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## S&T math students star in inquiry-based learning film

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### By Staff reports

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Rolla, Mo. — Movies like “A Beautiful Mind” notwithstanding, mathematics rarely gets top billing, or even a cameo appearance, in Hollywood movies. But for students in one math class at Missouri University of Science and Technology, the way they learn their subject will play a starring role for educators hoping to better understand a learning method with roots almost as old as mathematics itself.

This semester, every classroom session of Math 209, Foundations of Mathematics, is being caught on film as part of a project designed to help advance understanding of an instructional method called inquiry-based learning. The project is funded through an \$8,700 grant from the Educational Advancement Foundation, which promotes the use of inquiry-based learning, primarily in mathematics. Missouri S&T is one of only a few universities across the nation chosen for the program.

Inquiry-based learning, or IBL, is essentially a question-and-answer approach to education, says Dr. Robert Roe, professor of mathematics at Missouri S&T and the instructor for this course. The technique is based on one developed by Socrates, the ancient Greek philosopher whose question-and-answer approach – the Socratic method – dates back to around 400 BCE. Roe and other IBL advocates use a more modern style based on the work of University of Texas mathematician R.L. Moore, who used IBL to teach calculus and other subjects from the 1930s through the 1970s.

“My main job is to be a facilitator” for the 17 students enrolled in his Foundations of Mathematics class, Roe says. The students learn from each other by presenting their solutions to complex mathematical word-problems.

“I create a set of questions that the students have to work through” to develop their theorems, Roe says. From there, “It’s a student’s job to get up before the class and present the results, and it’s the other students’ job to critique the results and to ask questions.

“What we’re really trying to do,” Roe says, “is to get down to the basics of understanding the material, rather than just knowing the algorithm.”

The class is held in one of Missouri S&T’s distance-education classrooms, which is outfitted with three mounted cameras that record all classroom activity in a “very non-intrusive” manner. The campus’s Video Communications Center controls the cameras from a control room adjacent to the classroom.

The cameras capture every moment of classroom activity as students present their theorems to their classmates, who in turn attempt to poke holes in each presenter’s approach. Roe observes and occasionally intervenes with questions of his own. No esoteric mathematical formulas are involved, Roe says. “We do all of this in complete English sentences.”

A graduate student in mathematics, Reg Brigham, then reviews the video and logs the classroom activity, minute by minute. The video and logs will eventually be turned over to the Educational Advancement Foundation, a non-profit organization that supports the development of IBL approaches at all levels of education. In addition to Roe and Missouri S&T, the foundation is pursuing similar projects with mathematicians at Emory University in Atlanta and the University of Chicago, Roe says.

Roe has used IBL to teach Math 209 since 2001. He was trained in the method by Dr. Tom Ingram, the campus’s former chair of mathematics.

While the presence of cameras in the classroom took some adjustment at first for Roe and his students, it hasn’t detracted from the learning experience. “The students seem to react pretty well to the environment,” Roe says. More disconcerting for students, perhaps, is the idea of learning from each other rather than from the instructor.

“You have to let them know they can be successful in the strange new course,” Roe says.

More disconcerting for Roe, now in his 20th year of teaching mathematics at Missouri S&T, was being in a classroom absent any chalk and slate. “I was pretty apprehensive about losing my chalkboard,” he says. “We mathematicians love our chalkboards.”

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