

Spring 2014

**USNA STEM  
HITS THE ROAD**

# STEM

UNITED STATES NAVAL ACADEMY



- Teacher Training Feb 14 [Cleveland, OH]
- Mini-STEM from Memphis Feb 21 [Annapolis, MD]
- Liberty Science Center Feb 28 [Newark, NJ]
- Girls STEM Day Mar 1 [Annapolis, MD]
- STEM Spring Break Mar 8 [Kentucky]
- USNA Polar Science Program Mar 12 [Barrow, AK]
- STEM Spring Break Mar 14 [Illinois/Michigan]
- Mini-STEM from Michigan Mar 21 [Annapolis, MD]
- San Diego Sci. & Eng. Festival Mar 22 [San Diego, CA]
- Perot Museum of Sci. & Nature Mar 27 [Dallas, TX]
- SeaPerch Challenge Apr 5 [Annapolis, MD]
- USA Sci. & Eng. Festival Apr 25-27 [Washington, DC]
- SeaPerch Showcase May 2 [Annapolis, MD]

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# Teacher Training: Cleveland, OH



USNA and NOAA presented a SeaPerch/NOAA Ocean Exploration Workshop for Educators of Grades 5-12, held at the Greater Cleveland Aquarium.

Naval Academy professors, Angela and Pat Moran, traveled to Cleveland to lead an all-day SeaPerch workshop for 15 teachers from Ohio and Michigan schools. SeaPerch is an underwater remotely oper-

ated vehicle (ROV) program. Participants learned the necessary skills to start a SeaPerch program at their schools, and built their own SeaPerch ROVs that day. Teachers received SeaPerch supplies, and a collection of activities and lesson plans.

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

February 14, 2014

*The Cleveland teachers were very receptive to our new format— the collaboration with NOAA is a new adventure for the STEM Office. Currently our SeaPerch underwater robotics training sessions for educators have included complimentary, Navy-relevant curriculum, but adding the NOAA activities in underwater exploration really rounds out the workshops. The Cleveland teachers got a complete experience in ocean exploration and a wonderful two days at the Cleveland Aquarium. We will be offering more of these collaborative workshops in the future.*

*- Prof. Angela Moran, Director, STEM Office*



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**SeaPerch/NOAA**

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**Teacher Training**

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**Cleveland, OH**

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# Mini-STEM: Memphis, Baltimore, Arlington

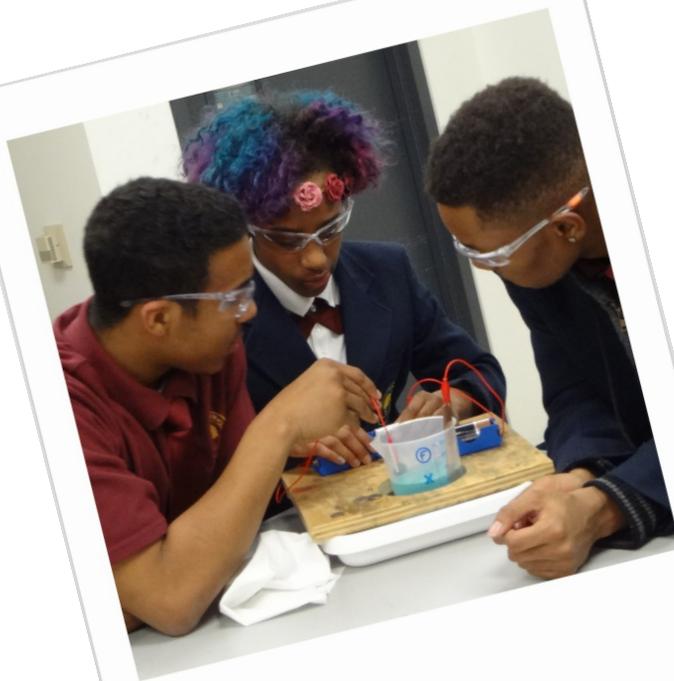
High school students visiting the Naval Academy from Memphis participated in a mini-STEM event on Friday, February 21.

