Winter 2014

STEM

UNITED STATES NAVAL ACADEMY

Inside this issue:

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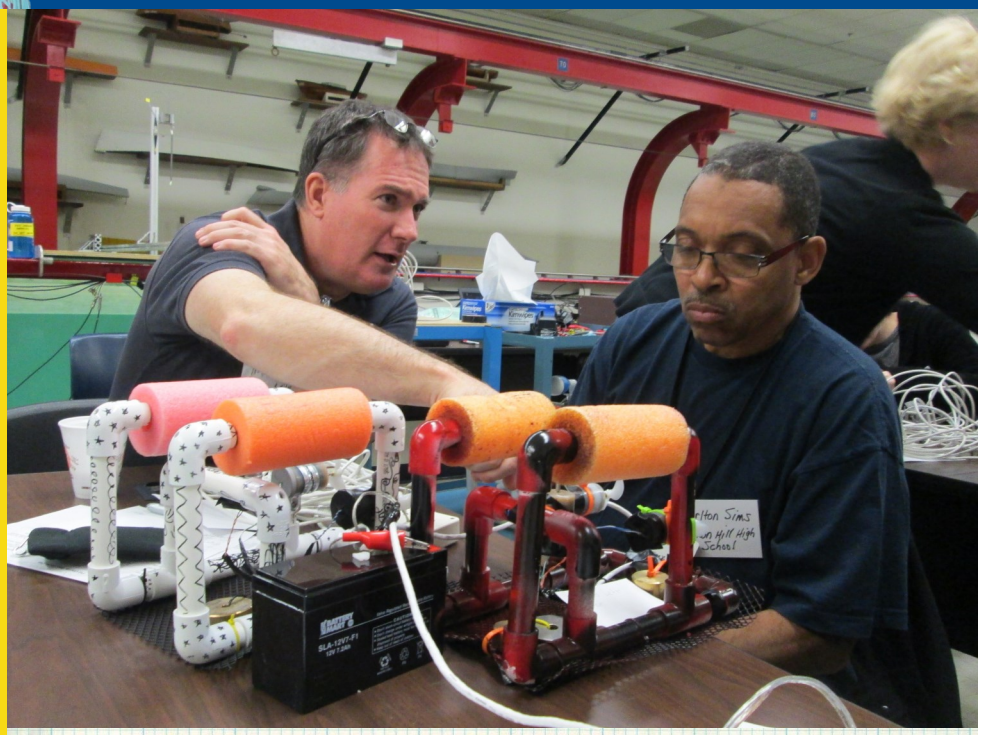

Focus on Faculty

STEM faculty share their thoughts on STEM outreach, and why they choose to participate.

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Naval Academy Science and Engineering Conference

The Naval Academy hosted the annual Naval Academy Science and Engineering Conference (NASEC), a four-day undergraduate conference beginning on November 3, 2013.

This student-run conference brings together policy makers and science advisors together with university faculty and students to meet and discuss significant science and engineering issues and challenges.

120 undergraduate students from 28 colleges and universities across the country came to USNA to focus on three themes: Renewable Energy and Alternative Fuels, Cyber Space and Security, and Health and Sustainability. 30 STEM midshipmen participated as conference facilitators.

The STEM Office hosted a Hands-on/Minds-on session for conference participants to engage in engineering competitions relating to the conference topics. Students teamed up to complete the design challenges, facilitated by Prof Jim Cowart, Mechanical Engineering, and 6 STEM midshipmen.

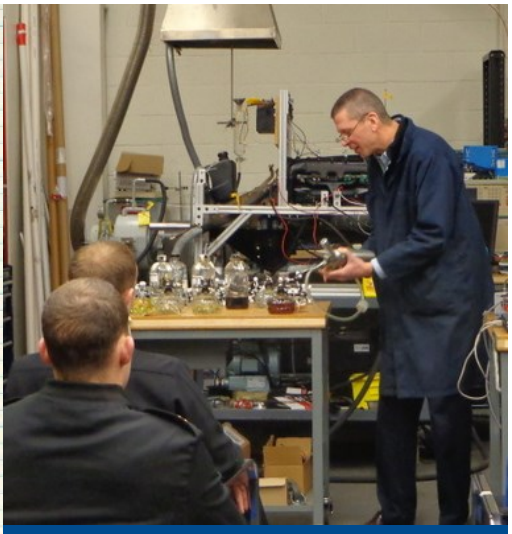
Participating students all enjoyed tackling the engineering challenges, which served to reinforce the themes of the conference.

