FEATURED CIRCLE

Hitting New Heights in Hawai'i

by Brianna Donaldson

The thriving Math Teachers' Circle of Hawai'i (MaTCH), founded in 2011, draws on the talents of teachers, faculty, and graduate students to organically integrate mathematics, teaching, research, and technology.

Part of the secret to MaTCH's success seems to be that co-founders Michelle Manes (Associate Professor of Mathematics, University of Hawai'i), Linda Venenciano (Assistant Professor of Education, University of Hawai'i), and Seanyelle Yagi (Formative Instruction Resource Teacher, Hawai'i Department of Education) have a penchant for approaching challenges as opportunities. Take their group's size, for example. MaTCH has consistently had high participation, but interest spiked this year, when a well-known State Department of Education math coordinator, Dewey Gottlieb, advertised it as a way to earn professional development credits. In searching for a room large enough to accommodate more than 40 people, the leaders wound up reserving a high-tech collaborative classroom.The new surroundings have invited experimentation. For example, Venenciano said, "During one session, we were modeling bee populations using rice scattered on paper. You don't really want to walk that up to the doc cam. The session leader snapped photos on her iPad of what each table was doing and was then able to share the photos with everyone by projecting back to monitors at the tables."

Using Technology to Overcome Geography

Another challenge-turned-opportunity has been the geography of the group's home state, with a population distributed across numerous islands. For the first two years of MaTCH, teachers from neighboring islands would fly in for MaTCH meetings, funded by the broader impacts portion of Manes's NSF research grant, and would spend their whole day in transit or at the four-hour meeting. According to Manes, they started asking themselves, "How can we serve teachers on neighboring islands in a way that doesn't require lots of ongoing funding and travel, for either participants or facilitators?"

With the support of an Elementary and Secondary Education Act, Title IIA grant, they brought in two consultants from the Education Development Center (EDC) to train the MaTCH team and two teachers from the neighboring island of Moloka'i on how to use Google Hangouts to involve remote participants. At the next MaTCH meeting, three teachers from Moloka'i "hung out" with 40 of their colleagues in Oahu at an "e-table" that was mixed in with the rest of the tables in the room. EDC consultant Bowen Kerins, who also consults for TV game shows, led a session in which participants analyzed the mathematics behind Price is Right games. Throughout his session, Kerins also demonstrated strategies for integrating remote participants into the "live action." Manes explained, "He had some interesting ways of keeping us on an even footing. For example, he had one remote person be a contestant while he was host. Also, every 15 minutes or so, he would have us write something on a check-in spreadsheet in Google Docs and send a picture of what we were doing to a Flickr account. This was a chance for us to reflect on where we were in our work, and it also let him select what to focus on next. He would pick out a few pictures and ask the person who took them to describe what they were doing."

The leaders look forward to incorporating more remote participants into future meetings. "We haven't figured out yet exactly where this is going, but originally we thought of having an e-table for each of the neighboring islands—Kaua'i, Maui, Moloka'i, and the Big Island of Hawai'i—plus the tables for participants in the room," said Manes.

Vertical Integration for a K-20 Community

From its inception, MaTCH has included elementary, middle, and high school teachers. There are challenges inherent in such a mix, but also benefits. According to Manes, herself a former elementary teacher, "We have gotten feedback from some elementary teachers that they would like to see a MTC for elementary teachers only, but a real positive about the range of backgrounds is that it gives them more of a chance to stretch. There's a real value for everyone to seeing lots of approaches. The high school teachers tend to jump right to formulas. It's good for them to see that there are other types of solutions."

MaTCH has also capitalized on opportunities to involve graduate and undergraduate students. For instance, the Department of Mathematics at the University of Hawai'i at Manoa has a GK-12 grant from the National Science Foundation that supports mathematics graduate fellows in partnering with local schools. From its inception, MaTCH was conceived as a way that these graduate students could continue their work with local teachers. Manes has worked with several GK-12 fellows over the past three years to coach them through the process of leading a math session for MaTCH teachers.

Venenciano works with both undergraduate and graduate students in the university's teacher training program. She requires all her students to attend at least one MaTCH session so that they can interact with the teachers, who will in many cases be their future colleagues, and also so they can see a different style of teaching than they may have been exposed to as younger students. In addition, education graduate assistants have helped with handling logistics as well as various aspects of data collection for MaTCH.

As the project has grown, Manes and Venenciano have included their mathematician and mathematics educator colleagues in MaTCH activities. Interactions among these faculty and MaTCH teachers have led MaTCH teachers to participate in other mathematics professional development activities, such as Monte Carlo Night and the Ethnomathematics and STEM Institute at the University of Hawai'i's West Oahu campus.

All photos courtesy of MaTCH

From top: In a session activity, grains of rice provide a simulated depiction of a population of bees for counting. Teachers generate data by simulating football plays in an investigation of functions. MaTCH participants learn about the context for a modeling problem.

Integrating Research with Education

Mathematically, MaTCH sessions often tie in with active research areas in some way. For instance, Manes led a session focused on this problem: "9 can be represented as a sum of consecutive counting numbers (4+5); so can 10 (1+2+3+4). Which numbers can and can't be represented this way?" She planned to conclude the session with a short introduction to the Goldbach conjecture (every even number greater than 2 can be expressed as the sum of two primes).

