



## Sponsoring Scholars in Science Awards

### Seedling Research Funding

Propose your ideas for engaging and inspiring students to pursue science, technology, engineering and mathematics (STEM). Funding will be provided for compelling K-12, higher ed and educational research initiatives designed to build student interest and awareness in the STEM disciplines.

### Code 32

## Topic: Using Sound to Explore and Communicate in the Undersea Environment

**Objective:** To engage students' imaginations while teaching them how sound is used for exploring and communicating in the undersea environment

**Description:** The Office of Naval Research seeks innovative educational and technology solutions to improve the Navy's reach among secondary school students. Solutions should engage student imagination while teaching how sound is used to explore and communicate in the undersea environment. The successful proposal will describe a means to present technically accurate lessons in an entertaining manner and permit graduated learning suitable for students in grades 9-12. Proposals should be scalable to provide a capability for small classrooms as well as remote learning lessons, including tracking each student's mastery of key concepts and ideas as the program progresses. Important topics to include in the solution include:

- (1) Basics: Sources of sound in the ocean, how underwater sound is used by people and marine life, basics of underwater sound propagation, how the ocean environment differs geographically and what that means for sound
- (2) Intermediate: The sonar equation, relationships of frequency wavelength and sound speed, sound velocity profiles, bottom losses, ambient noise, surface losses, scattering from objects and sound propagation using rays
- (3) Advanced: Non-mathematical treatment of the wave equation, alternatives to ray propagation, simple sensors and array designs, and fundamentals of underwater signal processing

Proposers are encouraged to make use of computer/Web-based learning technologies in their solutions, and may also use videos, music, games and network interactivity to present material and evaluate progress in an engaging manner.

**POC:**

Mike Vaccaro

ONR Ocean Battlespace Sensing Department,  
Ocean Sensing and Systems Applications  
Division

Email: [michael.vaccaro@navy.mil](mailto:michael.vaccaro@navy.mil)

Phone: (703) 588-0615