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Midshipmen & Faculty Impact: STEM Outreach in the Community

Communicating STEM

The USNA STEM Center presented a poster at The Ecosystem of Science Communication: Communicating the Science Solution meeting, hosted by the National Center for Science and Civic Engagement in Washington, D.C. on October 21, 2016. Jennifer da Rosa and MIDN 1/C Courtney Mason presented the poster, Communicating STEM to Educators and Students in Informal Settings Using a Naval-Relevant Message, describing both Mason’s and MIDN 3/C Dante Daniels’ experiences as midshipmen communicating complex STEM concepts to the public during USNA STEM outreach events. The focus was on the importance of near-peer mentorship, communicating naval-relevant connections, and the dual role midshipmen experience as both STEM educators and military members.

MESA Day

USNA STEM partnered with Maryland Mathematics Engineering Science Achievement (MESA) to present two days of STEM activities to over 400 students on November 7 & 18, 2016 at Johns Hopkins Applied Physics Lab in Laurel, MD. Students came from 17 elementary schools in five Maryland counties. On each day, about 30 midshipmen led hands-on activities in topics including robotics, materials science, chemistry, cryptography, hydraulics, and engineering design. Midshipmen introduced students to STEM concepts, connecting complex ideas to everyday applications. Midshipmen developed leadership skills. “I learned to work with different personalities to accomplish a common goal,” shared MIDN 3/C Lindsey Wan, “and also how to motivate different types of people to participate and engage.”

STEM Family Day

On October 22, 2016, over 120 USNA faculty and staff and their families participated in STEM activities led by midshipmen on the lab deck of Rickover Hall. “One of the best things about the experience was seeing officers and professors that I interact with on a daily basis with their families,” shared MIDN 3/C Kristen Skerry, “Getting to teach their children something that they may have taught me was awesome.”

Girls Only STEM Day

Addressing a national need for more young people to pursue careers in critical technology fields, the USNA STEM Center hosted Girls Only STEM Day on October 15, 2016 at the U.S. Naval Academy. Offered twice a year, this day provides middle school girls an opportunity to learn about STEM academic and career paths through engagement in hands-on activities and interactions with women role models in a range of fields. Attended by 300 students, workshop topics included sports medicine, coastal engineering, robotics, weather and climate, applied math, chemistry, and biometrics. The event was facilitated by 42 midshipmen and 20 faculty and staff, including staff from Naval Health Clinic Annapolis. Students participated in an engineering challenge to design and build a self-propelled Martian rover for sand collection. An additional information session, attended by about 100 parents, addressed preparing for college, the importance of a STEM education, nutrition and health, and peer pressure.
Midshipmen & Faculty Impact: STEM Outreach Around the Nation

San Diego Fleet Week

USNA STEM faculty, Professor Mark Murray, and five midshipmen, Dante Daniels, Andrew Lee, Jordan Richardson, Kristen Skerry, and Svetla Walsh, traveled to San Diego’s Fleet Week celebration to participate in a two-day STEM Fair.

The STEM Fair was held at Broadway Pier in downtown San Diego on September 10-11, 2016. USNA presented various modules and hands-on activities to students of all ages as well as families. Activities included creating circuits using conductive dough, coding with colors using Ozobots, investigating the science of fire, exploring magnetism, and engineering aluminum foil boats to understand buoyancy.

“San Diego Fleet Week was a great opportunity for midshipmen to present STEM concepts and activities to families who toured ships as part of the event,” commented Professor Mark Murray, “It was also a good way to convey information about the Naval Academy.” In addition to teaching the modules, midshipmen had the opportunity to discuss the importance of STEM education with many of the high ranking officials that were in attendance.

Mini-STEM Event

Thirty-six high school students, visiting USNA from St. Louis, MO as guests of the Office of Admissions, participated in a mini-STEM event presented by the USNA STEM Center on Friday, September 30, 2016. Following a tour of academic and laboratory spaces, students participated in interactive, hands-on modules, including buoyancy and boats, robotics and programming, and materials engineering. Modules were led by USNA STEM faculty, Professor Aurelia Minut, CDR John Schedel, CDR Brad Baker, and six midshipmen.

GM Tech Center STEM Day

USNA STEM faculty, Professor Mark Murray, CAPT Len Hamilton, and LT Kevin Burnett, and six midshipmen, Shannon Gorman, Juni Kim, Steven Gutierrez, Patrick McMahan, Ross Cano, and Colby Sciarrella, traveled to the GM Tech Center in Warren, Michigan for a STEM outreach event. The STEAM (Science, Technology, Engineering, Art, and Mathematics) event was sponsored by General Motors for 125 high school juniors from inner city Detroit, in collaboration with the USNA STEM Center and the Office of Admissions.

The midshipmen ran a STEM module which included making both an aerodynamic paper airplane and a catapult to launch it into flight. After the module, they accompanied high school groups as they participated in STEAM activities led by GM, including building a battery, touring the wind tunnel, and watching a 3D printing demonstration.