Focus on Faculty

NASEC participants were challenged to build a balloon-powered boat, an engineering design activity developed by Mechanical Engineering faculty member, Jim Cowart.

"Ever since I can remember, I have greatly enjoyed opportunities to build and create. I enjoy participating in USNA STEM activities since we provide opportunities for young people to design and build and see their creations in action. It is wonderful to see our participants experience the success of their own ingenuity."

- Jim Cowart, Mechanical Engineering



Prof Jim Cowart developed engineering design activities for NASEC

SeaPerch/ NOAA Teacher Training

The Naval Academy and NOAA's Office of Ocean Exploration and Research presented a SeaPerch/ NOAA Ocean Exploration Workshop for Educators of Grades 5-12, held at the South Carolina Aquarium in Charleston, SC on November 8-9, 2013.

This collaborative effort is aimed at extending the popular underwater robotics program by adding Navy relevant curriculum aligning with NOAA to incorporate reasons and methods for ocean exploration and research as well as reach additional audiences.

USNA STEM faculty, Professors Angela and Pat Moran, and Mark Murray, travelled to Charleston to lead an all-day SeaPerch workshop for 24 teachers from South Carolina schools. USNA STEM faculty instructed workshop participants in the necessary skills to start a SeaPerch program in their own classrooms or after school programs.

Participants built their own SeaPerch ROVs that day, and were rewarded to see them successfully operate in the fountain outside the Aquarium.

All participating educators received SeaPerch supplies, a collection of activities and lesson plans, as well as a certificate of Professional Development.

These educators are now equipped to bring innovative classroom investigations into their schools, with an emphasis on real-world applications for underwater exploration.

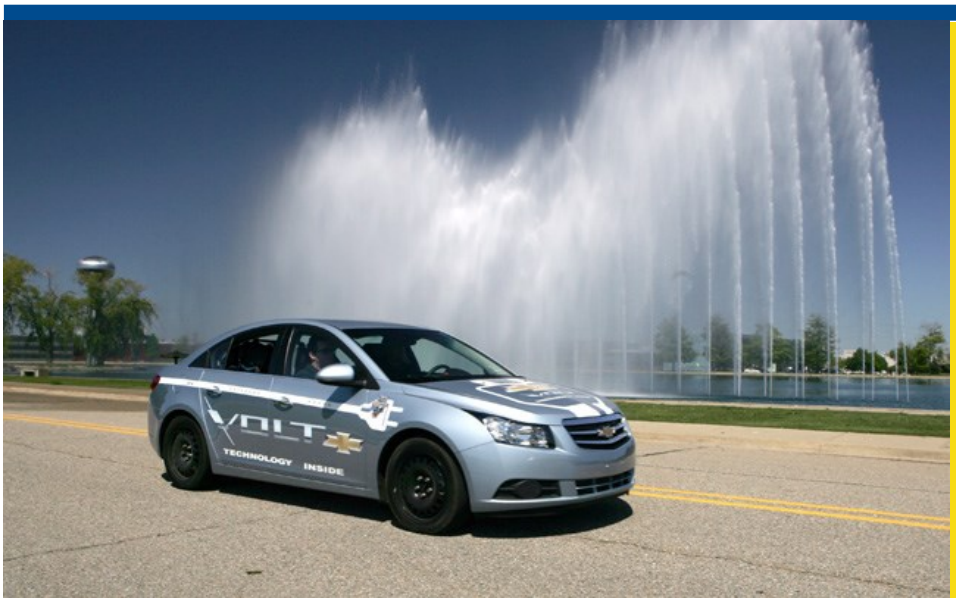
Focus on Faculty

Beth Mutch, a professor in the Academic Center, is active in both STEM outreach and educator training. She enjoys instructing students and teachers alike, using SeaPerch as an educational tool.

"Although SeaPerch is a national program, the curriculum provides a great opportunity to incorporate various disciplines, integrating concepts ranging from buoyancy to the chemistry of PVC piping."

