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Bryn Mawr undergrads test robotics approach with a younger crowd of students

In the summer of 2006, Bryn Mawr computer-science professors Doug Blank and Deepak Kumar and colleagues at Georgia Tech formed the Institute for Personal Robots in Education and designed an innovative introductory computer-science course featuring tiny "Scribbler" robots that were given to each student in the class to help bring the course's concepts to life.

The course has been such a hit since its introduction that a few of Blank and Kumar's students thought that robots might also be effective in getting younger students interested in computer science.

Last May, Bryn Mawr students Mansi Gupta '10, Marwa Nur Muhammad '09, and Shikha Prashad '09, with Blank as their adviser, applied for funding through the Computer Research Association's Collaborative Research Experience for Undergraduates program to create a course that would expose middle-school students to computing in a fun way through the Scribbler robots.

"Mansi, Marwa, and Shikha did an amazing amount of work. They proposed the project, got it funded, designed the materials, and finally spent hours with the middle-school kids every week. They have established that our IPRE materials can be effective and engaging for even the smallest computer scientists," said Blank.

The Bryn Mawr students originally planned to network with local schools to find interested students, but a chance encounter at Philadelphia's Franklin Institute between Blank and Kathleen McAllister, of Broomall, Pa., and her home-schooled son Graham resulted in the recruitment of a class of home-schooled children.

"It was robotics day at the Franklin Institute and I could tell by the way Doug interacted with his own children that he knew how to interest kids in the material. We got to talking and he told me about this course they were creating and it grew from there," said McAllister.

McAllister got the word out to other area home-schoolers, and by January a class of 15 students, age seven to 13, were ready to go.

"We wanted to get students between the age of 10 and 12 mainly, but when Kathleen let the home-schooled students in the area know, some of the very interested students happened to be younger," said the Bryn Mawr students who developed the course.

"Instead of not allowing the younger, enthusiastic students to take the class, we tried to modify the course documents and lectures so that they, too, could be part of it. It all worked out great," they added.

The Bryn Mawr student researchers were hoping to get a close to equal representation of boys and girls to test whether the Scribblers would have greater appeal for either sex. Unfortunately, they weren't able to answer this question, as only two girls ended up participating in the class.

During class the students would work on creating programs that would allow their Scribblers to draw geometric designs, do choreographed dances, navigate mazes, and even play music.

"The only trouble the young student group had was their typing ability," said McAllister as she watched her son work at a computer on the last day of class.

"They love it," said Nancy Gauntlett, whose eight-year-old twins Gregory and Daniel attended the class. "I've been surprised at how much they've learned and can do at their age. Now they want to turn their Legos into robots."

On the last day of class 12-year-old Stephen Quick and Benjamin Litwack, 13, were trying to program their robots to make their way through an elaborate maze that the instructors had created in the IPRE lab.

"I've done some programming in a different language, but this was interesting because you can instantly see if what you've done works," Litwack said as he placed his Scribbler in the maze.

Gupta, Muhammad, and Prashad say they've received a very positive response from both the parents and the students enrolled in the course and plan to offer it again next semester, when they hope to recruit more girls by reaching out to both home-schooled and traditional students from area schools.

Teacher to mother to daughter and back: a Bryn Mawr mathematical genealogy

When Annalisa Crannell '86 learned that she had been selected to receive the Mathematics Association of America's Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics, she knew that one of her Bryn Mawr mentors would have a special interest in the news: Professor of Mathematics Rhonda Hughes had won the same award a decade earlier.

Luckily, Crannell had a handy conduit for communication with the Bryn Mawr Department of Mathematics. Her daughter, Iolanthe Good, was a first-year student at Bryn Mawr who was enrolled in Hughes' Calculus/Analytic Geometry II course. She started college last fall firmly committed to majoring in classics, but now she's wavering: although she still loves her Latin and Greek, math is proving much more exciting than she imagined it would be.

