio and have been frequent presenters at USACAS conferences.

Special thanks to Texas Instruments and Ron Thomas for sponsoring the speakers' travel expenses.



From I-90 & Southbound I-294: Exit at I-190 West to O'Hare; Exit onto North Mannheim Rd.; Take Mannheim Rd. North 2.25 miles.

From Northbound I-294: Exit at West Touhy Ave.; Take Touhy Ave. to Mannheim Rd.; Turn right on Mannheim Rd.

Public Transit: Take the CTA Blue Line to the Rosemont Bus Terminal; Take Pace Bus #223 to Touhy Ave. & Lee Rd.; Walk East on Touhy to Mannheim Rd.

Friday, November 6, 2009

5:30 PM Doors Open, 6:00 PM Social Hour,
7:00 PM Dinner and Talk

**Fountain Blue Banquets &
Convention Center**

2300 Mannheim Rd., Des Plaines
(847) 298-3636

\$34 for Members, \$39 for Nonmembers

Reserve by Noon, Monday, Nov. 2
reservations@mmcchicago.org or (630)
907-5023, day or night, leave a voicemail.



Points & Angles, Volume XLIV
Number 3, November 2009



Points & Angles, published nine times per school year, is the official publication of the Metropolitan Mathematics Club of Chicago. Founded in 1913, the Metropolitan Mathematics Club is the National Council of Teachers of Mathematics' first affiliate. The official club website: <http://mmcchicago.org/>

Board of Directors

Paul Christmas (2008-2011)
President
Buffalo Grove H.S. (retired), Buffalo Grove

Don Porzio (2009-2012)
President-Elect
Illinois Math and Science Acad., Aurora

Phil Gartner (2007-2010)
Past President
Glenbrook South H.S., Glenview

Steve Viktora (2008-2011)
Secretary
New Trier H.S., Winnetka

Sheila Hardin (2009-2010)
Treasurer
Oak Park & River Forest H.S., Oak Park

Mary Wiltjer (2007-2010)
Membership Coord./Conference Co-Chair
Glenbrook South H.S., Glenview

Carol Nenne (2007-2010)
Conference Co-Chair
Lemont H.S., Lemont

Ismael Zamora (2007-2010)
Scholarship Chair
Hinsdale South H.S., Darien

Jenny Wexler (2009-2012)
Board Liaison
New Trier H.S., Winnetka

Ilene Hamilton (2008-2011)
Community Relations/Development
Stevenson H.S. (retired), Lincolnshire

Lisa Parker (2009-2012)
NCTM/ICTM Representative
Lincoln-Way Central H.S.

Isaac Greenspan (2008-2011)
Points & Angles Editor
Univ. of Chicago, Chicago

George Pryjma (2009-2010)
Historian
Northeastern Illinois Univ., Chicago

Dan Hall (2009-2012)
York Community H.S.

Points from the Interior

By PAUL CHRISTMAS

The September meeting was everything I hoped it would be and more. I have to admit I was concerned when Ed Burger said he needed *no* equipment—no LCD or overhead projector. I can't remember when we last had a speaker who didn't use transparencies or PowerPoint. Having heard Ed speak several times, I believed he could do it if anyone could.

His talk brought to mind a discussion I had with Virginia Highstone while walking to dinner at an ICTM meeting several years ago. We both love mathematics and love that it provides a medium in which we can teach the habits of mind that would serve the students well long after leaving our classrooms and that are as important as the mathematics topics themselves. Ed's list of life lessons he feels should be embedded in our daily mathematics teaching overlapped our list of habits of mind. Our list included persistence, using technology appropriately, metacognition, thinking flexibly, taking responsible risks, and reasoning inductively as well as deductively.

