

Math Teachers' Circles Connect Mathematicians with Middle School Teachers

Brian Conrey, Brianna Donaldson, and Tatiana Shubin

Math circles for students are by now a well-established phenomenon. Many MAA FOCUS readers have participated in them as leaders. Others of us have encountered former math circle students or are former math circle students ourselves. And all of us who have become acquainted with this lively, interactive forum for dialogue between young students and mathematicians can attest to its benefits.

A math teacher and assistant principal at Miller Middle School in Cupertino, California, Mary Fay-Zenk, went even further. She used to attend math circles with her students. She loved the math, but hated being relegated to the sidelines. "They have a rule that adults are not allowed to participate," she explained. "This was very frustrating because it was so interesting! I decided that we needed something like this for teachers."

To pursue her idea of a math circle for teachers, Fay-Zenk teamed up with local mathematicians Tatiana Shubin, Tom Davis, Joshua Zucker, and Sam Vandervelde, all of whom had been involved in organizing math circles for students. The group put together a plan and came to the American Institute of Mathematics (AIM), based in Palo Alto, California, with



The participants of the first Math Teachers' Circle at AIM, Summer 2006.

their vision. AIM Executive Director Brian Conrey and Director of Programming David Farmer were enthusiastic about the idea of a math circle for teachers, having worked with Shubin and her colleagues since 1998 when they all helped found the still-active San Jose Math Circle for students. In the summer of 2006 AIM hosted a five-day residential immersion program for local middle school math teachers. The organizers knew they were on to something when they observed teachers becoming so engrossed that they kept doing math into the late hours of each evening. This immersion program was the beginning of the first Math Teachers' Circle (MTC).

The success of the original MTC prompted AIM to expand the Math Teachers' Circle Program across the country. The national Math Teachers' Circle Program has two primary goals. The first is to engage middle school math teachers in mathematical problem solving and to involve them in an ongoing dialogue about math with students, colleagues, and professional mathematicians. In addition, the program also seeks to provide guidance, materials, and resources to middle school math teachers that will enable them to promote open-ended problem solving as a way of learning, thinking about, and practicing mathematics in their classrooms.



Brian Conrey, surrounded by MTC participants.

The life cycle of each local MTC starts with a residential five-day summer workshop, during which teachers are immersed in doing problem solving. This phase of a MTC serves to foster a culture of problem solving and establish a cohesive network among the teachers and the mathematician facilitators. During the subsequent school year, teachers who attended the residential immersion workshop continue to attend monthly meetings of the circle. A typical three-hour evening meeting includes an interactive math session followed by an informal period when participants discuss their classroom practices and concerns. At the end of the academic year, those teachers who have attended the summer workshop and most of the monthly meetings receive professional development, continuing education, or college credit. Most groups continue to meet in subsequent years with the same or additional teachers.



Mary Fay-Zenk working with teachers.

The Math Teachers' Circle Program focuses on math enrichment for teachers, but it is hoped that this, in turn, will result in better middle school math education for students as well. After all, the program has a profound effect on the kind of mathematics that these teachers present in their classrooms, and each teacher will reach thousands of students during the course of his or her career. One teacher participant in the original MTC wrote, "I truly believe in the joy of math and problem solving and the importance of comfort in risk-taking. The Math Teachers' Circle provided me with content and professional and peer support to further promote this teaching philosophy."

Overall, MTCs share many features with math circles for students, such as participant-centered, open-ended problem-solving sessions led by mathematicians. Yet there are important differences between running a math circle for students versus one for teachers. As adults who are expected to have expertise in math, teachers often initially feel vulnerable about being in a situation where they don't know all the answers, and so it is important to direct extra effort toward making them feel comfortable with the circle environment. As professionals, teachers also like thinking about how to incorporate what they're learning into their teaching, and so MTC sessions often include discussions of the pedagogical aspects of presenting open-ended problems.

To help spread MTCs around the country and to inform groups about some of the specific issues surrounding running a circle for teachers, Shubin, Davis, Zucker, and Matthias Beck have worked with AIM to organize three "How to Run a Math Teachers' Circle" workshops designed for teams

of middle school math teachers, school administrators, and research mathematicians who are interested in starting MTCs of their own. These local MTC chapters are intended to become self-sustaining over the long term. Thus, much of the workshop is spent preparing each team to set goals for their own incipient MTC, to discuss the recruitment of teachers and mathematicians, the evaluation of their program, and fundraising at the local or state level. Former workshop participants and circle leaders such as Steven Dunbar, Elgin Johnston, Harold Reiter, and Philip Yasskin have all become involved in efforts to help spread the program, as has James Tanton, the current chair of the new Special Interest Group of the MAA on Math Circles for Students and Teachers (SIGMAA on Circles). There are now a total of 19 existing or planned MTCs in 17 states. One of these 19 is the original MTC, which is well into its third year of monthly meetings at AIM. In the words of one participant, "I hope it will continue for a long time."

For more information about the Math Teachers' Circle Program, please visit <http://www.mathteacherscircle.org/> or email circles@aimath.org. Applications for the Summer 2009 "How to Run a Math Teachers' Circle" workshops are available on the web site. 🍎

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