



# STEM2Stern

Opening Minds • Capturing the Future



CAPTURING THE FUTURE  
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SUMMER 2014

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## MIDSHIPMEN TAKE STEM OUTREACH ON THE ROAD

BY SARAH DURKIN, UNITED STATES NAVAL ACADEMY

**D**eciphering secret codes. Engineering tinfoil boats. Launching catapults. Testing helicopter “whirlybirds.” Building electrical circuits. These are some of the hands-on activities that the United States Naval Academy (USNA) midshipmen bring to schools around the country as part of an outreach program to bring educational opportunities and promote interest in STEM to communities outside of Annapolis, Md.

In May 2014, three different groups of midshipmen went to schools in South Dakota, Kentucky and New Jersey. These trips promoted the USNA’s nationwide outreach by using interactive activities to excite students about STEM while contributing to the academy’s mission of developing midshipmen into future leaders. Program officials look forward to many more successful events in the years to come.

### RAPID CITY, SOUTH DAKOTA

The USNA STEM office and oceanography department sponsor an annual Severe Weather In-Field Training (SWIFT)



**TAKING SWIFT ACTION:** Midshipmen on the SWIFT team do STEM outreach in Rapid City, South Dakota. (Photo by USNA STEM Office)

program to teach midshipmen about forecasting, observing and verifying severe convective storms. Nine midshipmen on the SWIFT team—Dantaun Bernstein, Anthony Borrego, Rebecca Chamberlin, Bailey Colon-Waite, Merrill Dean, Walter Glenn, Alexis Kelm, John Marino and Lawrence Wilson—spent a day at Stevens High School in Rapid City, S.D., speaking to students about weather science and majoring in STEM fields. They also worked together on homemade catapults.

### LOUISVILLE, KENTUCKY

Midshipmen Zachary Dannelly, Max Goldwasser and Rylan Tuohy spent six days in Louisville, Ky., working with more than

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## MESSAGE FROM THE NAVAL STEM EXECUTIVE



**A**s large percentages of the national and naval STEM workforce near retirement age, it is not hyperbole to say that replenishing their ranks is a matter of national security. Our daily lives and the defense of this great nation depend on maintaining technological leadership in the global community.

We have worked to grow the pipeline of STEM talent nationally by encouraging young people to pursue STEM majors in college, and have supported STEM-related education initiatives across the country. Although great progress has been made, our mission isn't over.

This is a long journey, and I want to encourage you and also, thank you for the vital work you do to meet the goal of increasing the size and impact of STEM professionals across all sectors of society.

Throughout the Navy and Marine Corps, there is a strong awareness of the need to encourage the next generation of scientists and engineers—and also to raise awareness of the many opportunities for talented STEM professionals with us and our sister services.

In order to do this, we have teams across the country that engage in STEM outreach and education, working to support both students and working professionals to empower the United States' STEM workforce. We also partner with a number of world-class organizations promoting innovative solutions to STEM-related challenges. This summer, for instance, numerous engaging summer STEM programs were offered to students and teachers at naval

facilities that included our personnel. I'm continuously impressed by the number of naval scientists and engineers who participate as mentors and judges in local science fairs and other student events, further introducing students to not only interesting careers but also the great people we have working within our ranks.

We are making a difference. Again, thank you for all you have done, are doing and will continue to do to support students of all ages in their discovery of new paths and opportunities. With your continued dedication to this important issue, this nation and our Navy and Marine Corps will continue to prosper.

Sincerely,

Matthew L. Klunder  
Rear Admiral, U.S. Navy  
Chief of Naval Research  
Naval STEM Executive

FROM PAGE 1

300 sixth- and seventh-graders at three different schools. Dannelly, a cyber-operations major and Stamps Scholar, developed a lesson in cybersecurity to engage and educate students. They explored a variety of



**CRYPTIC MESSAGES - A TEACHER'S WORST NIGHTMARE!:**

Midshipmen Rylan Tuohy, Max Goldwasser and Zachary Dannelly do STEM outreach in Louisville, KY. (Photo by USNA STEM Office)

topics including cryptography, electrical circuits and engineering. "I want kids to say, 'Wow, I didn't realize computers affected the lights turning on—how does that happen?'" said Dannelly. "And then the more they delve into that, that is how kids really get a fire behind them and instead of having to learn, they choose research."