- Beth Mutch, Academic Center

Prof Beth Mutch (left) instructs teachers in SeaPerch curriculum



Remote STEM: GM Tech Center

Naval Academy Professor Mark Murray and nine midshipmen traveled to the GM Tech Center in Warren, MI to host a STEM day on November 14, 2013 for one hundred Detroit-area high school students. Students engaged in hands-on activities highlighting Navy-relevant technology, with an emphasis on hydraulics, robotics, fluids, and energy.

The students had the opportunity to visit multiple GM vehicle testing facilities at the Warren Technical Center, including the Advanced Energy Center, where GM develops battery technology; the Climatic Wind Tunnel and the Structural Development Lab.

"The U.S. Naval Academy hopes to grow this partnership to continue developing the next generation of leaders and innovators," said Everett Marshall, director of Strategic Outreach for the Naval Academy. "We hope that as a result of this program, students will become more aware of the many doors that a strong foundation in STEM can open, including Navy careers."

Focus on Faculty

Mechanical Engineering faculty member, Mark Murray, traveled to GM Tech Center in Michigan with 9 mids to host a STEM day for Detroit-area high school students.

“I enjoy teaching/demonstrating a basic physical principle and building on that concept to explain why things are designed or engineered in certain ways, with hopes that kids start to be curious about things around them. It is especially rewarding when you feel you have ignited technical curiosity in someone who has had it suppressed because of limited experiences.

I enjoy seeing mids get excited about showing their knowledge to kids. I have seen several individuals who have "come to life" in a way not seen in them previously, when working with kids.”

- Mark Murray, Mechanical Engineering

Prof Mark Murray demonstrates principles of fluids

MESA Day

Friday, November 22, 2013 was not a typical school day for 300 assorted elementary school students gathered together from local counties and Baltimore City at Johns Hopkins University Applied Physics Laboratory. These 4th and 5th graders spent the day participating in science and engineering activities hosted by Naval Academy faculty and midshipmen, in collaboration with Maryland Mathematics Engineering Science Achievement (MESA).

33 USNA midshipmen and faculty members, Sarah Durkin, Gwen Gray and Angela Moran, staged a full day of hands-on activities focused on Navy-relevant topics such as robotics, hull design, fluids principles, underwater vehicles, materials properties, biofuels, polymers, properties of water, electrical circuits, and more, as well as mini engineering design competitions.

One midshipman facilitator described the benefit of the event, as a way to inspire student interest in STEM, "A lot of kids have fantastic and innovative ideas, however, they rarely have the opportunity to stand out. Giving them the chance to compete and win hopefully gave them the confidence to stay with STEM."

At the end of the day, students and teachers described the experience as "the best field trip ever!" "The students were sharing things that they had learned during the bus rides back to their schools," said Paula Shelton, Executive Director of MD MESA, "They appreciated the diversity of the midshipmen and faculty, and the individual attention they received. Our partnership provides students a better understanding of how mathematics, science and technology are used in the real world, and the importance of teamwork."

Focus on Faculty

Sarah Durkin, a professor with the STEM Office and a biologist, has helped develop a variety of activities in topics such as energy and electricity, biofuels, bioterrorism, and applied math. Students participated in many of these activities during MESA Day.

“The best way to engage students in science, engineering, and math is to give them a hands-on experience.”

- Sarah Durkin, STEM Office

Prof Sarah Durkin teaches students how to make circuits using play dough at MESA Day

FIRST Robotics Tournament

Hundreds of students gathered alongside their robots in Dahlgren Hall at the United States Naval Academy on January 11-12, 2014, for a regional FIRST robotics tournament. FIRST, a non-profit organization founded by inventor Dean Kamen, uses robotics and exciting sports-like competitions to help students develop the skills needed to compete in the technology-driven global economy.

Over 500 students, on 50 teams from schools and robotics clubs around Maryland, as well as a Virginia and a Pennsylvania team, competed in the FIRST Tech Challenge Qualifiers. During the year, teams of middle and high school students build a remote-controlled robot using the LEGO MINDSTORMS™ controller and metal parts. At the competition, two-team alliances square off in successive two-and-a-half minute rounds combining autonomous and operator-controlled play. Each year's game is different, and teams must strategize, design and build their robots accordingly.

Events were also held for elementary school students. About 100 K-3rd graders from the Annapolis area participated in the Junior FIRST LEGO League Expo, with 21 teams building LEGO models with moving parts. In addition, about 50 students in grades 4-8, on 8 teams, participated in a FIRST LEGO League scrimmage. The students had 8 weeks to strategize, design, build, program, test and refine a fully autonomous robot using LEGO MINDSTORMS™ technology.

