

Exploring science through underwater robotics

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Across the country this summer, middle and high school students are making a splash by discovering science and engineering while building programmable robots to accomplish underwater missions.

"WaterBotics," an innovative program developed at Stevens Institute of Technology by the Center for Innovation in Engineering and Science Education (CIESE), is a fun activity that engages kids to solve real-world problems and attracts interest in science, technology, engineering, and mathematics (STEM).

"We are living in an age when knowing how to create new knowledge and what to do with it can create a healthier, safer, and more prosperous planet," says Dr. George Korfiatis, Stevens Provost and University Vice President. "Scientists, engineers, and technologists are providing the fuel to power the enterprises of this and [future generations](#)."

WaterBotics is part of a \$2.5 million National Science Foundation program to increase the pool, persistence, and diversity of students who pursue STEM study and careers. Expanding from its initial testing grounds in New Jersey, summer camps and educator institutes are happening this summer at sites in Dayton, Ohio, Chicago, Illinois, and in Austin and throughout Texas. "Our partners in this national scale up project are bringing their own expertise and engaging their networks of teachers and out-of-school educators to deliver the WaterBotics curriculum to girls and underrepresented youth in four regions this summer and during the next school year," says Beth McGrath, CIESE Executive Director and Principal Investigator of the NSF program.

Using LEGO and Mindstorms equipment, WaterBotics students work in teams to rapidly prototype, design, and program underwater robots to accomplish a series of "missions" in an 8 foot diameter pool. Building robots that can swim, grab objects, and navigate obstacles introduces concepts like buoyancy, stability, and gears, and engineering skills such as design, through the facilitation of trained educators. In addition to these science and engineering concepts, students learn 21st century skills, such as teamwork, problem-solving, and critical thinking, as they build and improve their underwater robot designs.

"Also embedded in this NSF grant is professional development for educators that introduces the value of project-based, open-ended, and hands-on learning," says Dr. Susan Lowes, the project evaluator and Director of Research and Evaluation at the Institute for Learning Technologies at Teachers College, Columbia University. Practitioners will take these new educational strategies back to STEM classrooms and after school programs for the next school year and beyond. "At every workshop, educators tell us how excited they are to use these methods in their own programs and classes," says Karen Peterson, CEO of EdLab Group and Principal Investigator, National Girls Collaborative Project.

CIESE data demonstrate that students not only learn key science and engineering concepts, but also show increased interest in technology careers as a result of these workshops. "WaterBotics make it easy for participants to see how underwater robots can solve real problems, like controlling oil spills, monitoring our coral reefs, and exploring shipwrecks," says Peterson. "This context especially helps girls and other students typically underrepresented in STEM fields visualize themselves in science and engineering careers."

WaterBotics also promotes immediate STEM learning by hosting programs on college campuses through collaboration with the League for Innovation in the Community College. "Washington is telling us that we

need more students in STEM programs and, subsequently, choosing technology careers. By using community colleges as the sites for these workshops, middle and [high school students](#) begin thinking about their own futures as college students in these programs," says Dr. Edward Leach, Vice President for Services and Programs and Director of the STEMtech conference at the League.

Partners in this NSF-sponsored initiative include: Stevens Institute of Technology, the League for Innovation in the Community College, the National Girls Collaborative Project, the Texas Girls Collaborative Project at the University of Texas at Austin, the Kentucky Girls STEM Collaborative at the University of Kentucky, Sinclair Community College in Dayton, Ohio, and Triton College in River Grove, Illinois. Teachers College at Columbia University and Evaluation & Research Associates are the program's external evaluation and research partners.

More information: www.waterbotics.org/

Provided by Stevens Institute of Technology

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