Reflecting on NCTM Annual Meeting

I am still so pumped about my experience in San Antonio this month, and I can't wait to share all that I have learned. It was so difficult to choose which sessions (out of the more than 700!!!) to attend, and at any given time, I felt pulled in at least three different directions. So, before I start forgetting where I learned things, here are my reflections of this awesome conference:



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How Not to Be Wrong: The Power of Mathematical Thinking General Interest Session

The math we learn in school can seem like a dull set of rules, laid down by the ancients and not to be questioned. In this talk, Jordan Ellenberg shows us how wrong this view is: Math touches everything we do, allowing us to see the hidden structures beneath the messy and chaotic surface of our daily lives. It's a science of not being wrong, worked out through centuries of hard work and argument. Drawing from history as well as the latest theoretical developments,

Centuries of nard work and argument. Drawing from instory as well as the latest theoretical developments, Ellenberg demonstrates that profound mathematical ideas are present whenever we reason, from the commonplace to the cosmic. He also shows how you can use this knowledge in your own life, whether you're a business looking to discover the power of big data, a corporate audience out to improve logic and understanding within your organization, or a college crowd with an appetite for the latest research by one of America's rising scholarly stars.

Jordan Ellenberg is a professor of mathematics at the University of Wisconsin–Madison and the author of two books: *How Not to Be Wrong: The Power of Mathematical Thinking*, and *The Grasshopper King*, which was a finalist for the New York Public Library Young Lions Fiction Award. His work has appeared in the *New York Times*, the *Wall Street Journal*, the *Washington Post, Wired*, *The Believer*, and the *Boston Globe*, and he is the author of the "Do the Math" column in *Slate*. In 2013 he was named one of the inaugural class of Fellows of the American Mathematical Society.

The 2017 NCTM Lifetime Achievement Awards will be presented to Margaret J. (Peg) Kenney, posthumously, and J. Michael Shaughnessy at the Opening Keynote.

Jordan Ellenberg University of Wisconsin–Madison

42 BUILD REFLECTION COVE Number Talks in the Middle Grades: Focusing on Student Reasoning 6–8 Workshop

Number talks are ideal in supporting procedural and conceptual understanding of mathematics, but implementation in the middle grades is different than elementary grades due to the nature of the content. This session will present ideas for middle level teachers looking to learn how to implement number talks in their classroom.

Cory Bennett

@AlohaCory Idaho State University, Pocatello, Idaho Emily Lockhart Alameda Middle School, Pocatello, Idaho Jordan Ellenberg is a speaker that was new to me, and I am so glad I attended his opening keynote. A dynamic speaker, he had the audience in stitches as we learned about how math is present in our lives any time we reason or solve a problem.

Cory shared with audience members some excellent resources related to Number Talks, including the website <u>illustrativemathematics.org</u>. Participants learned about the difference between number talks and reasoning talks. Attending to reasoning helps students recognize what is important about a problem, generate possible solution pathways, develop questioning skills, give meaning to symbolic representations, make connections and develop counter arguments.

135 TLC

"Noticing and Wondering" as a Vehicle to Understanding the Problem

General Interest Session

The practices of noticing and wondering can help all students generate mathematical ideas and make connections between them. Noticing and wondering pave the way for the development of other problemsolving strategies and support a classroom culture that gives every student a way to contribute mathematically and that treats math as a creative process.

Annie Fetter

The Math Forum at NCTM, Reston, Virginia

194 PROF

Mathematical Mindsets: Creating a New Future for Math Teachers and Learners

General Interest Session

New discoveries in brain science are both amazing and at times surprising. They help us understand why so many students—and perhaps you—haven't developed the connections with math that are possible and truly liberating. Come and learn what we can say and do with students to ignite new math pathways, creating classrooms that are full of excited, engaged students. Meet and greet following session.

