TEACHING BACKWARDS

By Debbie Aiken '12

"But, when am I ever going to use this in real life?"

It's a question heard around the world in math classes, from students of all ages. With the help of a grant from the National Science Foundation, two Oglethorpe mathematics professors hope to begin to change that.

Dr. Lynn Gieger and Dr. John Nardo recently launched a three-year plan to redesign the curriculum for Great Ideas in Mathematics, the math component of Oglethorpe's Core program. Their grant is part of NSF's Engaging Mathematics initiative, which supports faculty members as they develop curricula that show how math is used to solve real-world local, national and global issues—and in the process, help students better understand and retain that information. At Oglethorpe, they'll do this through a method Dr. Gieger likes to call "teaching backwards."

Traditionally in mathematics courses, students first learn the basics and then build on them until they reach a point when the material they've learned can be applied to solve a problem. That is when the lessons and assignments and homework usually begin to make sense—when they are given context and see how it can all be applied to a real problem. However, with this method, some students have trouble making it to that point. That's where "teaching backwards" comes in.

"We start with an issue like false positive results on a drug test, cancer screening or pregnancy test—things that can be explained using mathematics concepts such as probability and statistics," Dr. Gieger explains. "Then we figure out what we need to know in order to understand why that happens." It gives students an everyday application of the material that they are learning up front, and provides context for the lessons they receive throughout the course. Dr. Nardo adds, "Instead of saying, 'stay with me, you'll see the point sooner or later,' this teaching method helps students keep the big picture in mind and understand how and why we are laying the foundation for future lessons."

Drs. Gieger and Nardo chose to apply their research to Great Ideas of Mathematics for several reasons, but most importantly because it's a course that every student at Oglethorpe completes, and often with difficulty. "The biggest struggle that students and faculty face with this course is that different majors are together," explains Dr. Nardo. "The math majors might not be focused on the practical applications, while non-majors, often anxious about math, might not see that it can be used to help solve problems in the real world." This "teaching backwards" approach reflects a larger overall commitment by Oglethorpe—as evidenced by the new Atlanta Laboratory for Learning—to provide an education that combines classroom theory with opportunities to apply that learning in real situations.

Similar research and curriculum development was previously conducted at Oglethorpe, also funded by NSF grants. These projects were part of the larger initiative Science Education for New Civic Engagements and Responsibilities (SENCER) and spurred courses that examined such topics as the adverse affects of traffic in Atlanta, and the effectiveness of traditional versus online homework assignments (see sidebar). While the earlier SENCER projects focused natural and physical sciences, the Engaging Mathematics initiative applies the same principles of socially relevant curriculum to mathematics courses.

While the professors' research will mostly focus on how these changes affect student learning at Oglethorpe, their work also will be shared with other partner institutions, including Metropolitan State University in Minnesota, Roosevelt University in Chicago, and the United States Military Academy. As part of the initiative, all partner schools will share their research and curriculum units with each other, which may then be modified for their own use.

The Engaging Mathematics project is still in its infancy—just a few months into a three-year plan. Dr. Gieger and Dr. Nardo will spend the spring and summer of 2014 conducting foundational research to develop the first units of the new curriculum. In the fall, Dr. Nardo will actively write and prepare additional units while on sabbatical. In spring 2015, the new curriculum will be implemented for the first time by Dr. Gieger, who will give feedback to Dr. Nardo as he continues developing the remaining units. The final year of the plan will include analysis of data collected in pre- and post-course surveys to "examine how student attitudes about the role of science and mathematics in addressing civic challenges might change as a result of taking the course," according to Dr. Gieger.

"Real world problems that we grapple with are messy, and complicated," says Dr. Nardo, "and they require us to bring in not only science but mathematics and psychology and sociology and business. We are going to have to bring in so many different lenses and expertise to bear on the problem, that it doesn't just belong in this nice little category that you call math. Students see math as solving problems in a book, not their real problems like poverty or fairness in voting—but math does have a voice there."

Debbie Aiken graduated from Oglethorpe's Evening Degree Program in 2012 with a major in communication & rhetoric studies and a minor in English. During her last semester, she was an intern in the University Communications department at OU, where she now works as assistant director.