Later that year I discovered a series of four books published by the Association for Supervision of Curriculum Development, now combined into one book, entitled Learning and Leading with Habits of Mind (16 Essential Characteristics for Success), edited by Arthur Costa and Bena Kallick. I highly recommend this book as a source for discussions in your department professional development meetings. I believe the 16 characteristics described in the book are important life lessons for all students. They are persisting, managing impulsivity, listening with understanding and empathy, thinking flexibly, thinking about thinking, striving for accuracy, questioning and posing problems, applying past knowledge, thinking and communicating with clarity and precision, gathering data through all senses, creating, imagining, innovating, responding with wonderment and awe, taking risks, finding humor, thinking interdependently, and remaining open to continuous learning. Ways to create an environment to explore, develop, assess and report on the habits of mind are just a few of the topics explored. It is always exciting to find a book that puts together concisely those ideas we have thought about and with which we have struggled.

Did you share Ed's talk with colleagues who missed it? Let them know about the great professional development opportunities they miss at MMC meetings! Bring a new teacher, a student teacher, a middle school teacher, a school administrator, or someone who has never attended to the next meeting.

Coincidences, Chaos, and All That Math Jazz

BY JENNY WEXLER

Ed Burger traveled from Williams College to help us kick off the 2009-10 year. We start each school year with energy and new ideas to try. With a perfect blend of humor and seriousness, Ed gave the audience at the September meeting much to think about as we embark on our work with our students this year.

Ed focused our attention on the big question: what are we really trying to accomplish in teaching our students? He framed this question by talking about one of his classes at Williams, *The Art of Mathematical Thinking*, designed for humanities majors. He described two goals for this class: (1) share some of the big, beautiful ideas of mathematics, such as infinity, the 4th dimension, randomness, and chaos, and (2) offer his students something beyond the math that they can take with them as they go on in the world. He summarized goal #2 as the “ten-year question”: ten years from today, what will my students retain from this class? We know it most likely won't be the content that they remember. What it can (and should) be is a way of examining and making sense of the world, a way of thinking. Through an amusing example, Ed illustrated the kind of thinking that is unique to mathematics.

Ed built his argument around the commonly heard question, “If you have enough monkeys typing at enough typewriters, will one of them produce the entire play Hamlet?” Calling this a theorem to be proved, he answered that yes, if you wait long enough, one of them will do it. This is not the expected an-

swer, and in fact that was Ed's first lesson for us: this is a surprise, a “moment when our intuition runs perpendicular to reality.” Everyone has a preconceived notion of how the world works. By putting our students in situations where they see that things don't work the way they expected, we foster curiosity. They end up asking “How did you know that?” or “Why is that true?” and they become open to looking for hidden structures and patterns.

In proving his Monkeys Theorem, Ed shared other lessons about the mathematical mind. For example, when faced with a difficult task, the mathematical mind says *don't do it*. Create an easier question instead, and then keep building and adjusting the question slightly until eventually you've gotten at the original difficult task. Ed described this as “building up intellectual momentum,” which allows one to convert something challenging into something easy and accessible. An important life lesson about breaking things down and searching for patterns emerges from the mathematics.

Ed proved his Monkeys Theorem using basic probability. It is easy to understand that there is a positive probability that the monkeys will type the digit “2,” and thus there is a positive probability that the monkeys will type a string of several 2's, or even the whole Shakespeare play. Granted this is a very small probability, but it is still positive, which means if you wait long enough it will eventually happen. You can “do some mathematics” to find that we would expect to wait 10^{60} years for the monkeys

just to type, “To be or not to be, that is the question.” But it still could happen. It could even happen with the first monkey... with probability zero, of course.

Ed concluded his talk with the assertion that one of the big ideas that we're trying to teach is:

“To see the things that are there that other people miss.” Learning to look for hidden structures and patterns is a lesson that transcends our discipline. There are other ways of thinking and analyzing the world that are “inherently mathematical.” We should always strive to articulate these “metalessons” to ourselves and for our students; they should be a part of our lesson planning. By focusing on the kinds of thinking that are unique to mathematics, we can help our students see our classes as among the most useful they take, regardless of the paths they follow in life.