**ASBURY PARK, NEW JERSEY**

Two midshipmen traveled to New Jersey to work with seventh-graders at Sisters Academy, an all-girls school. Paige Rutkoske and Allyssa Randell spent a week working closely with students to spark their interest in all areas of

STEM. "Working with the girls, I have been challenged to explain concepts to them in a way that they can understand," said Randell. "It's been really cool seeing them learn and better appreciate STEM and how it's a positive part of all their lives." Activities ranged from strategy games that help to develop logical reasoning to engineering challenges that strengthen problem-solving skills, all while developing their own leadership abilities.

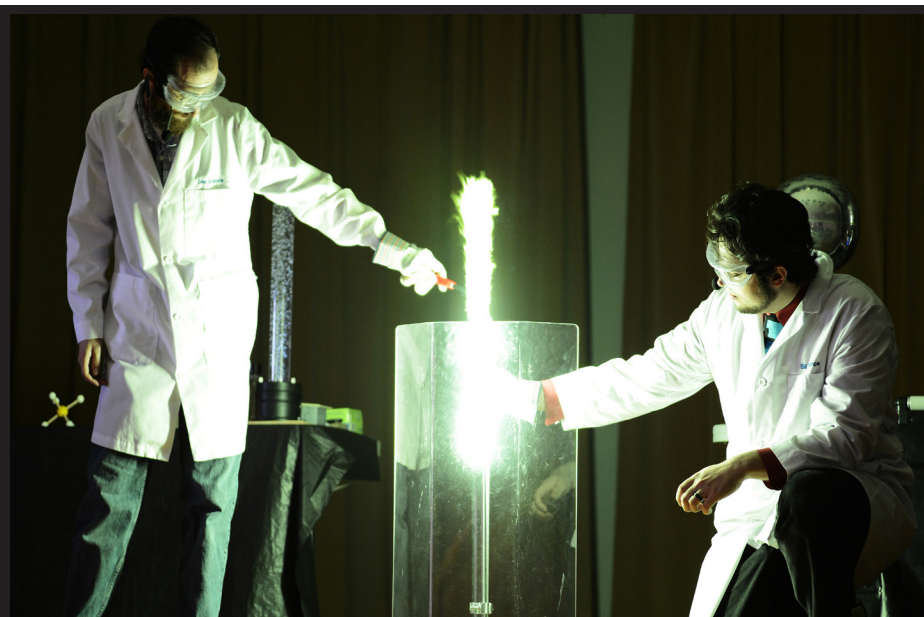


**SISTERS IN STEM:** Midshipman Paige Rutkoske, left, leads middle school students in STEM activities at Sisters Academy in Asbury Park, New Jersey. (Photo by USNA STEM Office)



# THE NAVY'S SCIENCE BROTHERS WOW STUDENTS ACROSS THE FLORIDA PANHANDLE

BY DAN BROADSTREET,  
NSWC PCD PUBLIC AFFAIRS



**WHO LET THE DOG BARK?:** NSWC PCD Scientist Dan Flisek (left) and Engineer Bill Porter (right) demonstrate the “Barking Dog” while performing their Science Brothers show at Patterson Elementary School. (Photo by MC2 Kevin Gray)

Engineer Bill Porter and scientist Dan Flisek, both employed at the Naval Surface Warfare Center Panama City Division (NSWC PCD), call themselves the “Science Brothers.” And a couple times a month, the “brothers” mesmerize students throughout northwest Florida with chemistry beakers changing colors, Tesla coils illuminating light fixtures and foam erupting from glass tubes like miniature volcanos.

Young students laugh and cheer with hands raised high to answer the Science Brothers’ question: “Now kids, was this magic?” Their resounding shouts of, “No, it’s science!” are definite indicators the Science Brothers give kids a whole new outlook on school.