Jo Boaler Stanford University/Co-Founder Youcubed, Stanford, California Annie Fetter is one of my math heroes. If you haven't heard her <u>Ignite talk</u> before, it's certainly worth listening to! This was a very reaffirming session for me; I've used her Notice/Wonder techniques for years. By using this strategy, we can use the problems in textbooks as supports for teachers instead of assignments for students – no more teaching to the text. This technique strongly correlates to 3 Act Math Tasks and is great as a whole math lesson or a 5 minute warmup.

OMG Jo Boaler! I admire this woman so much, and there was no way I was going to miss this presentation. I was one of the first people in the auditorium that holds over 2000 people. She continues to press on with her math revolution, and I loved her presentation so much! I actually didn't take a lot of notes here, but found my head nodding A LOT! Growth mindset plays into success in math, and Jo's message is that math learning IS NOT about speed. As educators, we must move from performance orientation to learning orientation. Performance orientation leads to fixed

mindsets, and creative, deep thinking is inhibited by speed, evaluation, and rewards. I loved the "Me During Math Class" video snippet that she shared. ③

213 BUILD Break It Down: Decomposition across Mathematical Domains

3-5 Workshop

Developing a solid understanding of part-whole relationships is essential to mathematical proficiency. Let's take a look at this big idea as it progresses throughout multiple domains in grades 3, 4, and 5. Explore with games, activities, and teacher practices that will help strengthen your students' understanding of decomposition.

Dennis McDonald

Howard County Public School System, Ellicott City, Maryland Claudia Eckstrom

Howard County Public School System, Ellicott City, Maryland

I actually went to this session by accident, but I enjoyed it very much. The presenters discussed how much more flexible students are with numbers when they are skilled in decomposing. Decomposing numbers begins in Kindergarten and continues through Gr. 8 and beyond, including decomposing fractions. A game called "Get to the Whole" was shared, and it's a

gooder! (See photo.) I also liked the three discussion points the presenters used: What? So what? Now what?



276 BUILD Minecraft Math: Making Geometry and Measurement Come Alive

6-8 Workshop

Learn how to incorporate the popular game, Minecraft, into volume and surface area lessons the students will enjoy and remember. Participants will be challenged to explore the mathematics of cubes, rectangular prisms, and cylinders using manipulatives and nets. Attendees will leave with templates to bring back to their classrooms.

Kim Moore Texas A & M University-Corpus Christi Faye Bruun Texas A & M University-Corpus Christi Christine Price Corpus Christi Independent School District, Texas This was a good, hands-on workshop. Participants cut and folded grid paper to create characters from Minecraft, and learned some ways to incorporate these activities with Shape and Space outcomes, including perimeter, area, surface area and volume. I was expecting to use the actual Minecraft game here, but it was all paper. Some good lesson ideas.

294 TLC REFLECTION COVE All the Things Kids Learn When We're Trying to Teach Them Math

General Interest Session

Sure, students need to count, convert, and calculate, but we also want them to persevere, use technology, and love math. While we try to do it all, some kids fall behind and think they're not good at math. Let's examine some unintended consequences of instruction, and explore strategies that foster the skills and habits that help students thrive.

Patrick Vennebush © @pvennebush Discovery Education, Silver Spring, Maryland



363 TECH

REFLECTION COVE Pixar in a Box: Theory and Practice General Interest Session

Pixar in a Box (pixarinabox.org) is a collaboration between Pixar Animation Studios and Khan Academy. It is a free online resource intended to show students how concepts they are learning in school play a crucial role in the creation of Pixar movies. Each Pixar in a Box lesson focuses on a creative challenge faced by Pixar artists and then shows how math, science, art, and humanities concepts are used to address that challenge. In this talk, we will demonstrate how PIAB is structured to engage middle to high school students using interactive lessons that they can do in or outside of the classroom. We will also discuss our partnership with Khan Academy and the development principles we used to inspire students to discover their creative potential. Educator William Gowsell will share his experience of using PIAB in the classroom and the feedback he has received from his students.