Many thanks to Ed for an entertaining and thought-provoking evening!

When faced with a difficult task, don't do it. Create an easier question instead, and keep building and adjusting the question slightly until eventually you've gotten at the original difficult task.

Sat, Jan 30:
MMC Conference
of Workshops
York Comm. HS
Elmhurst, IL

A Mathematics Education Travelogue in Asia: Dispelling Myths, Opening Dialog

By PHIL GARTNER

Steve Rasmussen has visited many mathematics classrooms and talked with educators and educational leaders from the building level to the Ministers of Education. He shared with an eager MMC audience that what he has found is that educators in Asia are looking to make changes in their curriculum and pedagogy in line with what NCTM advances as a strong mathematics education. This is ironic since we in the U.S. are often told to emulate what is done in Asia since they score well on international standardized tests like TIMSS (Trends in International Mathematics and Science Study). While it is true that there is much to learn from Asia and that the U.S. can do much better, Steve was helpful in drawing the

right lessons from Asia. He successfully dispelled the myth that Asia does well due to their superior curriculum or outstanding instructional methods.

Asian countries support education. Families value mathematics tremendously. Many students take part in private tutoring in math outside of the school day at special centers. In many countries students spend hours each night on just mathematics work. This, coupled with Asian schools' longer school years, give Asian students an advantage. Throughout Steve's travels,

he noted how respected math teachers are. He also noted that the most beautiful building in a village was always the school. He showed pictures of a rural Vietnamese village with rather modest housing but a beautiful school. This sends a strong message about the value of education. Many countries pay their teachers well and the best students are attracted to the profession. In Vietnam, only the top 10% of university students studying to be teachers will get a job. Furthermore, professional development is a huge focus and teachers are highly trained. Time for professional learning is provided. In sum, Asian societies deeply value education, especially mathematics. The U.S. would do well to do the same.

One main point Steve made throughout his presentation, though, is that there are many reasons that Asian countries perform well on international tests. Having some magic formula for mathematics education is not why Asian countries succeed on examinations. He joked that American scores would no doubt be higher if the U.S. closed 80% of its universities and said to students that only the top 20% in mathematics

could get in to the remaining universities.

Much of the old Asian system is based on obedience and students competing for limited spots for future opportunity. In India, math exams in 10th grade are used as gatekeepers into further study where poor scorers are sentenced to a low job. Policy leaders in Asia recognize the failures and shortcomings of their highly-competitive systems and are committed to change—even as some in the U.S. advocate emulating the very systems they want to abandon.

Creativity, activity-based education, collaboration, inquiry, project-based learning, and technology-enriched education are gaining traction across Asia. These ideas are viewed as foundations for national prosperity in the information age. In his travels and training sessions, Steve saw a tremendous hunger to learn how to do this better. We in the U.S. should be proud of our curricula and processes advanced by NCTM in *Principles and Standards of School Mathematics* (PSSM). More traditional classrooms that are not Standards-based, whether in Asia or the U.S., would be wise to move toward a more conceptual approach rich with applications consistent with *PSSM*.

Steve also argued that tests like TIMSS that are often used to argue the superiority of the Asian mathematical system are only testing a certain kind of mathematical knowledge. They tend to be less conceptual in nature. For instance, a very successful math Ph.D. in Asia had no idea that π had anything to do with circles until the very end of his program. Many Asian students have little understanding of function. Steve shared that a class of high-performing university students were unable to even begin the classic problem of minimizing surface area of a can given its volume. The students were clueless when given an application problem outside the realm of their training. TIMSS does not expose such limitations in true mathematical understanding through its testing.

It is also worth noting that Steve gets shocked reactions when Asian officials learn more about provisions within NCLB. They are moving in the opposite direction (or beginning to try) and are surprised the U.S. is moving more toward high stakes testing. We are recognized around the world for *PSSM* and Americans like Steve are consistently hired to train Asian teachers unfamiliar with the methodologies used in a Standards-based classroom. Meanwhile, in the U.S. there are forces pushing us to get back to basic skills and not use technology.

