

# Points & Angles

Newsletter of the Metropolitan Mathematics Club of Chicago  
Volume XLV No. 7 May 2016

## The Real Big Ten: The Toughest Mathematical Ideas For High School Students To Learn, And How To Approach Them

### May Speaker

Zal Usiskin



**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, May 13, 2016**

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

#### **Fountain Blue Banquets & Convention Center**

2300 Mannheim Rd., Des Plaines  
(847) 298-3636  
\$43 for Members, \$49 for Nonmembers

#### **Reserve by Noon, Monday May 9**

Online at [www.mmccchicago.org](http://www.mmccchicago.org)  
or by phone at (847) - 486 - 4291

Some important elementary and middle school mathematical ideas are quite difficult for many students to get in their heads. For instance: Why can't we divide by zero? Why is the product of two negative numbers a positive number? In this talk, ten of the most difficult yet important ideas from high school algebra, geometry, and statistics are identified and discussed. Well, maybe there will be as many as 14 ideas, but we will still call them the "big ten".

Zalman Usiskin will be our speaker this May. Zal needs no introduction; this will be the 25th time he has spoken at the Metropolitan Mathematics Club of Chicago and continues a tradition dating back to 1982 in which he has been our speaker at the last meeting of every even-numbered year.

Zal was born in Chicago and educated in Chicago Public Schools. He received two bachelor's degrees from the University of Illinois, one in mathematics and one in education, a Master of Arts in Teaching degree from Harvard, and a PhD in mathematics education from Michigan. In the first half of his career, he taught mathematics in nine different secondary schools, six of them in the Chicago area.

He is the author or co-author of over 150 articles and other papers on mathematics and mathematics education, dozens of books and book-length research monographs, including textbooks and their teachers' editions for each of grades 6 through 12 and a college-level advanced mathematics text for high school teachers. In 1994, NCTM published a book of 38 of his papers, the first time that the organization has ever published a collection of writings of one individual.

Zal has served on the Mathematical Sciences Education Board of the National Research Council, the Board of Directors of NCTM and the United States National Commission on Mathematics Instruction, which he chaired from 1998 to 2001. From 1995 through 2004 he was a member of the test-development committee of the National Assessment of Educational Progress.

He is well-known as a speaker in the U.S. and abroad. He has spoken at conferences or colloquia in all 50 U.S. states and 25 foreign countries about a variety of topics. He received the Glenn Gilbert (National Leadership) Award from NCSM in 1994, and a Lifetime Achievement Award from NCTM in 2001. Closer to home, he received ICTM awards including the Max Beberman Award in 1981 and the both the Distinguished Service Award and the Distinguished Life Achievement Award in 2010.

Zal has been married for 35 years to Karen, a mathematics K-12 product development manager at Pearson Education. Karen herself was the first woman president of the MMC. Come learn from this great leader in mathematics education! Make your reservation today for May 13's dinner meeting. This is a presentation you won't want to miss!

# Points From The Interior

By PATRICIA TRAFTON

I've had the good fortune this year to teach both math and science. Actually, this is the second year I've taught both subjects as part of my teaching load. I first taught math and science two years ago while teaching seventh grade. This year I'm teaching both subjects to sixth graders. I've also had the wonderful opportunity to attend both the National Science Teachers Association (NSTA) annual conference and the National Council of Teachers of Mathematics (NCTM) annual conference this year. In teaching both subjects and attending the annual conferences of the professional teacher organizations of both subjects, I've had numerous opportunities to compare the teaching, learning, and assessment of the two subjects.

Both NSTA's support of the Next Generation Science Standards (NGSS) and NCTM's support of the Common Core State Standards for Mathematics (CCSSM) are grounded in the belief that "all students deserve a high-quality education that provides them with the skills and knowledge they need to be prepared for college and careers and to be well-informed and productive citizens in society."<sup>1,2</sup> Such a high-quality science and mathematics education consists of hands-on, experiential teaching and learning that emphasizes problem solving, sense-making, making connections, applying knowledge in context, and grounding practice in research.<sup>3,4</sup> The first four emphases are some of the Mathematical and Scientific Practices in CCSSM and NGSS, respectively. Both organizations stress embedding these practices in a coherent, focused, and rigorous curriculum.

Two of the Mathematical Practices and Science and Engineering Practices that are equivalent are: Develop and Use Models (Science and Engineering Practice 2) and Model with Mathematics (Mathematics Practice 4). The diagram below shows a comparison among the Next Generation Science and Engineering Practices and the Common Core State Standards in Mathematics and in English Language Arts. It is the Modeling standard that particularly intrigued me this year.