Tony DeRose Senior Scientist, Pixar Animation Studios William Gowsell Teacher and Math Lead, Catholic District School Board of Eastern Ontario Sometimes kids get the message "math is tedious" when we are trying to teach them perseverance. Perseverance ≠ doing a lot of problems! Sometimes kids learn that "math is not a part of my world," and this is one reason why we need to make sure that we are using real world problems. Patrick's presentation was easy to listen to, and confirmed some of my philosophies.

This session wowed me like nobody's business! Pixar has partnered with Khan Academy (and I do love Khan Academy!) to form <u>pixarinabox.org</u>, an educational resource that focuses on math, science and storytelling. The lessons use math and science skills to create animated films a la Pixar! The lessons in categories such as rendering, character modeling, effects, etc, progress in difficulty and are suitable for Grades 5+, although teachers have used them in lower grades. This presentation was led by Tony DeRose from Pixar and teacher Bill Gowsell from Ontario. I'm very excited to try this out. Anyone interested in integrating math into makerspace and/or coding, this is for you!

416 BUILD REFLECTION COVE The New Basics: Arithmetic and Algebra with 21st-Century Tools

General Interest Session

It's easy to get digital tools to drill students on their facts, at the very same time that these tools make fact memorization less valuable. What do students need to know about arithmetic and algebra, and how can digital tools support them learning it? This session provides some answers and classroom-ready examples.

Christopher Danielson @Trianglemancsd Desmos, Inc., St. Paul, Minnesota I really enjoyed this presentation! Christopher Danielson (aka @trianglemancsd) is the creator of Which One Doesn't Belong, and #unitchat, among other math activities. He talked about reverse number talks, which involves students creating their own number images. You provide the students with objects and have them arrange them in interesting placements (mathematical patterns, aesthetically pleasing arrangements, etc). He also shared with us the Central Park activity at Desmos, which is pretty cool! If you don't already, follow this guy on Twitter!

463 TLC REFLECTION COVE Rich Real-World Problems

6-8 Session

These engaging problems provide a context you can use to introduce a math topic and make conceptual understanding more tangible. We'll do a problem together and discuss how to help students articulate their mathematical thinking in writing. Finally we'll cover options for assessing their work and sources of free problems from kindergarten through high school.

Robert Kaplinsky

★@robertkaplinsky Downey USD, Long Beach, California

Face your estimate on the number line.
Place your estimate on the number line. What info do you need about the problem?
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Robert is the real deal! This extremely engaging and practical session involved using his Problem Solving Framework – very similar to (and could be used with) a 3 Act Math Task. He encourages estimation, because "not all tools are things we hold in our hands" - love it! This session explained how and when to use Problem Solving in the classroom, and included levels of convincing that I found very interesting. It's imperative for students

> to be able to construct a viable argument and critique the reasoning of others. This message was also encouraged in Jo Boaler's presentation. Check out his website – his lessons and resources are excellent! <u>http://robertkaplinsky.com/</u>. The <u>Problem Solving Framework</u> is a particularly useful resource!

498 A&E Six Reasoning Mini-Lessons to Revitalize Early Childhood Routines

Pre-K-2 Workshop

In early childhood, routines are one of the best ways to develop students' mathematical reasoning, listening, and social skills and ability to communicate with clarity. Often, because teachers do not know how to adapt them, routines become boring. In this session, we will explore reasoning routines that will keep all students challenged and engaged.

Antonia Cameron

Metamorphosis Teaching Learning Communities, New York, New York Jenn Costanzo Metamorphosis Teaching Learning Communities, New York, New York

Michael Cassaro

Metamorphosis Teaching Learning Communities, New York, New York



Understanding Division of Fractions through Models, Language, and Structure

3–5 Workshop

Fraction understanding is critical for students in helping them make sense of mathematics, but can be difficult to build. Participants will leave with ideas for tasks and practice items to use with students that build on their fraction sense to understand division of fractions, and allow for connections to proportional reasoning in later grades.