It is unfortunate that students in the highly-

Creativity, activity-based education, collaboration, inquiry, project-based learning, and technology-enriched education are gaining traction across Asia. These ideas are viewed as foundations for national prosperity in the information age.

competitive Asian systems often do not realize the beauty of mathematics because they are using math as a means to an end. Most students are just trying to secure a spot for future opportunity. For many students, once they have achieved their math “success” and accomplished their goal, they never want to study mathematics again. This is not true in some other Asian countries with a more student-centered, less competitive approach.

Here are some other highlights and interesting tidbits from Steve’s talk:

- Steve, who is a larger man than most in Vietnam, got stuck in a chair while standing up and the chair stuck to his rear end. People found it so humorous they had him do it again.
- A school had racquetball courts for teachers right next to their professional development center.
- In Vietnam, university students in mathematics education study only mathematics. Thirty-two of the thirty-two courses they take are math courses! A very poor school in rural Vietnam was using the same curriculum with the same materials with a highly trained, dedicated teacher as the premier school with the best students in the country. The poor students had the same textbook and were on the same page as the privileged students. These poorer students in a rural village also had graphing calculators.
- Many Asian classrooms have zero student-to-student discourse and are teacher-centered. Many do not permit student-initiated questions.
- Never did Steve see a teacher go over homework. Homework is for home and the students have to figure it out. Classroom time was dedicated to the lesson for the day.
- A student in Thailand created a fabric pattern using Sketchpad. Her mother, a weaver, created the garment with her daughter’s design and sold it. The design caught on and sold well.
- In China, Steve observed students being ridiculed for wrong answers. He also noted the tremendous investment China puts into education from training teachers and running experimental schools to simply constructing quality facilities. China is attempting to shift its pedagogy to a more conceptual and applications-rich approach. A forward-thinking Chinese scholar had proposed in 1980 that students could initiate questions. At the time, this was

See October Talk Summary, page 6

New Teacher Incentive

For this school year, 1st and 2nd year teachers who become members of MMC will receive ½ off their second and third dinner meetings! Take advantage of this tremendous opportunity to get involved with a great organization, hear top-notch speakers and meet fellow math teachers from throughout the Chicagoland area.

To participate, cut out the form below, bring it with you to all 3 dinner meetings, and have it signed at the registration desk. You will receive your 2nd and 3rd dinner meetings for only \$17!

Thanks to an anonymous MMC member for generously funding this program.

MMC 2009-10	
Name _____ FOR USE OF MMC REGISTRATION PERSONNEL ONLY	Meeting 1
	Date: _____
	Approved: _____
	Meeting 2
	Date: _____
	Approved: _____
Meeting 3	
Date: _____	
Approved: _____	



Sixth U.S.A. Conference on CAS

June 26–27, 2010

New Trier H.S.
Northfield, IL

More information available at
<http://usacas.org/6>

Speaker proposals accepted at
<http://usacas.org/speak>

October Talk Summary, continued from page 5

- heresy. He later worked to promote discovery learning and China is now beginning to change.
- The textbooks used, in Steve's opinion, are largely archaic.
 - When Steve did a workshop the production was like a Broadway show. There were ten men to set up the stage and do lighting. They slept in the conference room under the stage. Steve had a make-up artist get him ready for the presentation.
 - In India, every school is now equipped with a math lab. The emphasis on student-centered learning and learning through the use of technology is new and teachers are eager to learn how to facilitate a learner-centered environment. The Indian government has stipulated that 20% of the math grade is "math lab." This part of the grade is for creative application of mathematics. Such bold and sweeping change is illustrative of how much easier it is to change educational practices in other countries than it is in the U.S. (because of our local control and lack of national standards).
 - Some countries give their teachers bonuses for the learning of and appropriate use of technology.

