

Navigating Professional Learning to Make Productive Mathematics Classrooms

Agenda

- High quality mathematics instruction and professional learning
- Learning and the adult brain
- Your needs as an adult learner
- Networking

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NCTM 2017 Annual Conference
San Antonio, Texas

Who's here?

- 1st time conference attendees
- PK – 2, 3 – 5, MS Teachers
- High School Teachers
- Mathematics Specialists
- Administrators
- District Personnel
- Higher Education Faculty
- Texans?

Roll
Call

Why am I here?



Norms

- Participate
- Be open to new ideas
- Value collaboration and communication
- Accept non-closure



Why are you here?

Introduce yourself to a person you do not know and share the problem(s) you hope to address by attending this session.

What are the components of high quality mathematics instruction?

Write one idea in response per sticky note.

Please work independently and silently.

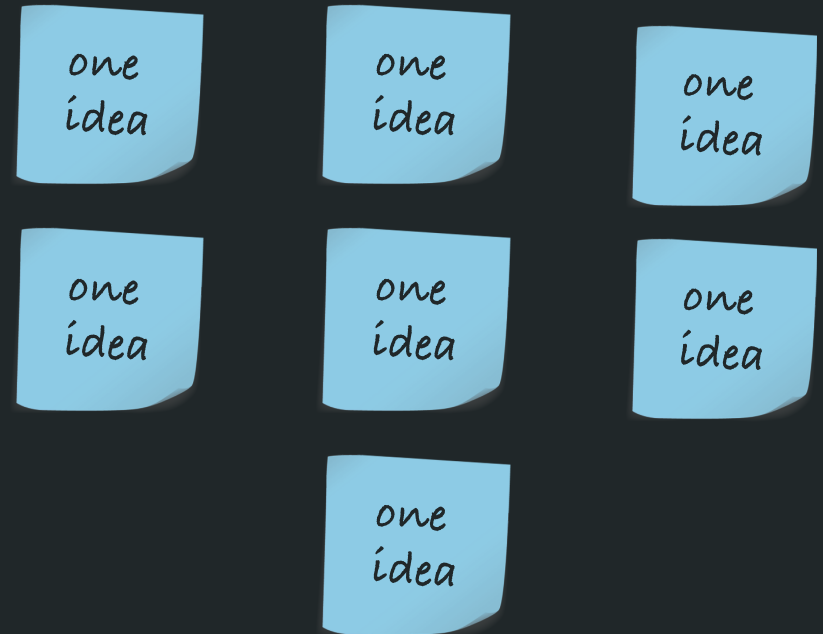


one
idea

What are the components of high quality mathematics instruction?

With the people around you, organize your sticky notes into groups.

If an idea fits into more than one group, duplicate the sticky note.



What are the components of high quality mathematics instruction?

Give your groups titles.

Title

Title

Title

one
idea

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The Five Dimensions of Mathematically Powerful Classrooms

The Mathematics

How do mathematical ideas from this unit/course develop in this lesson/lesson sequence? How can we create more meaningful connections?

Cognitive Demand

What opportunities do students have to make their own sense of mathematical ideas? To work through authentic challenges? How can we create more opportunities?

Equitable Access to Content

Who does and does not participate in the mathematical work of the class, and how? How can we create more opportunities for each student to participate meaningfully?

Agency, Ownership, and Identity

What opportunities do students have to see themselves and each other as powerful mathematical thinkers? How can we create more of these opportunities?

Formative Assessment

What do we know about each student's current mathematical thinking? How can we build on it?

Teaching for Robust Understanding (TRU) Framework

TRU provides a research-based response to the question,

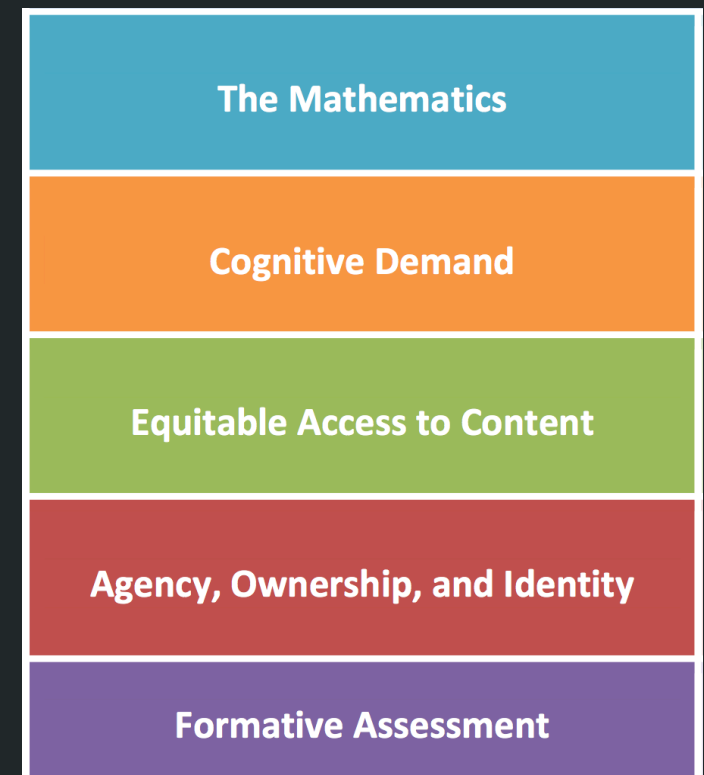
“What are the attributes of equitable and robust learning environments – environments in which all students are supported in becoming knowledgeable, flexible, and resourceful disciplinary thinkers?”

