



The Math Forum @ Drexel

20 Years of Building Online Community to Change Practices, Change Mathematics Education, and Change Lives

“I felt valued for what I could do but at the same time felt the expectation that I should progress... I wasn't left alone to progress but ... I was expected to have the active role.”

– Suzanne Alejandre, Director of Professional Development at the Math Forum

Feeling Valued

The Math Forum @ Drexel launched on June 15, 1992. At the time, it was known as the Geometry Forum, and based out of Swarthmore College. In 1992, being a member of an online community meant using technology like email, newsgroups, and Telnet. But it also meant participating in an entirely new experience. Ethnographers and education researchers were eager to study the Math Forum to help them think about the benefits of virtual communities for teachers and learners. Here are some things they noticed:

- In online communities, roles evolve as people learn, explore, or try new identities.
- The community's values can support learning and growth: values like responsiveness, teamwork, and resourcefulness.
- Online communities have multiple entry points: you can lurk, contribute a little, or change the game completely.

From the beginning, Math Forum staff members have set the tone that every individual on the Math Forum site, whether elementary students, their teachers, calculus professors, or educational researchers, has a voice in the community. This commitment lets us meet learners where they are and nurture them. From introducing problem solving with the gentle questions, “What do you Notice? What do you Wonder?” to supporting teachers to take on projects that lead to new professional leadership roles, the Math Forum has fostered the development of thousands of students and teachers to find their mathematical voice.

Serious Math

One of the first community requests of the Math Forum was to publish problems online that went beyond practice problems – to create regular challenges that would really stretch students' brains. Doing serious math, and doing it well, has always been at the heart of what we do. Our professional development courses, developed by professional mathematicians and math educators, support teachers to learn the big ideas of mathematics, while our Problems of the Week challenge students at all levels to think hard and explain and justify their thinking.

“The Math Forum... has produced... real improvements in the quality of mathematics in the classroom.”

– Hyman Bass, Past President, American Mathematical Society

“...it’s been empowering to stand back and think about the “why” of it all. This will shape the way that I teach - setting the background knowledge and choosing problems that allow kids to discover the concepts and resulting strategies.”

*– Mary Taylor,
3rd-grade teacher*

“We are not done noticing and wondering yet!”

– a group of 7th grade students in North Philadelphia telling Steve Weimar, Director of the Math Forum, to wait before thinking about possible solution approaches.

“My students have turned into ‘thinkers.’”

–Barbara Delaney, middle-school teacher

From 1992 – 2001, Math Forum staff wrote back to every student who attempted to solve one of our Problems of the Week. This created an amazing archive of student work, and a library of the mentors’ responses that helped the students learn. Through studying the archive, we’ve learned a lot about the conditions in which students learn how to solve interesting problems, and to learn math through solving problems. We’ve also helped teachers use this community resource to practice learning the skills of creating problem-solving conditions in their classrooms. Some of these conditions for learning include:

- When students reflect on their work and revise, their learning skyrockets. They can’t just focus on getting answers; we need to support them to think about their own thinking and learn from the problem-solving process.
- The problem-solving process and mathematical practices need to be an explicit part of the curriculum. Too many students fail to learn math because they don’t have strategies to connect their thoughts to the answers being presented and aren’t armed with tools to solve interesting problems.
- The “Math Wars” have it wrong: there is no dichotomy between focusing on concepts and focusing on procedures. Students who are successful problem solvers have big picture *concepts* that they use to launch and check their understanding; they have lots of *methods* in their toolkit to apply and explore concepts, and they recognize patterns and repeated steps to develop generalizations and *procedures* to solve similar problems fluently. We help teachers learn to recognize and support students on all of these levels.

Problem Solving: Beyond “Key Words”

One of the biggest challenges facing teachers of problem solving is helping students get started understanding the problem. The Math Forum’s focus is on students making sense of math. Too many problem-solving curricula (or the strategy posters that serve as too many schools’ only problem-solving curriculum) instruct students to highlight key words. Not only can key words be misleading (does “all together” always mean add? What about “Ria has 12 dozen eggs. How many eggs does she have altogether?”), but students who are struggling don’t know what the key words will be.

Math Forum staff member Annie Fetter distilled our approach to supporting problem solving into the pithy questions: “What do you Notice? What do you Wonder?” The first time she used these questions, it was with “the lowest class” of 8th graders at a struggling school. The list of noticings and wonderings they generated astonished their teacher. These students had mathematical ideas, and when Annie asked them to act like mathematicians (noticing lots of mathematical details and making conjectures) and valued what they had to say, they rose to the occasion. Annie assigned them the optional task of solving the problem for homework, and more students did their homework that night than in the history of the class.

Pressing Pause: Using Online Communication for Learning

A question people have of the Math Forum is often, “wouldn’t it be easier and faster to work with teachers and students face-to-face?” While face-to-face communication can be faster and has different qualities than online communication, we really value the opportunity to communicate online. From pausing teacher-student interactions to study and practice specific questioning skills in online professional development, to supporting students’ mathematical writing and revising skills in authentic contexts, to creating permanent archives of student learning for personal and public display, the online written environment is a powerful learning tool for mathematics.

We have come to treasure the way that brush strokes evident in a finished canvas allow us to trace the hand of the artist in their work. If we are to fully value learning as a process and inculcate students with an appreciation of that process, then we must find ways to capture thinking in the moment and render it visible and permanent for the benefit of all.

“It is very interesting to see what kids ask [of Dr. Math]... we assume they think in certain ways and their questions reveal quite a different story.

Who would expect primary students to wonder who made up zero, or who invented the plus sign!”

– Vasha Rosenblum, a Presidential Awardee in Elementary Math

Why $2 > 4$ (and Asking is Better Than Telling)

Around the Math Forum, we often say “2 is greater than 4,” but don’t worry, it’s not new math. What we mean is that *listening to peoples’ ideas is more powerful than listening for the right answer*. The key behind every Math Forum service is to ask questions and listen to the answers we hear. And then make those questions and answers available to the public. This is what sets a resource like Ask Dr. Math[®] apart from sites like Khan Academy or Purple Math. Our volunteer Problems of the Week (PoW) Mentors, our Math Doctors, and our Teacher2Teacher Associates all learn to respond to community members’ questions with a mix of expertise, honest reflection, and questions to stimulate more thinking. When you write to Dr. Math, a volunteer writes back with an explanation that honors your question, provides some insight with real-world analogies or illustrations, and also asks you to think, reflect, and write back. PoW mentors never tell students how to solve problems, they ask questions to learn more about the student’s thinking and help the student reflect and revise.

We believe that building an online community for math education really does have the power to change lives, by changing how we view math and math education. When every teacher and every student knows they have something to contribute mathematically, when everyone knows there is a place where their voice can be heard, when everyone knows that math has an entry point for everyone and can proceed in infinitely many directions, the world will be a better place. The Math Forum has been supporting individuals to make those changes for 20 years, from 1992 when we logged on to slow dial-up connections through our land lines, to 2012 when we can Tweet our math ideas from our phones while we ride the bus, and hopefully ’til 2032 when we are communicating through tiny chips embedded in our glasses, clothes, and other ways we haven’t even imagined!

The Math Forum @ Drexel

3210 Cherry St.
Philadelphia PA, 19104

Telephone: 800-756-7823

Fax: 215-895-2964

Email: contact@mathforum.org

Twitter: [@themathforum](https://twitter.com/themathforum)

<http://mathforum.org>