By the end of Steve's interesting talk it was clear that the Asian systems are not as wonderful as we are told. They do not have a magical answer to the teaching of mathematics. They want to change their instructional practices and do not hold themselves up as the model. Mathematics educators in the U.S. have much to learn from Asian schools and society, but we must consider all factors carefully that contribute to Asia's "successes" and move beyond the stereotypes.

In the end, all students, whether from Chicago or Mumbai, deserve a quality education and the world will be better off if this is done. We need to partner with other countries and learn from one another. Education should be about helping children. "Our children will thrive only if all children are educated and [we] are committed to working across borders for their common benefit."

A large part of this talk was Steve's firsthand stories and his photographs. Steve has put many of his pictures on the web along with slides of his talk and diary entries for his various Asian travels. Visit <http://www.steverasmussen.net/> and click on taxi diaries. Use the user name "teacher" and password "12345". There will be various diary entries from his Asian travels. Scroll down toward the bottom and you will see a link to "Talk: Mathematics Education Travelogue in Asia."

NEW TEACHER INCENTIVE CARD

IMPORTANT DATES 2009-10

Friday, September 11th—Ed Burger
 Friday, October 2nd—Steve Rasmussen
 Friday, November 6th—Edwards & Phelps
 Friday, December 11th—Millie Johnson
 Friday, January 8th—Akihiko Takahashi
 Saturday, January 30th—Conference of Workshops
 Friday, February 5th—Richard Stalmack
 Friday, March 12th—Ken Indeck
 Friday, May 7th—Zal Usiskin

NCTM
 Chapter
 Club of
 Mathematics
 Metropolitan
 Chicago
 1913

Even More Upcoming Events

Mathematics Educators Exploring Computer Algebra Systems (MEECAS) Meetings, New Trier High School, Northfield Campus, 9AM–12PM:

More Inspiring CAS problems, November 7. Michael Todd Edwards and Steve Phelps.

Actual CAS lessons we have used, February 6. TBA.

Workshop Challenge, April 10. Writing CAS questions for high-stakes tests.

<http://meeecas.org/>

MDHWCS Luncheon Meeting: Common Core State Standards, Lisle Hilton, November 9. Henry Kepner, NCTM President. Learn about the new Common Core State initiatives

and the implications for all of us. It will also be stressed that reasoning and sense making is necessary for all students. *Contact Kathy Young at (630) 243-3263.*

TI International Conference, Atlanta, GA, March 5–7. TI combines the Georgia peach and the teacher's apple to provide a unique combination of instruction in Atlanta. Learn from experienced educators and participate in a wide variety of hands-on sessions. Receive lots of classroom activities and ideas, along with the latest news on TI technology. http://education.ti.com/education-portal/sites/US/nonProductMulti/pd_conferences_atlanta.html

2010 NCTM Annual Meeting and Exposition, San Diego, CA, April 21–24. Connections: Linking Concepts and Context. The meeting will address the challenges that teachers face every day, including: engaging and motivating students, addressing diverse learning styles, balancing state testing and student understanding, using technology in the classroom, and more! You'll also be able to learn from more than 700 presentations and experience the latest teaching products in the exhibit hall.

<http://www.nctm.org/sandiego>

USACAS6, Northfield, IL, June 26–27. Sixth U.S.A. Conference on CAS. <http://usacas.org/6>