“When we hear the students fill their school cafeterias and auditoriums with cheers and laughter because of our zany science experiments, we know we’re accomplishing our goal,

which is to get children excited about science, technology, engineering and mathematics—the STEM curriculum being taught in school,” said Flisek.

The Science Brothers is a non-profit outreach program aimed at getting elementary and middle school students interested in STEM activities. “To remain globally competitive, our country needs to graduate more students with STEM-related degrees,” said Porter. “Basically, we revived a presentation that used to be acted out for school students by another pair of NSWC PCD engineers in the mid ‘90s.”

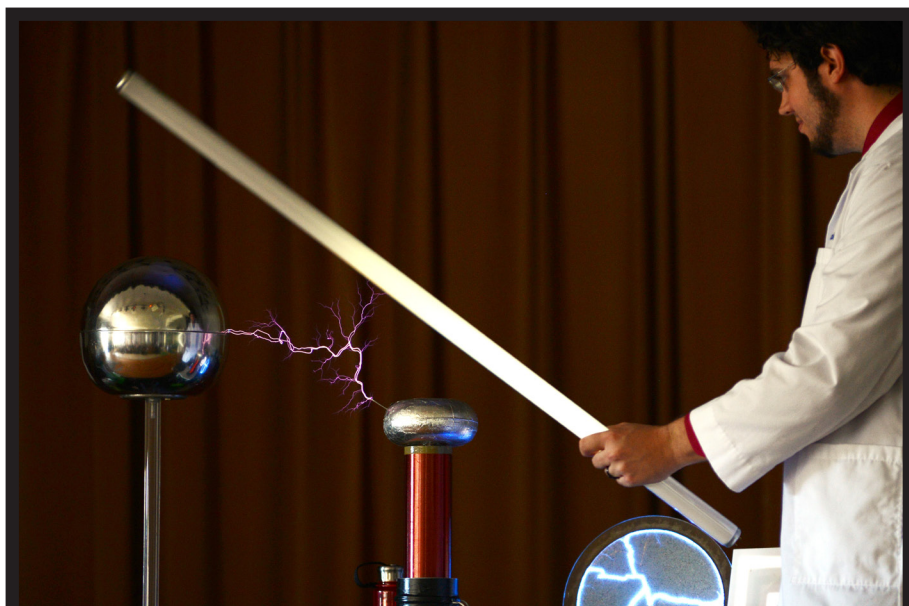
Porter said he and Flisek had simply updated the former show’s experiments with modern technology, new experiments and embedded these elements in an act where the two carry on a zany competition arguing whose scientific experiments are “cooler.”

“Dan and I believe if we are going to capture students’ interests in STEM disciplines, then we need to inspire them while they’re young, which is why we develop most of our shows for the elementary and middle school students,” Porter said. “It’s important to inspire them at an early age.”

NSWC PCD Commanding Officer Capt. Phillip Dawson recently observed a show and praised the performance as worthy of support in every way possible.

“I can tell by the awestruck faces and the cheers from students and teachers alike, the science being shared is being enjoyed by all,” said Dawson. “It’s great to have the opportunity to show these students the Navy would like them to work for us someday and that we can employ them in a career they will enjoy.”

For more information on the Science Brothers, go to: <http://www.sciencebrothers.org/>.



**ILLUMINATING EXPERIENCE:** NSWC PCD Engineer Bill Porter demonstrates the ability to power a fluorescent light bulb wirelessly using a Tesla Coil. (Photo by MC2 Kevin Gray)

## STUDENT

## Spotlight



## Emily Escalante

**PROFILE:** Mechanical engineering student at San Diego State University and founding president of the local San Diego MAES chapters, an organization for Latinos in science and engineering.

**QUOTE:** *"I'm proud to be a part of the effort to bring knowledge of STEM careers to underrepresented communities and encourage them to celebrate the potential of their youth."*

**S**cientific information presented in English often baffles second-language learners and prevents them from understanding simple concepts. To them, this lack of understanding too often translates to *No hablo ciencias*, meaning, "I don't speak science." For that reason, few English learners pursue

degrees in STEM because they equate not understanding the language with not understanding the subject.