Baldinger, E. Louie, N., and the Algebra Teaching Study and Mathematics Assessment Project. (2016). TRU Math conversation guide: A tool for teacher learning and growth (mathematics version). Berkeley, CA & E. Lansing, MI: Graduate School of Education, University of California, Berkeley & College of Education, Michigan State University. Retrieved from: <http://ats.berkeley.edu/tools.html> and/or <http://map.mathshell.org/materials/pd.php>.

Teaching for Robust Understanding (TRU) Framework

The quality of a learning environment depends on the extent to which it provides opportunities for students along the following five dimensions:

- (1) The richness of disciplinary concepts and practices (“the content) available for learning;
- (2) Student sense-making and “productive struggle”;
- (3) Meaningful and equitable access to concepts and practices for all students;
- (4) Means for constructing positive disciplinary identities through presenting, discussing and refining ideas; and
- (5) The responsiveness of the environment to student thinking



Why TRU Math?

The five focal dimensions of TRU have the following properties:

1. They are comprehensive.
2. Each dimension can be the focus of coherent professional development.
3. Together, they provide a language and a framework for inquiring into instruction and improving it – not a set of “recipes” telling teachers what they should do.

Baldinger, E. Louie, N., and the Algebra Teaching Study and Mathematics Assessment Project. (2016). TRU Math conversation guide: A tool for teacher learning and growth (mathematics version). Berkeley, CA & E. Lansing, MI: Graduate School of Education, University of California, Berkeley & College of Education, Michigan State University. Retrieved from: <http://ats.berkeley.edu/tools.html> and/or <http://map.mathshell.org/materials/pd.php>.

Learners who have well-developed schemas have a more extensive basis for the integration of new content than learners lacking related schemas.