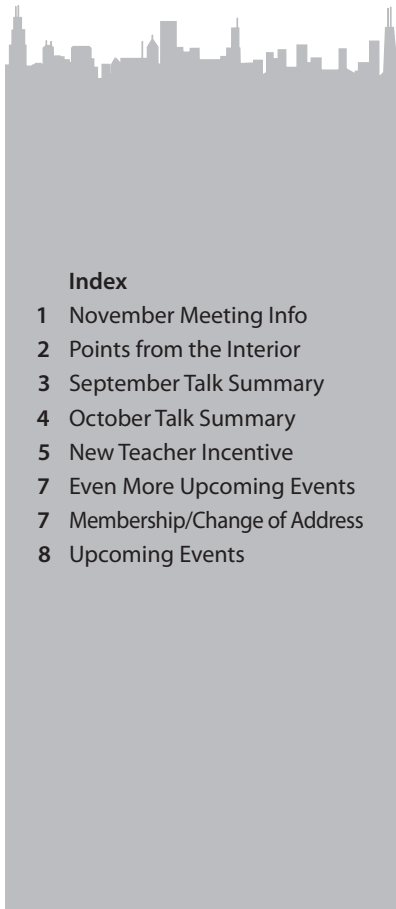
NAME		PREFERRED CONTACT Check one: <input type="checkbox"/> Home <input type="checkbox"/> Work	
HOME ADDRESS			
CITY	STATE	ZIP	
HOME PHONE	HOME E-MAIL		
EMPLOYER			
WORK ADDRESS			
CITY	STATE	ZIP	
WORK PHONE	WORK E-MAIL		
ELECTRONIC-ONLY MEMBERSHIP Check the box below for electronic-only membership. You will receive an email with a direct link to each issue of <i>Points & Angles</i> when it is posted on the web site, often before paper copies are mailed. You will no longer receive <i>Points & Angles</i> by mail.		MEMBERSHIP TYPE Check one: <input type="checkbox"/> 1 year (\$27) <input type="checkbox"/> student, 1 yr (\$15) <input type="checkbox"/> 2 years (\$50) <input type="checkbox"/> 1 st yr teacher, 1 yr (\$15) <input type="checkbox"/> 3 years (\$70) <input type="checkbox"/> retired, 1 yr (\$20)	
<input type="checkbox"/> Electronic-Only Membership			
FORM USE Check one: <input type="checkbox"/> New Membership <input type="checkbox"/> Renewal <input type="checkbox"/> Former Member <input type="checkbox"/> Change of Address		MEMBERSHIP COST \$ _____ DONATIONS	
		SCHOLARSHIP FUND \$ _____	
		SPEAKER FUND \$ _____	
		TOTAL AMOUNT OF CHECK \$ _____	

Make check payable to **MMC**

Mail completed form and check to:

MMC
 2408 Glenview Rd.
 Glenview, IL 60025

MMC Membership and Change of Address Form



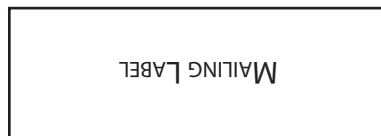
Upcoming Events

Fri., Nov. 6	Edwards & Phelps	Nspired Connections from Outside the Box: Uncovering New Ideas with Technology
Sat., Nov. 7	Northfield, IL	MEECAS: More Nspiring CAS Problems
Mon., Nov. 9	Lisle, IL	MDHWCS Luncheon: Henry Kepner
Fri., Dec. 11	Millie Johnson	Tracking Mathematical Threads from Early Childhood through College
Fri., Jan. 8	Akihiko Takahashi	Improving Mathematics Teaching and Learn- ing through Lesson Studies
Sat., Jan. 30	York Community H.S.	Conference of Workshops
Fri., Feb. 5	Richard Stalmack	Physics and Mathematics—Two Different Sub- jects Sharing a Common Language
Sat., Feb. 6	Northfield, IL	MEECAS: Actual CAS Lessons We Have Used
Fri., Mar. 12	Ken Indeck	The Most Misunderstood Concept in Geometry
Fri., May 7	Zal Usiskin	The Geometry of Shape and the Shape of Geometry

(See also "Even More Upcoming Events" on page 7)

Send upcoming event items to ilg@chicagomath.org no later than the date of the MMC dinner meeting preceding the issue in which the item should appear. All items are subject to editing.

Your membership renewal date appears in the upper right corner of the label.



METROPOLITAN MATHEMATICS CLUB OF CHICAGO
c/o MMC
2408 Glenview Rd.
Glenview, IL 60025