In 2011, I was introduced to the national president of MAES and became enamored with their cause—I knew I had to bring it to San Diego State University (SDSU) to encourage minorities to pursue STEM degrees. By the fall semester of 2012, I had organized a local MAES chapter. The SDSU chapter worked with the Space and Naval Warfare Systems Center Pacific (SSC Pacific) to create *Día de Ciencia e Ingeniería*, the first STEM event in San Diego presented entirely in Spanish for middle school families. STEM professionals and college students present hands-on demonstrations to students, while panel members comprised of educators, college students and STEM professionals provide information to parents about STEM degrees. At the end of the event, families are brought back together for a shared hands-on activity.

In the two years we've held this event, we've spoken to hundreds of students at 10 different schools and 12 different grade levels. The SDSU MAES chapter's commitment to this event, along with SSC Pacific's support, has led us to launch San Diego's first MAES professional chapter.

For more information on the MAES organization, please visit: [mymaes.org](http://mymaes.org).

## Jessica Brown

**PROFILE:** Mechanical engineering student at San Diego State University (UCSD) and lover of hiking, line dancing and riding dirt bikes.

**FACT:** Serves as SDSU's outreach coordinator for Society of Women Engineers.

**A**sk a room full of 8th graders if they like math and science and you may get a couple positive responses. Ask a room full of 8th grade girls the same question and the room might go completely silent.

The outreach team at Space and Naval Warfare Systems Center Pacific (SCC Pacific) is changing that response, one girl at a time, through programs like *Imagine More*— a mentorship program geared toward 8th grade girls at the Preuss School at the University of California, San Diego.

Through this program, I was fortunate to mentor a young lady named America. For me, this was less a mentorship and more a friendship. We would meet for breakfast at Denny's just to chat, hang out and scheme up projects. America and I did our best to wreak havoc upon the hallowed halls of the engineering building by testing out the schemed projects we had designed and constructed, including a mousetrap car, ski lift, homemade carpet skates and party poppers. We even messed with some visual implementation computer code.



**'TIRE'ING TREK:** Jessica on one of her many desert adventures. (Image courtesy of Jessica Brown)



## COLLEGE STEM CLUB TOURS NSWC IHEODTD

BY ANDREW REVELO, NAVAL SUPPORT ACTIVITY SOUTH POTOMAC PUBLIC AFFAIRS



**WE HAVE TO WEAR WHAT?:** Students from the Carroll Community College STEM club and their professors after their tour of Naval Surface Warfare Center Indian Head Explosive Ordnance Technology Division (NSWC IHEODTD) facilities. The group wore anti-static suits and other safety gear during much of the tour. (Photo by Andrew Revelos)

**M**embers of the Carroll County Community College STEM club got a firsthand look at STEM professions in action during a recent tour at the Naval Surface Warfare Center Indian Head Explosive Ordnance Disposal Technology Division (NSWC IHEODTD).

The 21 students and two professors took in a bomb-disposal robot demonstration and toured the Cartridge- and Propellant-Actuated Device manufacturing facility, a bomb-proof test facility, and the Advanced Energetics Laboratory. “These students are part of the STEM club on campus,” said Dr. Raza Khan, chemistry professor and STEM club advisor for Carroll Community College. “Right now there are about 50 STEM club students with [majors] in engineering, sciences and technology.”

Khan wanted the students to not just understand STEM in the classroom, but see those professions in action. “The whole idea is for them to see what people do in real life out there,” he explained. “We can teach content in class, but we can’t teach application.”

The students also learned about STEM-related internship opportunities with the Navy. “The other aspect of why we come out is to see some of the internship opportunities out there—to show the students how to get their foot in the door,” said Khan. “We are a community college; at a four-year college they can do research on their own turf. This is our avenue for

STEM club members to see what [research] is like.”

Chris Bradford, a student at Carroll Community College and president of the STEM club, found the tour of the Navy’s premiere energetics research and development facilities to be an interesting compliment to his studies.

“The different buildings... [were] unlike anything I have ever seen before,” he said. “It was extremely interesting to see how people from many different backgrounds and different educations can... pull their resources together to solve problems and major challenges. It is always a plus to see people in STEM fields in their work environment because it pushes us to reach our goals and gives us courage to complete our own challenges.”