“I believe it was incredibly impactful to see what kind of an influence we had on the high school students,” shared MIDN 2/C Shannon Gorman, “Some students had never heard of the Naval Academy before and I believe that we left a very positive impression. While not everyone will study engineering, it is important to understand the significance of STEM fields and how ‘thinking like an engineer’ can benefit everyone.”
Supporting DoD STEM Outreach

STEM Outreach Workshop: Pearl Harbor

Educators from across Hawaii joined scientists and engineers from Pearl Harbor Naval Shipyard to participate in a STEM workshop at the NOAA Inouye Regional Center on Ford Island, Honolulu. The two-day program, held on October 3-4, 2016, focused on project-based learning using multidisciplinary STEM topics and engineering design. Topics, presented by Professors Angela Moran and Patrick Moran, included sensors, programming and robotics, corrosion, sound, light, and ocean physics, and engineering applications. Emphasis was placed on building the STEM community of teachers and Navy personnel in the local area. Leeward Oahu District Public School teacher Carrie Laforteza commented, "I just wanted to thank you again for the awesome workshop! I learned so much and am so excited to implement the lessons with my students. It truly was the best workshop I have attended!"

STEM Workshop: Quantico

On October 17, 2016, USNA STEM presented a workshop at Naval Health Clinic Quantico for personnel from Naval Health Clinics in Quantico and Annapolis, Marine Corps Systems Command, along with teachers from DoDEA Quantico and Prince William County Public Schools, as part of an effort to grow the STEM community. Participants learned how to use hands-on activities to present STEM topics including biomedical engineering, sound waves, optics, and sensors. One teacher commented, "I learned some great practical activities that could be adapted to our STEM program. I also learned that schools and military can work with each other to bring STEM to kids."

STEM Outreach Workshop: NRL Washington DC

Scientists, engineers, and staff members from the Naval Research Laboratory in Washington, D.C. came together with School Liaison Officers from Naval District Washington at a workshop aimed at exploring methods for STEM outreach. Held on October 18, 2016, USNA STEM faculty, Professors Sarah Durkin, Angela Moran, Patrick Moran, and Mark Murray, presented an interactive, hands-on approach for engaging youth in complex topics including corrosion and electrochemistry, fluids engineering, mechanics and materials, and engineering design. Participants explored how to scale activities for audiences of different ages. Staff at NRL will use the methodology and tools learned at the workshop as they continue to develop STEM outreach programs in the community.

Cyber Ops Workshop

As part of an ongoing effort sponsored by the Office of Naval Research, the USNA STEM Center conducted STEM Outreach Training for Naval Scientists and Engineers from commands across the country in support of the Naval STEM community.

On November 14, 2016, a training workshop was held on site at USNA which focused on the science and engineering aspects of cyber operations, led by USNA STEM staff Rachel Fees. Sessions were offered in both "plugged" computer-oriented activities as well as hands-on, offline "unplugged" learning modules, developed by USNA STEM Center faculty and staff for all grade levels.

The workshop introduced attendees to project-based learning and covered topics including encryption and decryption, hashing, phishing, use of sensors and Arduino microcontrollers, password hacking, binary counters and logic gates, and engineering design. Additional curriculum support was provided by USNA STEM faculty, Professors Chris Brown, Don Needham, and Christine Maceo.
On September 24, 2016, USNA STEM hosted a day-long SET Sail workshop for STEM educators. Held twice a year at the U.S. Naval Academy, this professional development was attended by 114 K-12 teachers from 86 public and private schools in 18 counties and cities in Maryland and beyond. Ten faculty and staff, including Professor Christine Maceo, Professor Charles Nelson, CDR Janice Rice, and CDR Hite Spencer, led hands-on lessons in the theme of “Cyber Ops”, with support from 25 midshipmen. Topics included encryption and decryption, electronics and soldering, robotics and coding, cyber security, and malware. Teachers participated in an engineering design challenge, using simple machines to construct a physical logic gate for a marble input. The experience demonstrated how to develop lessons to promote problem solving and other skills.

The workshop was an ideal setting for teachers to discover, explore, and test ideas for effective and engaging STEM education. Teachers found the activities to be highly applicable to their curriculum and easy to use. “This is the best training I have ever participated in because it gives me the theoretical knowledge and practical tools and worksheets to replicate these activities in the classroom,” shared Andrew Lantos, a Technology Educator from Baltimore County. Ailsa White, from Nashville, NC, commented that the training “recharged me and gave me the energy and knowledge to motivate my students’ learning with hands on activities that are relevant today.” The workshop inspired many teachers to bring this style of hands-on learning back to their own classrooms.

