

THE TEACHERS' CIRCLE

organized by

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Workshop Summary

As stated at our web site, the aim of The Teacher's Circle is to equip educators with an effective problem solving approach to teaching mathematics. This style of learning is based on the math circle environment that has proven to be successful for students around the world. Therefore The Teachers Circle will immerse a group of middle school math teachers in engaging mathematics and expose them to a dynamic style of classroom presentation. Participants will come away with a variety of resources, lesson modules, and a renewed sense of appreciation for the fascinating world of mathematics. Teachers will also be eligible for continuing education credit, professional development units, or college course credits.

The Teacher's Circle program started with a summer workshop held at the American Institute of Mathematics (AIM) in Palo Alto, CA during the week of August 14–18, 2006. At the workshop, there were more than 20 local middle school mathematics teachers and administrators. There were also four outside observers, three of whom were professional mathematicians from St. Louis, Chicago, and Charlotte.

The daily Monday to Thursday curriculum included six hours of interactive talks delivered by five instructors, and a less formal one-hour evening session. In addition, there were two hours of instruction on Friday. Topics covered during the week included an introduction to problem solving, number theory, geometry, tiling, the Euler characteristic, the fourth dimension, symmetry and visualizing algebra, and probability.

One of our goals was to demonstrate that problem solving is an effective mechanism for learning, since we believe that it provides the strongest motivation for studying mathematics. We also wanted to free teachers from the fear of tackling difficult problems. Failing to solve a problem in a very short time is a positive rather than negative thing. By thinking hard about a problem for a long time students learn material at a deeper level. The more often this occurs the better they are able to absorb new and more complicated concepts both inside and outside of mathematics.

This notion seems to have been successfully conveyed. One of the participants stated, "I hope to introduce many of the problems I learned during the week to get my students to think more deeply about a problem rather than just calculating an answer." Another wrote, "I will focus more on problem solving and strive to keep it ever present in my classes. I am more willing to pose challenging problems, even if they may be 'too' challenging, and share strategies with children. I will emphasize process as much as outcome." All of the participating teachers replied in the affirmative to the question "Do you anticipate changing the way you teach middle school mathematics in the upcoming year?" The various changes that they proposed included giving more open-ended problems to their students, providing more group problem solving time, replacing repeated drills with a good problem that requires patience, and illustrating different methods for approaching math problems.

A recurring theme in teachers' responses was that of collaborative learning. Teachers appreciated the collaboration that they experienced at the workshop and how this teamwork enhanced their own learning. They perceived this as the true essence of a math circle, and they are ready to implement more collaboration in their classrooms. Some of their responses were, "I will allow more thinking and collaboration time," and, "I hope that I will be able to integrate more 'student circle' opportunities for kids to be talking to each other while tackling problems."

Teachers also pointed out the positive effect of experiencing different teaching styles. They admitted that even though the instructors were fast-paced and covered many topics (so that teachers may have been lost at times), this in itself was a valuable experience for them. One teacher wrote, "Some of the problem solving was way over my head. Even so, I learned—if only to understand what my students experience when lost or overwhelmed." Another said, "Some of the topics required us to struggle, but it was a good reminder of how our students might feel, so even that had value."

Mathematics is often taught at school as an unrelated collection of facts. At the workshop, teachers were able to see a more coherent picture. We hope that they will begin revealing this interconnectedness of ideas and underlying mathematical structure to their students. In their final evaluations, teachers said that they would begin "discussing a given topic from as many angles as possible."

Among the aspects of the workshop that participants found to be particularly valuable they listed the following: the variety of educators present (middle school teachers, college professors, etc.), the opportunity to work with other teachers that allowed them to weigh and solidify ideas, the time to explore and work on mathematics with a partner or small group, the developing network of teachers with whom they are now able to share ideas, the discovery of new materials and resource people, and the compatibility of 'hard' mathematics with the middle school curriculum.

The workshop clearly showed that one of the greatest deficiencies in professional development for middle school teachers is the lack of solid mathematical content. All the participating teachers greatly enjoyed and valued the mathematics that was offered. It seems that the teachers are really starving for mathematics, and that math circles for teachers may help to alleviate this problem.

The summer workshop was the first component of The Teacher's Circle year-long program. An equally important component of the program consists of seven follow-up events which will occur once a month throughout the school year. Every month from September to April (except December), The Teacher's Circle will offer an evening three-hour event for middle school math teachers interested in exploring accessible, exciting topics in mathematics and learning about a problem solving approach to teaching math. Participants in The Teacher's Circle program who attended the summer workshop and who attend at least six of these evening sessions will be eligible for course credit through San Jose State University.