The success of this event rested on the support of 68 midshipmen from the midshipmen STEM and NSBE (National Society of Black Engineers) groups, who acted as facilitators and judges. "The Mids were extremely helpful and exhibited great attitudes working with the kids," said Bill Duncan, Regional Director of Maryland FIRST. As STEM majors themselves, the midshipmen also served as role models to inspire kids to pursue their interests in STEM.

Focus on Faculty

Angela Moran, Director of the STEM Office and professor in Mechanical Engineering, makes sure that all sorts of STEM events, such as the Robotics Tournament, continue to happen on the yard.

"The reach of the STEM Office is such that we facilitate not only our own STEM events, but act as an umbrella for all types of STEM events at the Naval Academy. The STEM Office and affiliated Midshipman group (M-STEM) support an array of STEM activities such as those sponsored by NSBE, Admissions, Office of Diversity, MAG and the AcDean."

- Angela Moran, Director, STEM Office

Prof Angela Moran teaches students properties of materials

NESA Merit Badge Jamboree

The USNA National Eagle Scouts Association with the assistance of the STEM Office hosted their annual Merit Badge Jamboree for over 500 scouts and 150 scout leaders on January 18, 2014.

Each scout was able to complete the requirements for two badges from STEM choices including Engineering, Chemistry, Aviation, Space Exploration, Computer Science, Nuclear Science, Oceanography, Weather, Electronics, Energy, Radio, Robotics, Medicine, and Electricity.

A new addition this year was a session for scouts attempting to complete requirements for the new NOVA award in engineering, designed to stimulate interest in STEM fields.

All sessions were led by NESA midshipmen using hands-on activities, real world demonstrations and engaging lectures to convey the concepts to the younger scouts.

STEM faculty and staff assisted the event by meeting in advance with the midshipmen merit badge counselors, providing content and activities to enhance the STEM learning aspects, and being on site for the day to provide technical support. Supporting faculty/staff included: B. Baker, L. Becnel, M. Botnick, B. Bruninga, D. Dillner, S. Durkin, D. Jobe, R. Link, T. Lusby, A. Moran, P. Moran, and G. Taylor.

Focus on Faculty

Pat Moran, Division I Senior Professor and Professor of Mechanical Engineering, is active in STEM outreach, and helped facilitate hands-on STEM activities at the NESA Merit Badge Jamboree.

“I enjoy showing students of all ages things that are "cool" and then using those opportunities to explain scientifically why the "cool" things happened. It's fun to see students get excited about something and then want to know why it happened. STEM provides lots of such opportunities if done well. The USNA STEM activities are done very well and being part of them gives me a chance to have an impact on the future of science and engineering in the United States.”

- Pat Moran, Mechanical Engineering

Prof Pat Moran demonstrates principles of corrosion

Mini-STEM: Miami

Students visiting the Naval Academy from 6 high schools in Miami participated in a mini-STEM event on Friday, January 24, 2014.

Led by 10 faculty and 3 midshipmen, 41 visiting students participated in a variety of hands-on engineering design, science, and computer activities in the lab spaces in Rickover Hall. Supporting faculty included: B. Barrett, M. Botnick, D. Brown, J. Cowart, A. Crainiceanu, A. Minut, A. Moran, P. Moran, M. Murray, and G. Richards.

All activities were hands-on: creating and firing straw rockets, engineering design in the Hydro lab, building model houses and testing their ability to withstand high winds, learning Scratch computer programming, creating a webpage, dissecting a sheep heart and measuring your own blood pressure, investigating properties of fluids, studying corrosion, and exploring biometrics.

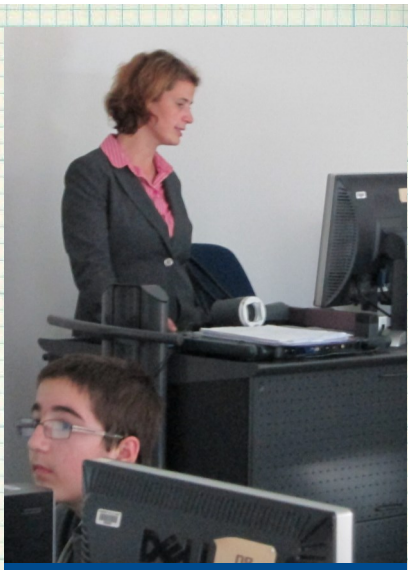
In addition to the modules, all students participated in a discussion on what engineers do, learning about STEM careers. They enjoyed dinner at King Hall with STEM mids, and spent the next day at the Air and Space Museum in Washington, D.C.