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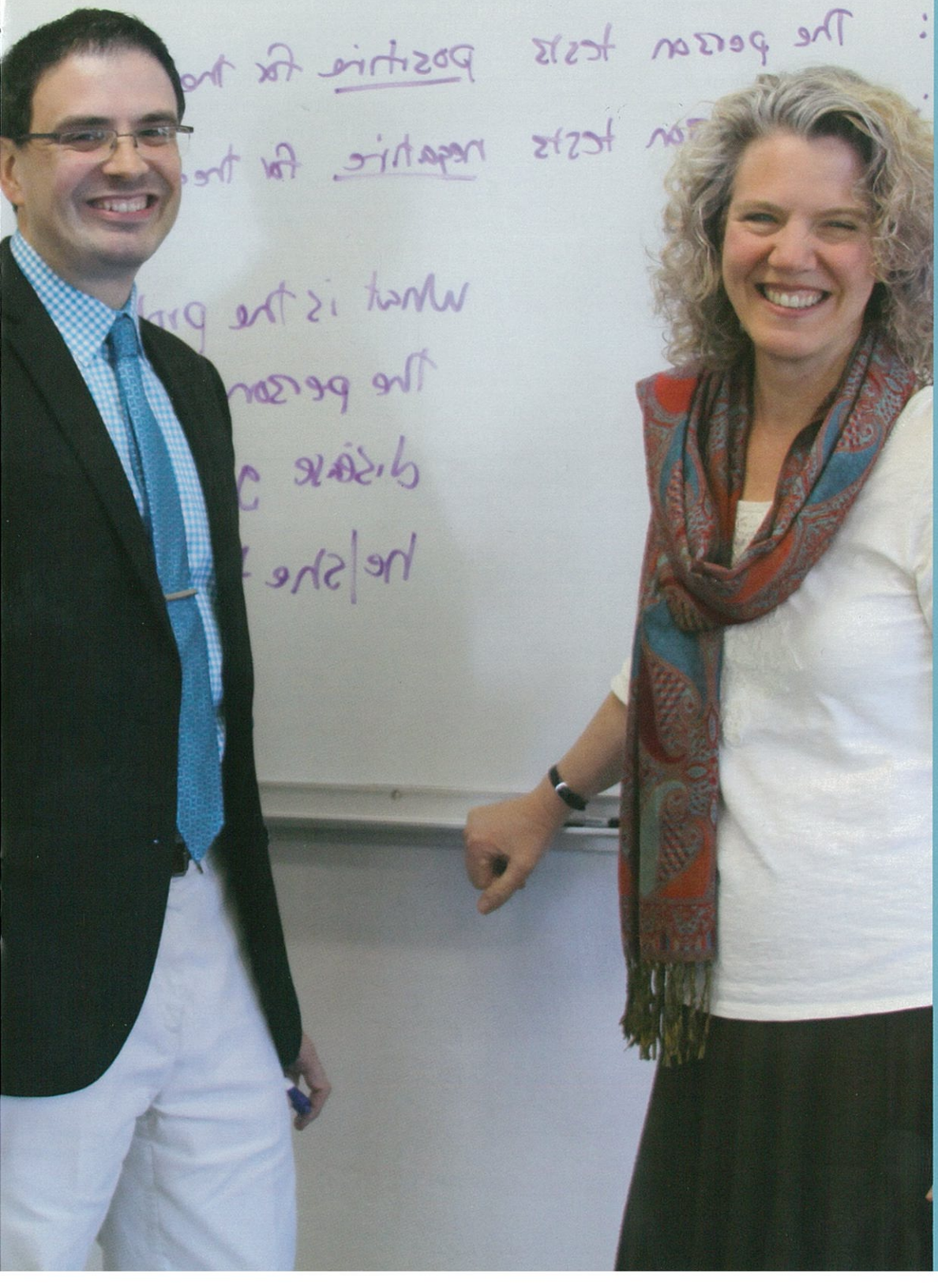

Engaging Mathematics is part of a larger initiative by the National Science Foundation called Science Education for New Civic Engagements and Responsibilities (SENCER), which has previously funded science research at Oglethorpe.

In 2009, faculty from three different disciplines coordinated to have the students in their classes conduct a water quality study that spanned three semesters. Students from physics, chemistry and statistics courses were grouped together and tasked with collecting water samples every day for a semester from the Blue Heron Nature Preserve in Atlanta, Silver Lake in Brookhaven, and the stream on campus in front of the former Emerson Student Center. Students in later semesters analyzed the data—all research that was funded by a SENCER grant.

"SENCER's tagline is 'teaching through problems not to problems,'" says Gieger. "The goal is to drive interest to a capacious social or civic issue and then to utilize science instruction to deal with that issue." In addition to Drs. Gieger and Nardo, other Oglethorpe faculty who have participated in SENCER-backed research include Dr. Keith Aufderheide, Dr. John Cramer, Dr. Mike Rulison, Dr. Karen Schmeichel, and Dr. Leah Zinner.

Oglethorpe's faculty is dedicated to continually evaluate and improve curricula through these research initiatives, as evidenced by the relatively high participation rate. On average, more than 40% of Oglethorpe's faculty in mathematics and sciences participate in SENCER projects—that's greater than most other institutions nationwide, both large and small.