Connections with other disciplines have also formed the basis of some unusual and rewarding sessions. For example, Manes met Alexis Rudd, a graduate student from the zoology department, through the Graduate Women in Science program. "She kept emailing me about math that was coming up in her research in bioacoustics. She drags a microphone behind a boat and tries to determine the location of whales based on the data she gets. She finally told me, 'It all comes down to the distance formula! Why didn't they tell me in school that you could use the distance formula to find whales?' " Together, Manes and Rudd developed a session based on Rudd's research. "She started out by giving a short presentation about her work, then we basically gave people a bunch of data and said, 'Here's the data that Alexis received from her microphone. Where's the whale?' "

Another favorite session involved ethnomathematics, which can be described as the intersection of mathematics with a social, cultural, and historical context. "We had a crew from a traditional Polynesian canoe come in, and one of the guys was apprenticing to become a navigator," said Manes. "He taught us about traditional navigation, and we built a star compass!"

Developing Teacher Leaders

The first 2.5 hours of MaTCH meetings are devoted to working on mathematics, and then the group shifts gears to focus on teaching for the last 1.5 hours. The group's pedagogical discussions have evolved over time to meet the changing needs of the teachers. For example, during the group's second year, the discussions emphasized links with the Common Core, particularly the Standards for Mathematical Practice. This year, the MaTCH leaders used the pedagogical time for teachers to share their own classroom experiences related to their participation in MaTCH. Again, this was a case of taking advantage of a potential challenge. Manes explained, "Many of the teachers get professional development course credits through the Hawai'i Department of Education. If they repeat any course, including MaTCH, for credit, they have to do something new the next time."

Left: A group on a neighboring island shares via Google Hangouts during a class discussion. Right: In a MaTCH activity, teachers step into the shoes of students.

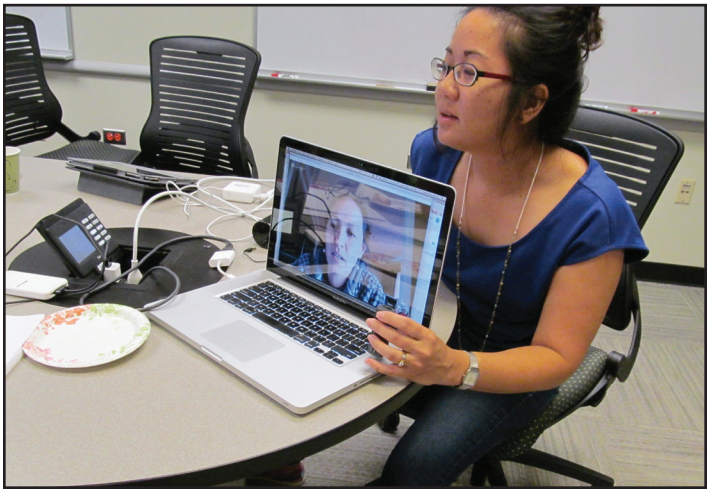
Teachers in their first year of MaTCH participation are asked to develop a portfolio that includes reflections and samples of their mathematical work from each session they attend, as well as several lesson plans reflecting mathematical content or new approaches that they have learned. By their third year, teachers are required to give a presentation either to MaTCH or at a state-level conference. For example, one elementary teacher received funding through MaTCH to attend a workshop on manipulatives, and he then presented to the group about what he had learned. A high school teacher did a presentation on modeling activities that he characterized as "Dan Meyer-style activities if you're technologically incompetent." He introduced Meyer's version of the activities and talked about some low-tech adaptations that he used in his own classroom. Manes said, "All the teachers were nervous before doing these presentations, but they came off so well. I really feel that this aspect of the program has helped us develop a cohort of math leaders, some of whom I think will continue on to become more involved at the state level."

The Future of MaTCH

Administrators at the University of Hawai'i have met the achievements of MaTCH with enthusiasm. According to Kathleen Berg, Director of the Curriculum Research & Development Group in the University of Hawai'i's College of Education, "Each time I talk with Dr. Venenciano about her Circle work, her excitement is evident and contagious. It is inspiring to hear about the Saturday gatherings of the mathematicians, educators, and mathematics educators who together solve mathematics problems and further their content knowledge and problem solving experience to make them better teachers. What better way is there to spend time, I say, as a former math teacher myself?"

While thrilled with the level of interest that MaTCH has generated, the leaders admit that it would sometimes be nice to work with a smaller group. They have begun exploring the possibility of helping start another branch of MaTCH with interested faculty from another campus of the University of Hawai'i that is also located on the island of Oahu. The two MaTCH locations could either serve participants based on geography, or perhaps they would split up according to grade levels taught by the participants.

Despite all the hard work involved in developing MaTCH, "It's been a great few years!" said Venenciano. With all the challenges and opportunities on the horizon, MaTCH is on course for many more.



All photos courtesy of MaTCH

Left: A team of teachers uses colored tiles to study patterns. Right: In one of the first Google Hangouts attempts, a teacher from neighboring island participates in a session.