Mathematical models often consist of writing an equation or drawing a diagram or geometric figure of a problem situation. Sometimes mathematical models involve making a 3-D representation of the problem. Science investigations also use the same types of models. While I've had my students make Playdoh models of animal and plant cells, and drawings depicting the Water Cycle and chemical reactions this year, it was at the NSTA Conference in a session about modeling that I had an Aha! moment. In Science, modeling means revising in response to new evidence. Students don't revise their drawings just once, they revise them two or three times or however many times needed until they have considered all the evidence presented to them in a problem. So with each revision of their model, students' drawings are more detailed and refined than in previous versions. I don't recall having my math students, over the years, revise their models this many times for a given problem. I will certainly apply Science's concept of modeling to my math classes from now on, particularly if it involves a drawing as a model. As the school year winds down, what will you do differently next year?

Practices in Mathematics, Science, and English Language Arts*		
Math	Science	English Language Arts
<b>M1.</b> Make sense of problems and persevere in solving them.	<b>S1.</b> Asking questions (for science) and defining problems (for engineering).	<b>E1.</b> They demonstrate independence.
<b>M2.</b> Reason abstractly and quantitatively.	<b>S2.</b> Developing and using models.	<b>E2.</b> They build strong content knowledge.
<b>M3.</b> Construct viable arguments and critique the reasoning of others.	<b>S3.</b> Planning and carrying out investigations.	<b>E3.</b> They respond to the varying demands of audience, task, purpose, and discipline.
<b>M4.</b> Model with mathematics.	<b>S4.</b> Analyzing and interpreting data.	<b>E4.</b> They comprehend as well as critique.
<b>M5.</b> Use appropriate tools strategically.	<b>S5.</b> Using mathematics, information and computer technology, and computational thinking.	<b>E5.</b> They value evidence.
<b>M6.</b> Attend to precision.	<b>S6.</b> Constructing explanations (for science) and designing solutions (for engineering).	<b>E6.</b> They use technology and digital media strategically and capably.
<b>M7.</b> Look for and make use of structure.	<b>S7.</b> Engaging in argument from evidence.	<b>E7.</b> They come to understanding other perspectives and cultures.
<b>M8.</b> Look for and express regularity in repeated reasoning.	<b>S8.</b> Obtaining, evaluating, and communicating information.	

\* The Common Core English Language Arts uses the term "student capacities" rather than the term "practices" used in Common Core Mathematics and the Next Generation Science Standards.



# March Talk Summary

BY CARRIE FRAHER

John McConnell began his talk by crediting MMC for being an important part of his life and professional development. McConnell shared a touching memory of member Jerry Cummins. He noted his enthusiasm and joy for teaching and shared a great story about working with him to increase engagement at Glenbrook South.

McConnell noted the new directions in statistics that should be causing new approaches in teaching. At the forefront is the replacement of statistical tests with simulations. Applications using random number generators allow statisticians to replicate all kinds of interesting situations and make predictions. The de-emphasis on statistical tests could lead teachers to find more time to ask big, critical, essential questions.

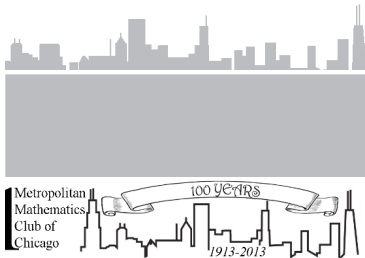
Sir Francis Galton worked in statistics around the turn of the 20th Century. Galton took advantage of the World's Fair to take height measurements of parents and their adult children. Working without computers, he observed that he could put all the males and females together in the study by multiplying female heights by 1.08. Using a scatterplot, Galton found a regression of the inverse relationship. He was able to predict the height of a couple's adult children by applying the previous formula. The audience was warned that correlation does not imply causation.

Next he discussed statistics in medicine. McConnell encouraged the following questions: Does a new treatment provide a cure? Does a new treatment provide a cure better than a placebo? Does a new treatment provide a cure better than an accepted treatment? A common medical test was examined. Mammograms are a widespread use of testing for breast cancer. In 2011, a study in the United Kingdom examined over diagnosis, number of screens required to save one life, and the percent of women in each age group taking advantage of the screening. Researchers concluded that the mammograms did extend lives, but at a cost. While 1300 breast cancer deaths could be prevented each year in the UK, 4000 women were being treated for a condition that would never have caused them harm. A newer study published in the New York Times on 2/11/14 raised further questions about mammograms. Researchers found that the death rates were the same from groups that had mammograms and groups that did not.