Another mini-STEM event was held on Friday, March 21, for high school students visiting from the SEED School of Maryland in Baltimore, KIPP Baltimore, and St. Charles School in Arlington, VA.

Students participated in a variety of interactive,

hands-on modules, covering a wide range of STEM topics.

In addition to the modules, students participated in a discussion on what engineers do, learning about STEM careers. They enjoyed interacting with STEM mids while dining at King Hall for dinner.

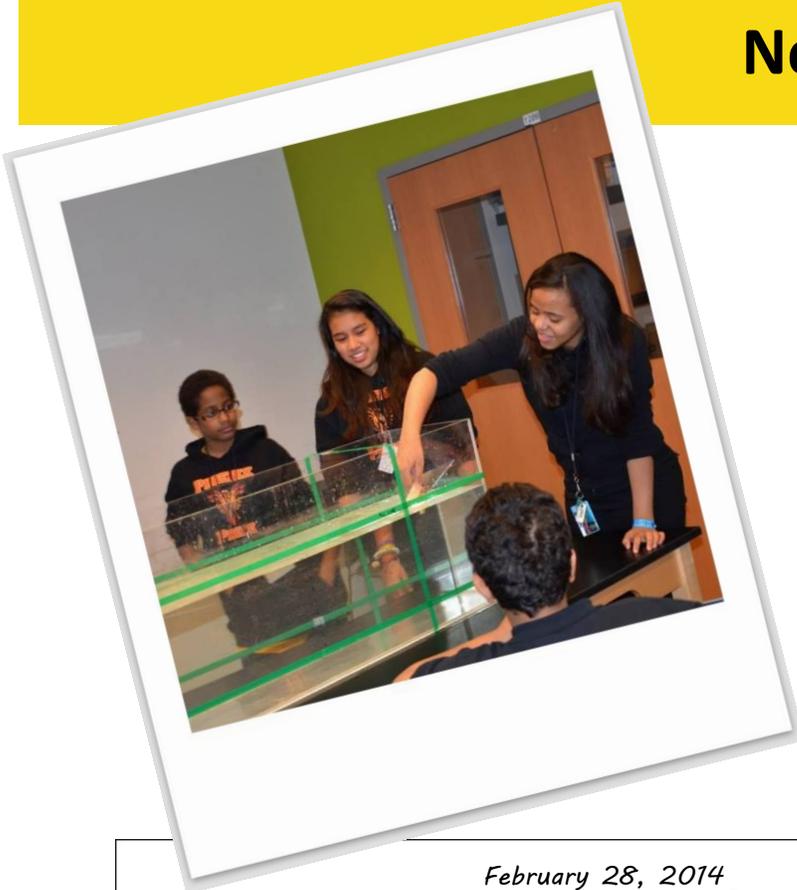


Hands-on activities were offered and covering a wide variety of STEM fields, including:

Engineering design of balloon-powered boats in the Hydro lab, building model houses and testing their ability to withstand high winds in the Aero Lab, learning Scratch programming in the Computer lab,

launching rockets, building model houses and testing their ability to withstand high winds in the Aero Lab, learning the fundamentals of Biometrics, investigating electrochemistry and corrosion, and dissecting a sheep heart and measuring blood pressure in the Biology lab.

# Liberty Science Center: Newark, NJ



New Jersey middle school students learned what it takes to be an engineer at a STEM Day hosted by the Liberty Science Center (LSC) in partnership with USNA.

100 students from Infinity Institute in Jersey City and Science Park High School in Newark participated in a full day of STEM activities led by 8 USNA midshipmen and faculty members, Gwen Gray and Richard O'Brien, along with LSC educators.

underwater exploration, fluid dynamics, materials properties and engineering, as they designed and built different kinds of gliders. Students competed individually to build hoop gliders that soar through the air, made only of straw and paper. Then, they worked in teams to design and build underwater gliders out of a variety of materials.

Students learned firsthand the process of engineering, and greatly enjoyed the challenge.