Along the tour, NSWC IHEODTD professionals offered students some of the career wisdom they acquired throughout their years of service to the Navy.

Byron Brezina, an engineer and project manager at NSWC IHEODTD’s EOD Department, emphasized the need for STEM professionals to have a strong work ethic. “Engineering isn’t for everyone,” he said. “You have to be willing to do the work. There are lots of [employment options] and it’s a great career, but you’ve got to stick with it.”

Of course, solving complex, highly-technical problems is also a rewarding endeavor for professionals like Brezina. But those interested in a STEM profession must build the necessary cerebral skills.

“The reason you go to college is to learn the tools,” Ariel Garcia, a branch manager at NSWC IHEODTD’s Systems Engineering Department, told the students. “But it’s a lot of fun. Knowledge is cool.”



**WHOA...COOL ROBOTS!:** Wayne Jones, a student at Carroll Community College and member of its STEM club, examines a bomb disposal robot during a tour of Naval Surface Warfare Center Indian Head Explosive Ordnance Technology Division (NSWC IHEODTD) facilities. (Photo by Andrew Revelos)

**Carroll Community College is a two-year community college located in Westminster, Md.**

# SSC ATLANTIC HOSTS MATH GAMES ACTION

BY SUSAN PIEDFORT, SPAWAR SYSTEMS COMMAND ATLANTIC



**MATH WARS:** Kids compete under the watchful eyes of SSC Atlantic computer scientist Jason Morrow. (Photo by Joe Bullinger)

Space and Naval Warfare Systems Center Atlantic (SSC Atlantic), in Charleston, S.C., was the site of two competitions that pitted middle school students against one another as they tested their math skills in online, multi-player educational video games.

More than 90 students from various schools took part in the tri-county DimensionU virtual math games competition, all under the supervision of SSC Atlantic volunteers and mentors. Winners from each grade earned a "Golden Ticket" to return and compete against Air Force, Army, Marine Corps and Navy teams in the 2014 Department of Defense Math Games Virtual Tournament. During the DimensionU event, students competed with others

in Illinois, Maryland, New Jersey and New York. The teams participated in five rounds of gaming. South Carolina middle schools Dubose, Hanahan and Cane Bay did well, taking first place in each of

their divisions in the overall challenge.

DimensionU, funded by the National Defense Education Program, is a math gaming tool that enhances students' skills in pre-algebra and algebra. Students engage in a series of first-person action adventure missions with three-dimensional

graphics, sounds and animation similar to those in popular video games. Students can customize their avatars and go online to play individually or in teams with classmates or other students around the world.

This is the third year SSC Atlantic has hosted the competition, held in the command's conference center. "It's always exciting to bring students here and see their enthusiasm about math and technology," said Capt. Amy D. Burin, SSC Atlantic commanding officer. "It's fantastic that [the Space and Naval Warfare Systems Command] can give back to the community and work with these kids. It's wonderful to see the excitement on their faces as they play and win."

DimensionU and the Department of Defense Math Games Virtual Tournament are part of SSC Atlantic's educational outreach program aimed at developing STEM talent in K-12 schools and at universities.

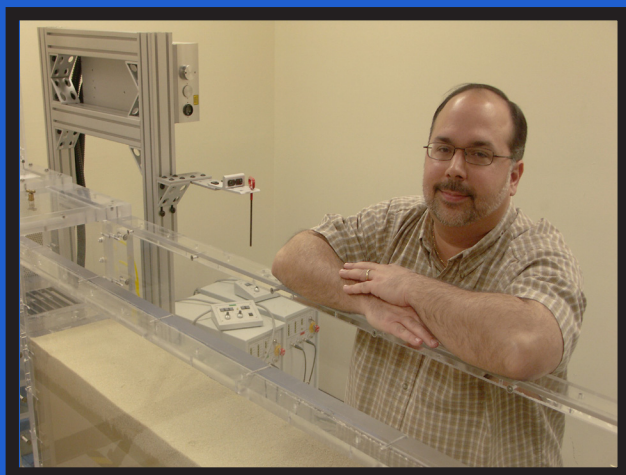
SSC Atlantic volunteers serve as role models, mentors, content experts, competition judges and in other roles that show students the value of STEM careers. Their mission is to inspire and attract the STEM talent that is essential for the nation's and SSC Atlantic's current and future challenges.