Jacquelyn Ismail Boise State University, Idaho Sam Strother Boise State University, Idaho Although I didn't recognize these presenters' names, I chose to attend this workshop because I've heard of the Metamorphosis Teaching Learning Communities (Lucy West). This session was far away from the last session I had attended, and I ended up about ten minutes late, so I missed the first Reasoning Mini-Lesson that was presented, but I believe it was a version of a number talk. The other mini-lesson routines included, "The You, Me Game," "Could Be, Couldn't Be," "Describe What You See," "50 Red, 50 Blue Squares" and "Comparing Expressions." Nice little routines that are not rocket science, but still useful.

The presenter for this workshop was actually Jonathan Brendefur, who stood in for the original presenters who couldn't make it. We participated in creating different models to represent operations with fractions, including Paper Folding, the Double Number Line and Symbolic Representation (equation writing). The message received: "Model, model, model, and then discuss the relationships of the numbers in the equations. Only when students see the multiplicative nature can we introduce the algorithm Invert and Multiply."

595 TLC Math Is Power Not Punishment General Interest Session

We often offer students shortcuts, strategies, and skills before students understand their origin, their value, and the millions of hours of work they've saved mathematicians throughout history. We'll look at techniques for putting students in a position to need these challenging skills so they feel like power, not punishment.

Dan Meyer

Desmos, San Francisco, California

Maybe you've heard of Dan Meyer? Just kidding! OMG, another math hero! This is the first time I've heard Dan speak, and I'm sure there were little stars sparkling in my eyes. He is awesome. I nodded and nodded and nodded, and restrained myself from shouting, "Amen Brother!" I really don't know how to sum up his presentation – it was amazing! He used <u>Guershon Harel's Intellectual Need</u> theory to hammer home the point that teachers must create a NEED in their students.

There are 5 Intellectual Needs: the need for certainty, causality, computation, communication and connection. If students have some reason for NEEDING TO KNOW the answer, or how to solve a problem, we are more than halfway to our goal. It's like the <u>PooTrap infomercial</u> – show the headache first, and then how to make the headache go away. Haha! We need to teach students what the longcut is before we show them the shortcut, otherwise they'll never fully understand how the shortcut works, and they also won't appreciate it. Dan's resources from NCTM are available online here: <u>mrmeyer.com</u>. I recommend the Creating Headaches document – and please add your own ideas here too!

634 BUILD

Developing Essential Understandings of Addition and Subtraction

Pre-K-2 Session

Have you ever heard, "If only my students knew their basic facts." This doesn't come from drill and kill, flashcards, or timed tests, it comes from strong number sense. Participants will explore the essential understandings of addition and subtraction to build numerical literacy from a conceptual understanding framework and how to progress monitor.

Jeremiah McGraw

Grant Wood Area Education Association, Cedar Rapids, Iowa Amy Schemmel Keller Grant Wood Area Education Agency, Cedar Rapids, Iowa This was a solid session on introducing all types of joining and separating problems to teachers. Jeremiah also discussed addition and subtraction strategies, and the order in which his association recommends introducing them to students. He prompted participants to encourage discourse in K-2 classrooms, through subitizing, mental math and number string activities. I've emailed him since the session, and he kindly shared his PowerPoint presentation with me, as I feel it could come in useful at a Numeracy workshop for Early Years teachers.

682 BUILD Nurturing Early Algebraic Thinking in Pre-K through Grade 2

Pre-K-2 Session

This session offers practical methods for teaching algebraic thinking at the early childhood level. The presenters will share ideas and classroom-ready activities designed to help support pre-K-2 teachers in providing appropriate and challenging instruction to develop the algebraic thinking of students in early elementary classrooms.

Edel Reilly Indiana University of Pennsylvania Joann Migyanka Indiana University of Pennsylvania This session was a nice follow-up to the previous session, and made the connection between the study of number and algebra, through studying number combinations (decomposing and addition/subtraction strategies), place value (mental math and the role of 10), and algorithms and operations (the meaning, interpretation and relationships between the operations). The presenters encouraged educators to ensure that students understand the idea of EQUALITY, and also cautioned us to move slooooowly from manipulatives to symbolic representation – something that is often rushed.