- Ruth C. Clark



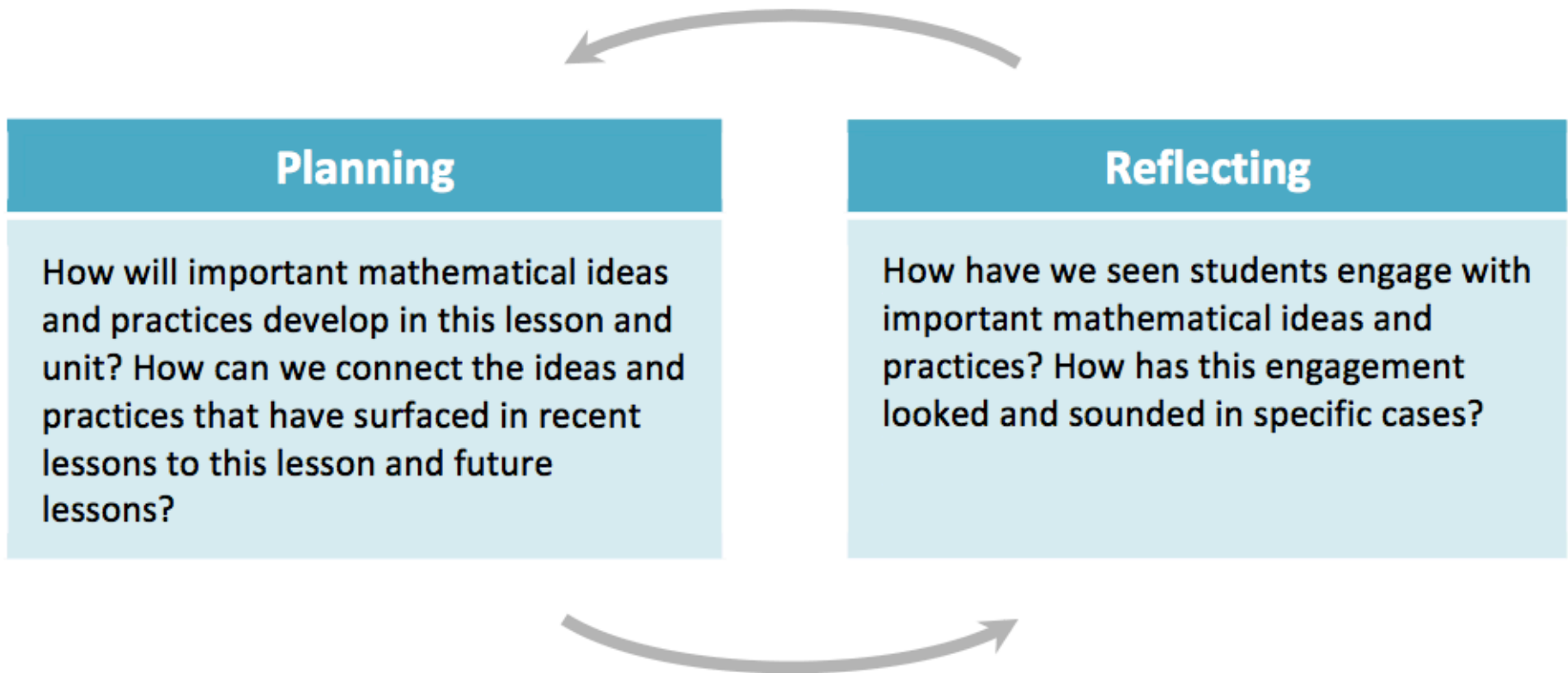
Using the TRU Math Conversation Guide

The Mathematics

Core Questions: How do mathematical ideas from this unit/course develop in this lesson/lesson sequence? How can we create more meaningful connections?

Students often experience mathematics as a set of isolated facts, procedures and concepts, to be rehearsed, memorized, and applied. Our goal is to instead give students opportunities to experience mathematics as a coherent and meaningful discipline. This requires identifying the important mathematical ideas behind facts and procedures, highlighting connections between skills and concepts, and relating concepts to each other—not just in a single lesson, but also across lessons and units. It requires engaging students with centrally important mathematics in an active way, so that they can make sense of concepts and ideas for themselves and develop robust networks of understanding. And it requires engaging students in authentic performances of important disciplinary practices (e.g., reasoning abstractly and quantitatively, constructing mathematical arguments and critiquing the reasoning of others).

Using the TRU Math Conversation Guide



Using the TRU Math Conversation guide

Things to think about

- What are the mathematical goals for the lesson?
- What connections exist (or could exist) between important ideas in this lesson and important ideas in past and future lessons?
- How do important mathematical practices develop in this lesson/unit?
- How are facts and procedures in the lesson justified?
- How are facts and procedures in the lesson connected with important ideas and practices?
- How do we see/hear students engage with important ideas and practices during class?
- Which students get to engage deeply with important ideas and practices?
- How can we create opportunities for more students to engage more deeply with important ideas and practices?

Using the TRU Math Conversation guide

- Set a long-term learning agenda. (Go deep!)
 - What are your needs?
 - What are the needs of your institution?
- Use the discussion questions as a menu.
Pick and choose.
 - Discuss these questions with others.
 - Activate your prior knowledge.

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The latest teaching trends and topics will include:

- **Access and Equity:** Teaching Mathematics with an Equity Stance
- **Assessment:** A Tool for Purposeful Planning and Instruction
- **Building Conceptual and Procedural Understanding**
- **Professionalism:** Learning Together as Teachers
- **Teaching, Learning, and Curriculum:** Best Practices for Engaging Students in Productive Struggle
- **The “M” in STEM/STEAM**
- **Tools and Technology:** Using Technology to Effectively Teach and Learn Mathematics

<http://www.nctm.org/News-and-Calendar/Calendar-Events/NCTM/NCTM-2017-Annual-Meeting-and-Exposition/>



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Because learning relies on the integration of new content into existing knowledge in long-term memory, techniques that activate prior knowledge in LTM relevant to the new information improve learning. - Ruth C. Clark

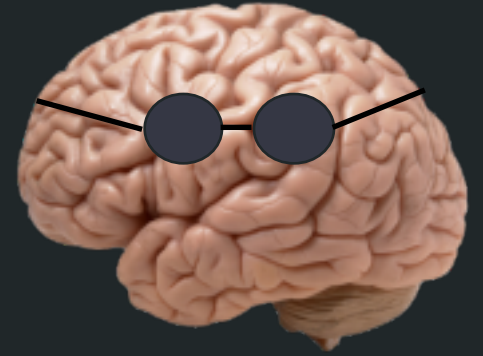
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Educating Your
Aging Brain:
All is not lost!

