Math gets hands on with MAPPS

When University of Wisconsin-Stevens Point Associate Professor of Mathematics **Andrea Knapp** observes parent-child interaction surrounding math at the grade school level, too often the tone is defeating and self-fulfilling. "A parent might tell their kid, 'I was bad at math, don't worry about math.'" Knapp says. "We're trying to break that cycle, so parents see math is cool, math is valuable. When children see their parents placing value on mathematics, they do."

Central to Knapp's cycle-breaking efforts is the **Math and Parent Partners Program**. MAPPS takes a new approach to math learning by promoting reasoning before procedures and giving parents the tools to continue the dialogue at home.

Knapp first learned about MAPPS at the University of Georgia's Griffin campus, where the continuing education office was looking to implement a math-based outreach program for parents. Knapp investigated, ensured MAPPS was consistent with the National Council of Teachers of Mathematics, and was soon running the program.

From 2008-11, Knapp and her team implemented eight mini-courses, inviting children, parents, administrators, teachers, and para-professionals. The result was an increase in test scores, and improvements in the way parents and their children interacted around math.

"Before, a parent might tell the child, 'You will do it my way, this is how it's done,' and the kid is saying, 'But my teacher doesn't do it that way.'" Knapp says. "We taught them how to work together. Instead of a parent telling their child to go do their homework and come out when it's done, we taught them that interaction around mathematics was very important and motivational for the children."

Knapp moved to UW-Stevens Point in 2010, laden with data cultivated from the Georgia program, and spent her first three years analyzing and writing about the findings. In the spring of 2014, she implemented MAPPS in Stevens Point, beginning with McDill Elementary School. UW-Stevens Point math lecturer **Ann Kiefer** had a relationship with McDill principal **Jeanne Koepke**, who was excited to begin the program at her school.

The program targets students in fourth through eighth grades, with

younger children participating in math-based activities in a nearby room. Sessions run from 5:30-7:30 p.m., and dinner is served to remove that burden from participating families. Cost is $5 per individual, $12 per family.

The eight-week program started in February at the Dreyfus University Center. Approximately 75 participants attended at least once, and around 50 came on a regular basis – roughly 25 children, 15 parents and 10 teachers/volunteers.

Sessions show participants a way to learn math that, instead of starting by teaching a procedure, moves students from concrete hands-on activities to pictorial activities to the abstract. "Instead of starting out with adding 35 plus 86 – 'Here's a procedure' – if you can get them some blocks representing those numbers and help them put together the tens and the ones, that moves them to understanding," Knapp says. "When they get to the procedure it's faster for them to understand it and they have fewer errors once they get to the testing situation.

"We don't ask them to understand procedures without reasoning behind it. It's important to get to a procedure, but you don't start with an algorithm or a procedure that makes no sense. You want them to reason about it, have something hands-on they can play with, pull apart, put together."

MAPPS demonstrates this new approach to math with hands-on tools like tangrams and base 10 blocks parents can use with their children at home. Knapp acknowledges that critics assert that standardized testing doesn't include manipulatives, so they shouldn't be used, but says manipulatives help students make sense of concepts and reduce the frequency – and size – of errors in a test setting. It is definitely not watered-down mathematics.

"We still want the math to be rigorous, but we want to get there through the path of understanding and enjoyment instead of math anxiety," Knapp says. "Kids seem to hate math, hate fractions. Why is that? We have twelfth graders who can't do fractions because we pushed them through in second grade, gave them an algorithm, made them swallow it. They didn't understand it, they decided they hated it. That's not right. Math is exciting, it's cool!"

Research findings suggest MAPPS is succeeding in changing attitudes about learning. Knapp says children who participate in the program are not just more engaged at home but more motivated to learn at school, and more likely to explain their reasoning and help others. "It's an environment that impacts student achievement, maybe not for tomorrow, but for the next year and the next year and the next year," Knapp says.

Assisting Knapp with MAPPS at the university have been Kiefer, who led the first Stevens Point sessions; **Julie Hellweg**, continuing education program manager; **Senfeng Liang**, assisting with grant writing; math professor **Nate Wetzel**, assisting with data analysis from the 2008-11 study; and CIS professor **Tim Krause**, assisting with accompanying online games.

This fall, the MAPPS program expands from McDill to Stevens Point's Madison Elementary School, and Knapp is hoping to increase participation to 120. That is just the start. The UW-Stevens Point Office of Continuing Education provides the infrastructure and logistical support to bring the program to a larger community. Knapp says the goal is to implement MAPPS not just in Central Wisconsin, but nationwide, through both face-to-face courses and massive open online courses.

"We have a vision to expand MAPPS for the benefit of families and education," she says. "There is a dearth of parental involvement in mathematics in this country. Parents have been shut out of the classroom in terms of mathematics and we need to change that, because children are motivated when their parents are successful and care about mathematics. We really believe we can make a difference."

For more information about MAPPS, visit www.uwsp.edu/conted/confwrkshp/pages/mapps.aspx.

(Above) UW-Stevens Point Associate Professor of Mathematics Andrea Knapp and daughter Claira, 7, work with a tangram. (Opposite page) Math lecturer Ann Kiefer led the initial MAPPS sessions at UW-Stevens Point.