14 visiting high school teachers participated in an evening workshop, led by Professor Angela Moran, on project-based learning with a focus on design.

Focus on Faculty

Adina Crainiceanu, Computer Science, developed a STEM module using the ALICE 3D computer simulation, which she leads during summer STEM and throughout the year at Mini-STEM events.

"I am involved in the STEM outreach program because I believe in the benefits and possibly long lasting effects of introducing children to the amazing world of Computer Science. Based on my experience, most of them use computers in their day to day life, but almost none of them know how the applications they use were created and how to create their own programs. I particularly like teaching students to create their own short movies. This combines the usefulness of learning how to program with the fun of playing the animated movies or games they have created. I believe that Computer Science is an important part of our future and exposing the future generations to the basics of computers and programming early gives them a better understanding of the choices they can make later on in life." - Adina Crainiceanu



Prof Adina Crainiceanu leads students in mini-STEM module on ALICE computer simulation

STEM Educator Training

The USNA STEM Office hosted the Spring SET Sail STEM Educator Training Workshop on Saturday, February 1, 2014. 70 STEM K-12 teachers from 50 public and private schools in Maryland and beyond attended the one-day workshop held at USNA, facilitated by 9 faculty/staff and 13 midshipmen. Supporting faculty included: S. Durkin, G. Gray, A. Moran, M. Murray, B. Mutch, C. Nelson and T. Severson.

Teachers participated in hands-on training in a variety of topics, including Engineering Design, Robotics, and Applied Math. At lunchtime, teachers focused their discussion on "Science Fair Success" with an emphasis on best practices.

During the day, participants worked in small groups to build SeaPerch underwater remote operated vehicles, developing the skills they need to set up a SeaPerch program at their own schools. Each group took home a SeaPerch that they built, as well as a sampling of STEM project materials and curriculum content.

"I really enjoyed building the SeaPerch robots," said Anya Keithley, a middle school science teacher from Baltimore City Public Schools, "I learned the engineering design process and got a lot of amazing lab and activity resources for my classroom."

The workshop was an ideal setting for teachers to discover, explore and test ideas for STEM education. Teachers found the activities to be highly applicable to their curriculum and easy to use.

Judith Nelson, a high school Environmental Science teacher from Prince Georges' County Public Schools, realized "STEM application into the classroom is easier than I thought it could be. This [workshop] was so thorough I can't think of anything that was missed."

Focus on Faculty

Gwen Gray, a professor in the STEM Office and a systems engineer, instructed teachers in how to build a SeaPerch at the STEM Educator Workshop.

"Project based learning in any discipline, especially STEM, is essential to the learning process. If we can impart this fact to a teacher, either by inspiring them with new activities to apply to their curriculum or reminding them why kids love to use their hands to learn, then we will not have made an impact on one person but one hundreds. We create champions here who go on to inspire others."

- Gwen Gray, STEM Office

Prof Gwen Gray instructing STEM educators at SeaPerch build

Focus on Faculty

Paul Mikulski, Physics Module

Aurelia Minut, Biometrics Module

John Schedel, Bioloids Module

Scott Davids, Helicopters

Elena Cimpoiasu, Physics Module

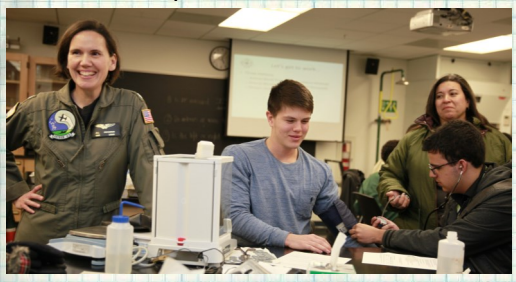
Brad Barrett, Storm Chasing Module

Cecily Steppe, Oceanography Module

Joel Schubbe, Materials Module

Deb Dillner, Chemistry Module

Currie Wooten, Robotics Module



Jill Richards, Heart Module

Dane Brown, Cyber Module

Meredith Botnick, Rocket Module