**"It's wonderful to see the excitement on their faces as they play and win."**

**Capt. Amy D. Burin**  
SSC Atlantic commanding officer

## NAVAL VOLUNTEER PROFILE

JOE CALANTONI



Dr. Joe Calantoni is head of the Sediment Dynamics Section in the Marine Geosciences Division of the Naval Research Laboratory (NRL) at Stennis Space Center, Miss. He is internationally recognized for his pioneering approach to sediment transport modeling and simulation, where the motions and interactions of every grain of sand are directly computed using the discrete element method. He has since expanded his use of this method to applications ranging from sediment acoustics to ice floe mechanics.

Calantoni also spends a significant amount of his time mentoring and supporting the research efforts of the next



# SUB 'DRYDOCKS' AT TOP-RANKED HIGH SCHOOL

BY OFFICE OF NAVAL RESEARCH

**P**erched on a stand inside the Thomas Jefferson High School for Science & Technology cafeteria, a goldenrod-colored, human-powered submarine revealed its inner workings during the school's spring 2014 tjSTAR Symposium.

The Phantom III, designed and built by students at Virginia Tech, served as a platform for volunteers with the International Submarine Races (ISR) to describe the biannual design and engineering competition. ISR will host its 13th race June 22-26, 2015, at the Naval Sea Warfare Center Carderock Division's David Taylor Model Basin in Bethesda, Md.

ISR joined the likes of tech-savvy federal agencies and companies—including NASA, CIA, Lockheed Martin and Northrop Grumman—all appealing to students at the Alexandria, Va., school to pursue technology.

Kurt Yankaskas, a program manager at the Office of Naval Research who volunteers as the race's executive coordinator, encouraged students to start thinking now about organizing a team for the race.

"It takes about two years to plan and get started," he said, aiming his message at freshmen celebrating the completion of their Integrated Biology, English and Technology programs for the year.

Each team designs, builds and powers its own craft, but long before any sub reaches the starting line, every team member must earn a scuba certification to participate. Teams also collectively must raise the funds to support lodging, as well as transportation and shipping to the event.

ISR is one of several Navy-supported programs developed to attract STEM graduates to careers with the Department of the Navy. In particular, ISR showcases science and engineering principles typically used in the workplace by marine engineers, naval architects and divers.

Yankaskas has volunteered with ISR for more than 14

years and has built a database of former student contestants who have gone on to pursue careers with Navy.

"I am sure some of the students I talked to today will appear in the contestant database in a couple of years," he said. "They are an excited group."

Jefferson ranked fourth nationally among high schools in the U.S. News & World Report's annual rankings published earlier this year. It is one of 19 learning facilities assigned by the Virginia Department of Education as an Academic-Year Governor's School, a designation for schools providing "acceleration and growth" in the arts, government and international studies, and STEM disciplines.



**OFF TO THE RACES!** Kurt Yankaskas, a program manager at the Office of Naval Research, talks with students at Thomas Jefferson High School for Science and Technology about the International Submarine Races (ISR). ISR is a unique international engineering design competition that inspires high school and college-age students of the various engineering disciplines to pursue careers in STEM. (U.S. Navy photo by John F. Williams)

generation of scientists and engineers throughout the Gulf Coast. In August 2009, he initiated—and still oversees—a K–12 education outreach program to promote STEM in the classroom. This outreach provides science and engineering professionals as mentors in support of STEM efforts such as SeaPerch, MATHCOUNTS and FIRST Robotics.

"My scientific career has benefited tremendously from strong and influential mentors," he said. "I view promoting STEM education to inspire and mentor the next generation of Department of Defense scientists and engineers as a natural extension of my research."