McConnell skillfully linked the studies on medical diagnosis to a topic facing schools every year – math placement. Schools need statistical methods to place students into courses, gifted programs, AP, support programs, and college mathematics. Most focus in math placement testing is on predicting success and preselecting against failure. McConnell encouraged thinking about how we can include more students who will benefit from the programs. Schools were encouraged to use a variety of tools to place students and to place safeguards, that enable students to drop back early in the class, is needed instead of raising minimum scores to exclude students who may have done very well. AP classes are viewed as elite by many educators, but as more students take them, more students pass them. We need to encourage more students to challenge themselves.

What are the effects of increased state testing? The government has a vested interest in determining the effectiveness of schools. Testing through NCLB has identified unserved groups of students. Achievement gaps have been narrowing because Black and Hispanic student scores have been rising faster than White student scores. Overall, state tests have improved student performance.

McConnell wrapped up with questions about the curriculum. What is the worth of a Pre-Calculus course? Is it just a dumping ground for topics that are no longer in Calculus? A Sonnert & Sadler study of 10,000 Calculus students at 134 schools revealed that Pre-Calculus made no improvement in college Calculus and hinted that it may be detrimental to students. McConnell also discussed radical acceleration with students taking Algebra 1 and 2 in grade 7 followed by Geometry and Pre-Calculus in grade 8. If talented students are racing through, does the curriculum lack depth? Could more students benefit from acceleration? The appropriate title of "Looking Both Ways Before Crossing The Street" has left us with great questions to ponder about the effectiveness of some our methods and to always be thinking about what is in the best interest for our students.



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# Ln(blogs)

By JOHN O'MALLEY

When someone is passionate about what they do, it shows. If you read anything at all on Sarah Hagan's blog "Math = Love" then you will understand that Sarah is one of those people. Sarah teaches in a small town in Oklahoma that only has about 3000 residents. Despite this small town effect, Sarah has been able to make a huge impact. Since it does not appear that she wants to use a textbook in class, Sarah has created her own textbook by using foldables. Students paste certain things and jot down important information into a composition notebook. If you look at her blog, there are a countless number of foldables that she has uploaded for the world to see...and for all of us to steal! She even has a separate section titled Free Downloads and it would be incredibly hard not to find something you could use in your classroom.

Lately, the queen of foldables has been uploading tons of pictures and files on her blog of her algebra 2 curriculum. She is literally opening the books and showing us everything she has done and created. This is one of the things I admire the most about her, she is not afraid to have everything out in the open. Sarah is not afraid to throw caution to the wind and try something new. She has reflected several times on lessons or activities that have not gone her way and has caused me to learn a lot of great ideas. She was even featured on NPR! This is one extraordinary teacher that you can't pass up checking out.

<http://mathequalslove.blogspot.com/>

## Upcoming Workshop

**Build Your Own TI-Nspire CX CAS Calculator Workshop: 1 to 3 days**

**June 14th to 16th, 2016 - Times and dates vary**

**At Highland Park HS - Cost is \$40 per day or \$100 for all 3 days (including lunch).**

**You must sign-up in advance by Friday, June 3rd** to attend a variety of TI-Nspire calculator sessions. **PLEASE GO TO THE RevTRAK LINK BELOW TO REGISTER FOR THESE WORKSHOPS.** You will need to pay in advance in order to complete your registration process with a generated receipt/confirmation of your registered sessions. Any questions, please contact Robin Gapinski at 224-765-2224 or [rgapinski@dist113.org](mailto:rgapinski@dist113.org)

RevTrak Registration Link: <https://dist113.revtrak.net/tek9.asp?pg=products&grp=341>

# MMC Board Report

BY LYNN BOND

The MMC Board of Directors met on February 9, 2016 at Schaumburg High School. The board discussed the Conference Of Workshops and commented on it being, yet again, another successful day of professional development. Thanks are extended to speakers and everyone involved to make it possible. The scholarship committee has been soliciting applications and at the time of this meeting, had a plan to meet to evaluate responses and choose recipients. Election ballots for Board directors and President were being sent out at the time of this meeting. Election results will be available to everyone in the near future. The MMC service project at the Greater Chicago Food Depository will be Saturday, April 30th. The next Board meeting will be Wednesday May 18, 2016 at 6:00 pm. It will be located at ECRA Group in Schaumburg. MMC members are welcome to attend any board meeting. Please contact John Diehl at john3500i@att.net if you plan to attend.

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# Upcoming Events

Sat., Apr 30	Service Project	Greater Chicago Food Depository
Fri., May 13	Zal Usiskin	<b>The Real Big Ten: The Toughest Mathematical Ideas For High School Students To Learn, And How To Approach Them</b>
June 14-16	Highland Park	MEECAS + TI-Nspire CAS Workshop

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Send upcoming event items to [jomalley@glenbrook225.org](mailto:jomalley@glenbrook225.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.*

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