SeaPerch/NOAA Baltimore County
On September 20-21, 2016 USNA STEM went to Parkville High School in Baltimore County, to teach 19 teachers from Baltimore City, Baltimore County, and Charles County about NOAA’s ocean exploration strategy and how to build a SeaPerch underwater remotely operated vehicle (ROV). Teachers tried projects for use in the classroom including building sensors, analyzing water samples, and simulating multibeam SONAR. Teachers worked in teams to construct a SeaPerch ROV, practicing skills such as PVC pipe cutting, drilling, and soldering. "As an educator, I can now use real life examples of ocean exploring to teach engineering lessons," commented one teacher. In the end, all of the teams successfully launched their ROVs in a local pool, and are well equipped to bring engineering projects to the classroom.
STEM Educator Workshop: Albuquerque

The Albuquerque BioPark was the site of the second STEM Educator Workshop in New Mexico, involving about 25 educators from 18 different schools. The two-day workshop, led by Professors Angela Moran and Patrick Moran, was held on September 30-October 1, 2016, and provided experience for teachers in hands-on, project-based learning methodology. Educators were introduced to skill sets required to build SeaPerch underwater remotely-operated vehicles (ROVs), as well as resources to extend the applications in related science and engineering topic areas. Projects included investigating physical and chemical properties of water and using sensors to test the environment. A module on corrosion and electrochemistry showcased Navy and real world applications, and another session used hands-on activities to explore sound, light, and ocean waves. A final session on engineering design allowed teachers to apply their new skills and resources.

Detroit Area Educator Workshop

As part of an ongoing commitment to support the STEM community in Michigan including the Detroit, Warren, and Flint areas, USNA STEM presented workshops to train teachers in hands-on, project-based learning methodology. The workshops were part of the Detroit Area Council of Teachers of Mathematics (DACTM) and the Metropolitan Detroit Science Teachers Association (MDSTA) annual conference held on November 5, 2016. USNA STEM faculty and staff, Beth Waitkus and Jennifer da Rosa, presented workshops focused on the theme of natural disasters, and teachers learned how to analyze seismograms to locate an earthquake’s epicenter, to build and calibrate a tilt meter to measure changes on a volcano, to investigate a decline in fish populations due to overfishing, and to measure the features of an impact crater.

STEM Educator Workshop: Philadelphia Regional Noyce Partnership

On December 17, 2016, USNA STEM faculty, Professors Sarah Durkin and Angela Moran, presented at the Project-based Learning in the STEM Classroom professional development hosted by the Philadelphia Regional Noyce Partnership. This organization, sponsored by the National Science Foundation, supports undergraduate STEM majors to become K-12 math and science teachers in high-need schools. The training, held at the Workshop School in West Philadelphia, was attended by 30 educators from the region. USNA STEM presented an opening session for all attendees, taking teachers through a series of short projects to be used in the classroom, with an emphasis on engineering practices and real world applications. Projects included probability analysis with paper whirligigs, bioengineering a heart valve, designing a hydraulic actuator, and building a conductivity meter. A smaller group of teachers attended a second session by USNA STEM, focusing on an engineering design challenge to move an object using a series of simple machines. Teachers learned how to effectively incorporate engineering in the classroom with limited resources.
### Upcoming Events

#### Spring 2017

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| **Jan** | • NESA STEM Merit Badge Jamboree, USNA, Jan 14  
• FIRST Tech Challenge Robotics Tournament, USNA, Jan 20-22  
• STEM Educator Workshop, Miami-Dade, FL, Jan 23  
• Oxon Hill Middle School STEM Night, Fort Washington, MD, Jan 26 |
| **Feb** | • Baltimore Building STEPS Mini-STEM, USNA, Feb 7  
• STEM Educator Workshop, Tulsa, OK, Feb 8  
• STEM Educator Workshop, Dayton, OH, Feb 17-18  
• “SET Sail” STEM Educator Workshop, USNA, Feb 25 |
| **Mar** | • San Diego Festival of Science & Engineering, San Diego, CA, Mar 4  
• Girls Only STEM Day, USNA, Mar 4  
• Best Practices in STEM Workshop, Great Lakes, MI, Mar 14-15  
• Prince George’s County Science Fair, Springdale, MD, Mar 18  
• Baltimore Science Fair, Towson, MD, Mar 25 |
| **Apr** | • STEM Day, Infinity Science Center, Pearlington, MS, Apr 7  
• Maryland Regional SeaPerch Challenge, USNA, Apr 8  
• DoDEA STEM Educator Workshop, Japan, Apr 20-24  
• Junior Science & Humanities Symposia (JSHS), San Diego, CA, Apr 26-30 |
| **May** | • SeaPerch Showcase, USNA, May 5  
• STEM Outreach Workshop, USS Turner Joy, Bremerton, WA, May 12-13  
• Intel International Science and Engineering Fair (ISEF), Los Angeles, CA, May 14-19  
• STEM Outreach Workshop, Pensacola, FL (TBA) |