Calantoni received an undergraduate degree from Penn State and master and doctoral degrees from North Carolina State University, all in physics. He was granted a National Research Council Research Associateship Award and began

working as a postdoctoral fellow at NRL immediately after defending his dissertation in late 2002. In 2004, he accepted a position as a full-time NRL research physicist.

In addition to his ongoing efforts in numerical modeling and simulation, Calantoni's research portfolio includes state-of-the-art laboratory and field studies for sediment dynamics. Through all of this work, he has established the Sediment Dynamics Laboratory as a major facility at NRL.

NRL's Sediment Dynamics Section, which Calantoni oversees, performs basic and applied research focused around the physical, mechanical and acoustical properties of sediments from the seafloor, estuaries and rivers through a combination of high-performance computing simulations and numerical modeling, detailed laboratory measurements and field experiments.

# ABOUT STEM2STERN

**S**TEM2Stern is the Department of the Navy's science, technology, engineering and mathematics (STEM) Initiative. Under the leadership of the chief of naval research, who serves as the Naval STEM Executive, STEM2Stern works with the naval system commands, laboratories, warfare centers and other research and education institutions to leverage resources and maximize the impact of the department's STEM investments.

These investments support a wide variety of STEM educational programs, ranging from activities designed to spark younger students' interest in STEM careers, to more in-depth, hands-on learning opportunities for middle and high school students, internships and research fellowships for older high school and post-secondary students and professional development opportunities for naval STEM professionals and faculty.

Please visit [STEM2Stern.org](http://STEM2Stern.org) for more information about naval STEM, or contact the STEM2Stern office at [STEM2Stern@navy.mil](mailto:STEM2Stern@navy.mil)



## STEMtistics

### ELEMENTARY & SECONDARY EDUCATION

- 56 percent of middle school students would rather eat broccoli than do math homework. (Raytheon Corporation [2012])



### HIGHER EDUCATION

- The United States has one of the lowest ratios of STEM to non-STEM bachelor's degrees in the world (National Science Board [2012])

### WORKFORCE

- According to a 2010 study from Georgetown University's Center on Education and the Workforce, about 76 million baby boomers will soon retire, and only about 51 million people are in line to replace them, creating a "worker gap" of 25 million. (Education Week)
- The two counties in the U.S. with the most STEM workers per capita – Los Alamos, N.M. and Butte, Idaho – are home to major Department of Energy national laboratories (Department of Professional Employees)



**On the front cover:** Emeka Ebirim, Naval Surface Warfare Center Dahlgren Division (NSWCDD) engineer, tests a laser while on a temporary assignment at the Lead Naval Technical Laboratory for Laser Safety (LNTL) facility. At the time of the picture, Ebirim was mentored by NSWCDD laser engineer Sheldon Zimmerman who is currently Chairman of the International Electronics Commission's Laser Safety Committee. (Photo by Kevin Elliott)

**On the back cover:** STEM Summer Academy students program a robot to engage in a fictitious Navy operation. They were among more than 100 middle school students working on STEM summer camp activities and projects impacting simulated naval robotic missions at the event. (Photo by John Joyce)

### LOOKING AHEAD:

Check out the fall edition on internships, slated to come out **October 2014**.

### UPCOMING STEM DATES

Online applications open **Oct. 1**, for two Navy internship programs:

Science and Engineering Apprenticeship Program (SEAP): [seap.asee.org/apply](http://seap.asee.org/apply)

Naval Research Enterprise Internship Program (NREIP): [nreip.asee.org/apply](http://nreip.asee.org/apply)

### NAVAL STEM WEBSITES AND SPONSORED ACTIVITIES

Below is a list of websites you may find interesting. It includes Web addresses for various naval programs, as well as some of our signature program partners.

[www.usna.edu/STEM](http://www.usna.edu/STEM)  
[www.ndep.us](http://www.ndep.us)  
[seap.asee.org](http://seap.asee.org)  
[nreip.asee.org](http://nreip.asee.org)  
[smart.asee.org](http://smart.asee.org)  
[www.dodstarbase.org](http://www.dodstarbase.org)



[www.stem2stern.org](http://www.stem2stern.org)