UMass Dartmouth researchers receive $2.1M National Science Foundation grant to help educators empower the digital generation

The grant will provide elementary school teachers with resources to develop computational thinking-based problem-solving skills in their students

UMass Dartmouth researchers have been awarded a $2,116,315 grant by the National Science Foundation to help elementary school teachers integrate problem-solving skills common for computer programming into their math and science classes.

“The future of work and the future of citizenship require that our young people develop an unprecedented level of problem-solving skills and collaborative abilities,” UMass Dartmouth Chancellor Robert E. Johnson said. “Through this research, our world-class faculty will develop new strategies for elementary school teachers to unleash their students’ potential. This is an example of how our region benefits from having a national tier-one university in its midst.”

“This new generation of students needs new modes of teaching,” said Congressman William R. Keating, whose district includes UMass Dartmouth. “Our students are tech-savvy and will approach problems in ways different than previous generations with less sophisticated technology. Providing our teachers with the tools necessary to teach these students will help ensure success for everyone.”

The initiative is entitled “Computational Thinking Counts in Elementary Grades: Powerful STEM Teaching and Learning for the

21st Century.” The Principal Investigator on the grant is Director of the Kaput Center for Research & Innovation in STEM Education and Professor of Mathematics Education Chandra Orrill. Co-Principal Investigators are Associate Provost for Decision Support & Strategic Initiatives and Professor of Computer and Information Science Ramprasad Balasubramanian, and Assistant Professor of STEM Education and Teacher Development Shakhnoza Kayumova.

The research team seeks to help elementary school teachers engage their students in computational thinking, the kind of thinking that computer programmers use. For example, students will be challenged to think about problem solutions in ways that would allow a computer to solve them; create solutions that require a series of ordered steps to carry out; identify, analyze, and implement solutions that are efficient, effective, and creative; and use models and simulations to represent data.

“These thinking skills are important for students because they will build confidence in tackling complex problems,” Dr. Orrill said. “Students prepared with computational thinking skills will be better equipped to persist when faced with any challenging problem. They will learn to deal with ambiguity and use creativity to solve problems, and they will learn to communicate and collaborate with others in their problem solving. This is a unique and critical endeavor that allows elementary teachers, who are considered generalists in the field, to work with content and pedagogy experts to develop their professional knowledge and skills.”

“The digital generation has already been exposed to thinking a certain way about daily problems they encounter. We need to ensure their teachers have the tools to enhance and accelerate student learning in key STEM concepts in ways that students are already utilizing,” Dr. Balasubramanian said.

“While at the 2018 American Education Research Association

conference in New York, Chandra and I noticed there was a critical gap of strong professional development programs for elementary teachers to engage their students in computational thinking," Dr. Kayumova said. "We sat down right then and developed a vision and plan for this project."

While computational thinking has been taught to college-level students for years, the research team has been exploring how these approaches can be extended to K-12 students. With backgrounds in math, science, and computer science education and pedagogy, the team will be working in three New Bedford elementary schools over the next four years.