UA Program Working to Improve Math Instruction, Learning

G-TEAMS, a project at the UA that was initiated with National Science Foundation funding, aims to improve math instruction and learning in K-12 classrooms by placing UA graduate students in schools to serve as mathematics experts.

By La Monica Everett-Haynes, University Communications
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At the same time Arizona’s high school freshman must begin taking four years of math to graduate, University of Arizona graduate students will begin serving as math specialists in area schools.

A new UA program funded at nearly $3 million for five years by a National Science Foundation grant is pairing graduate students in applied mathematics, mathematics and statistics with K-12 teachers in an effort to help improve both math instruction and learning.

The “GK-12 Graduate Students and Teachers Engaging in Mathematical Sciences,” or G-TEAMS, program serves to create a fundamental shift in instruction so that students are not just learning equations but applying the principles of mathematics to thought and practice.

“Focusing on equations is not very pleasant. It can make math feel boring or extremely mechanical, which it is not,” said Joceline Lega, a UA mathematics professor and the principal investigator for the program, which is run jointly by the UA mathematics department and the Institute for Mathematics and Education.

“Math is very creative. It’s like the construct of the mind in some ways,” Lega said. “What’s really important is to teach students this, and that’s true at all levels.”

She believes it is especially important at younger ages when students have the tendency to lose interest in the subject.

The effort at the UA, Lega said, “is part of a broader picture.”

In an age of advanced communication and more complicated social problems, modern students must be better prepared to think and problem solve in more complex and abstract ways.
Numerous national reports, including one released last year by the U.S. Department of Education, have noted that an educated workforce must have a solid grounding in math – and science, among other disciplines – to help strengthen the nation’s economy, security, global competitiveness and also the quality of life.

Of note, programs – much like G-TEAMS – at the UA and elsewhere are working to improve math instruction while boosting the number of students studying in the STEM fields: science, technology, engineering and mathematics.

At the state level, the Arizona State Board of Education approved requiring freshman to take four years of math to graduate beginning during the fall of 2009.

At the national level, the NSF initiated the GK-12 (Graduate STEM fellows in K-12 education) program 10 years ago and has since funded more than 200 projects. The agency’s Division of Graduate Education, which manages the program, has funded three other projects to initiate GK-12 programs at the UA.

**Adding “Depth” to Math Instruction**

Each year as part of the new program at the UA, 10 graduate students will aid elementary, middle school and high school teachers and their students in the Sunnyside Unified School District and Tucson Unified School District for one full academic year. Also, a teacher from Casa Grande is participating in the program.

David Kukla, a math teacher at Sabino High School, said having the additional support will help him add depth. Teachers like himself have such a limited amount of time to spend on mathematics that “students give up before they see the magic and beauty of it,” he said.

“It’s really hard to be casual about math because mathematicians are not casual and the complexities of the concepts are also not casual,” he said.

Kukla will work with UA graduate student Yuliya Gorlina, a doctoral degree candidate in the mathematics department. Gorlina initially met Kukla last year after being invited to speak about math with some of his students. The two opted to join the program together.

The program provides a $4,500 stipend for each of the participating middle and high school teachers and elementary teachers will receive $2,750.

Though the UA students won’t begin their work in the classrooms until the fall – spending, on average, 15 hours on activities – the fellows and K-12 teachers met for the first time Monday as part of the program’s week-long Summer Institute.
"We want the fellows to develop an awareness of K-12 issues and education," Lega said, adding that once students graduate they will then be able to encourage initiatives and outreach that promote education.

"The other piece is the development of communications skills because most students stay here on campus and will only talk to either their peers and their professors," she said.

Lega also said that the intention of the program is to introduce concepts to the classroom that otherwise would not be introduced.

"Hopefully the lessons will be different from what the students would normally see in their classrooms so they will get a different perspective," she said. Also, fellows will have the opportunity to interact with other teachers in varying subjects.

"Teachers don't necessarily have time to talk to one another, so the fellow can be a resource to the school to help it to be more integrated," she said.

**Keeping Curriculum Current**

But fellows are not meant to serve as student teachers, but rather as expert mathematicians who can help the K-12 educators structure curriculum, plan projects, evaluate lessons, introduce concepts about math and assess materials that can be used in the classroom.

Janet Liston, an International Baccalaureate program math teacher at Cholla Magnet High School, said she was drawn to the program because she likes to bring people into her classroom to enrich the learning experience for her students.

"It keeps me fresh and learning," said Liston, who has been teaching for 35 years. She and her fellow, she said, intend to introduce projects that will help students prepare for their math research paper, which is required as part of the International Baccalaureate program.

"Coming up with research questions and putting together a research paper are very different," Linton said. The challenge in such a project, she said, will be in helping students to think about math in ways they may not have previously learned.

Chantel Blackburn, a doctoral degree candidate in mathematics, said that as a fellow she hopes to both influence students and aid in their growth.

"I want to help cultivate mathematical thinking in students to help them with structural thinking and reasoning," said Blackburn, who has been assigned to Cholla Magnet High School.

"I feel that is really important because when you learn to think carefully and logically in life you can anticipate problems and solutions," she added.

Lega said the G-TEAMS program shows great promise for not only improving math instruction, but also in encouraging students to consider studies and jobs in STEM disciplines.

"It's not just about training graduate students, but also communicating to the public," Lega said. "Hopefully their presence in the classroom will also help the students to realize that mathematics is an option that is open to them."
William McCallum, the mathematics department head and a UA Distinguished Professor of mathematics, and Virginia Horak, an associate professor of mathematics, serve as co-principal investigators on the grant.

Joceline Lega, McCallum and Horak will each work with the graduate fellows. Mary Bouley, program facilitator for the GEAR-UP and the GK-12 program BioME programs, is also collaborating on the project and Melissa Page, a project evaluator for several UA programs, will evaluate the effectiveness of G-TEAMS.

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