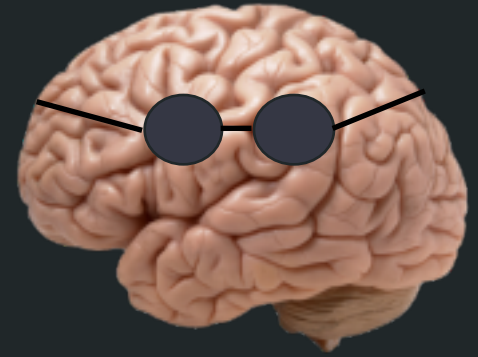


The Aging Brain



- Forgets details
- “...in middle age...from 40s to 60s, also get[s] more easily distracted.”
- Struggles to recall facts when neural connections weaken or go unused
- Can learn and develop!

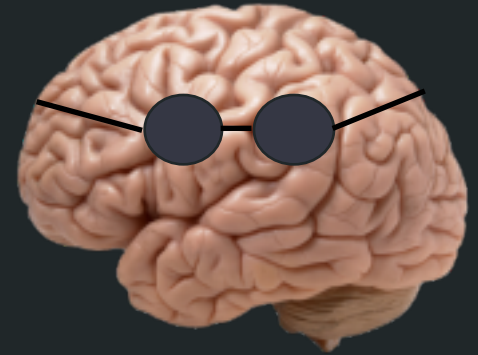
Educating the Adult Brain



- Sounds aid information recall
- If maintained, older brains can keep growing and get faster at recognizing patterns
- The brain in middle age gets better at remembering **BIG IDEAS**

Strauch, B. (2010, January 3). How to train the aging brain. *The New York Times*, p. ED10.

Educating the Adult Brain



- Focus less on facts and more on BIG IDEAS.
- Challenge assumptions from your youth (“nudge neurons”)
- Consider multiple perspectives and reflect on how your new learning is changing your point of view
- Leave your comfort zone and do things differently
- Engage in critical thinking with “disorienting dilemmas”

Strauch, B. (2010, January 3). How to train the aging brain. *The New York Times*, p. ED10.

How are you addressing your needs as an adult learner?

An **adult learner** (North America) or mature **learner** (UK) (sometimes also called **adult** student, returning **adult**, **adult** returner, and student) is a person who is 25 years and up who is involved in forms of learning.

[Adult learner - Wikipedia](https://en.wikipedia.org/wiki/Adult_learner)

https://en.wikipedia.org/wiki/Adult_learner

Assumptions about Adult Learners

As people mature, they become more self-directed in their learning

Adults have knowledge and experiences that can be used as resources for learning

Adults want learning that can address their immediate needs

Adults become intrinsically motivated when learning addresses their needs

Adults want learning that is more problem-centered versus subject-centered

Adults want to be involved in the planning and assessing of their own learning

The TRU Math Conversation Guide: A Tool for Teacher Learning and Growth¹

Our experience as teachers, coaches, and researchers has been that our most meaningful learning occurs when we interact with others, developing and sustaining relationships that simultaneously challenge and support us. These relationships

- push us to expand our vision of teaching and learning
- offer perspectives on our work that differ from our own
- respect our intelligence, skill, and intentions—as well as our need to continually grow
- help us to alter our practice but also to deepen our understanding of the complex work we are undertaking

GET STARTED!

What is the problem you want to address with your learning?

- Start from your strengths

Which dimension(s) apply to your learning?

What questions for reflection can initiate conversations?

Who will help you in your learning and research?

The Mathematics

Cognitive Demand

Equitable Access to Content

Agency, Ownership, and Identity

Formative Assessment

Add yourself to your phone as a contact. Share.



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Be Brain Friendly



- Focus on **BIG IDEAS**
- **Challenge assumptions**
- **Consider multiple perspectives**
- **Leave your comfort zone and do things differently**
- **Think critically** about “disorienting dilemmas”
- **Reflect** – How is new learning is changing your point of view?

Educate Yourself as an Adult

- Self-direct your learning & build your learning network.
- Plan and assess your own learning.
- Find learning that addresses your immediate needs.
- Use your knowledge and experiences as resources for learning.
- **Stimulate your brain.**

Pick a problem and discuss it.

What is the problem you want to address with your learning? Start with your strengths if necessary.

Which dimension(s) apply to your learning?

What questions for reflection can initiate conversations?

Network

Who will help you in your learning and research?