Family resemblance is apparently more than skin deep. Crannell, who is now a professor of mathematics at Franklin and Marshall College, arrived at Bryn Mawr determined to study foreign languages. The daughter of two physicists, she displayed linguistic aptitude that was unique in her family circle, whereas a head for numbers was relatively unremarkable in that setting. Although she had excellent instruction in high school, math hadn't really spoken to her yet.

"The kind of math you learn in high school isn't the math you do when you really *do* math," Crannell says. "It was at Bryn Mawr that I fell in love with math."

In fact, the story of a budding humanist or social scientist seduced by the ineffable splendor of multivariable calculus, partial differential equations, or topology is not an unusual one at Bryn Mawr. Typically, about eight percent of the bachelor's degrees the College awards each year are in mathematics—a figure that dwarfs the national average of about one percent.

It's no surprise, then, that a Bryn Mawr math professor would win a national teaching award or that her student would carry on that tradition.

The Haimo award is given annually to three "college or university teachers who have been widely recognized as extraordinarily successful and whose teaching effectiveness has been shown to have had influence beyond their own institutions."

Hughes is the co-founder, together with Sylvia Bozeman of Spelman College, of EDGE (Enhancing Diversity in Graduate Education). EDGE is a nationwide program designed to encourage women, especially women from underrepresented groups, to complete graduate programs in mathematics, where retention rates for those populations are typically very low.

Since the program's inception in 1998, 105 students have attended the summer workshops that constitute its core program. Fourteen have completed Ph.D.s, less than 10 percent of them have left graduate school with no degree at all, and many of the rest are well on their way to the Ph.D. finish line. The National Science Foundation has recently awarded Bryn Mawr and Spelman Colleges a \$1.1 million grant to fund four more years of EDGE.

Crannell, who has taught at Franklin and Marshall since she earned her Ph.D. from Brown University in 1992, is a nationally recognized advocate of writing in postsecondary mathematics curricula and the author of *Writing Projects for Mathematics Courses: Crushed Clowns, Cars & Coffee to Go*; her classroom writing materials have been used in more than 100 college and high-school classrooms throughout the country. With funding from the National Science Foundation, she and a colleague have developed a series of workshops on the connections between mathematics and art for practitioners and teachers of both disciplines.

Hughes and Crannell are both active researchers as well, Hughes in functional analysis and Crannell in topological dynamics.

As Crannell sees it, simply making the decision to go to Bryn Mawr helped open her mind to possibilities—like a career as a mathematician—that she might otherwise have overlooked.

"The very fact of deciding that you are going to a women's college already rejects a popular mindset and sets you apart from your peers. You think, 'I'm different. I'm going to be at this college with a bunch of brilliant women, and I'm going to do something extraordinary.' That first decision to separate yourself from the herd really helps you reframe the way you think about yourself."

Despite her devotion to her alma mater, Crannell says she didn't do a lot of hard campaigning on Bryn Mawr's behalf when her daughter was deciding where to go to school.

"She said the same thing to me that I'd said to my dad: 'The one thing I know is that I don't want to go to a women's college.' I said, 'Okay, that's fine, but you might want to take a peek at BMC because it's really good.' Then she visited the campus and loved it, and after that every school she considered was compared to Bryn Mawr and found wanting."

Good's version of the story corroborates Crannell's. "I came to Bryn Mawr for prospectives' weekend. It poured rain and I was sloshing through the mud, getting soaked and still thinking, 'This place is so beautiful.'"

She visited a Latin class, met a Greek teacher, and marveled at the conversations going on around her: "People were having these intense discussions about the most abstruse topics and I felt like I could join right in. It was really nice not to be singled out as the smart girl."

She hasn't been disappointed. "There's an aura about this place—an atmosphere of acceptance. I feel like I really belong here," she says.

For Good, the choice between classics and math is still a year away. Perhaps she'll opt for a double major.