Students learned about

*February 28, 2014*

*We explained some of the basic principles [of underwater gliders] such as ballast, lift, and rudder/flap control to different groups of kids, then one student from each of those groups came together to form a design team for the competition. Each student had a different area of expertise, and when working together students were able to use all of these principles to make the best possible underwater glider. The areas of expertise involve all students in the design process so no one dominates and the competition keeps it fun and intriguing.*

*- MIDN 3/C Zachary Dannelly*



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**STEM Day**

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**Liberty Science Center**

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**Newark, NJ**

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# Girls STEM Day: Annapolis, MD

250 middle school girls of diverse backgrounds from Maryland, Washington D.C., Virginia, Pennsylvania, New Jersey and Delaware attended a Girls-Only STEM Day held at the Naval Academy on Saturday March 1<sup>st</sup>. A full day of hands-on workshops were offered as part of an on-going effort to encourage young women to pursue education and careers in STEM.

Activities included: Astronomy, Biomedical Engineering, Biometrics, Bioterrorism, Bridge Building, Flight, Hydraulics, Physics, Robotics, and Rockets.

At the end of the day, students worked in teams on an engineering design challenge in which they competed to create a vehicle to deliver "food aid" to a simulated island nation in "Girlandia".

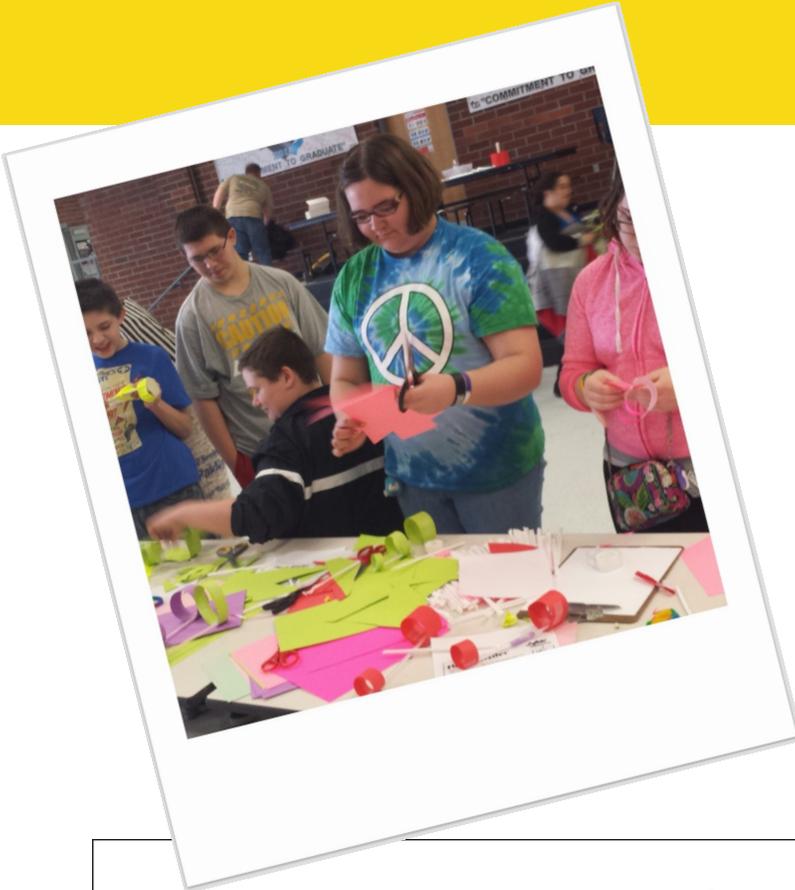
While the students were engaged in science experiments and engineering challenges, their parents had the opportunity to attend a workshop targeted at raising a girl in today's competitive world.



Activities for the day were led by 16 female faculty/staff members and 32 midshipmen, who serve as leaders and role models in STEM fields. As practicing scientists and engineers, these women were able to introduce students to STEM careers and present real-life applications, while also guiding students through hands-on experiments and engi-

neering design activities. The middle-school girls who attended became actual scientists, engineers, and technologists for the day. At the end of the day, motivated by the activities they participated in and the inspiring women they met, each girl finished the statement, "I want to be..." and imagined a future where anything is possible.

# STEM Spring Break: Kentucky



During Spring Break, MIDN 3/C Catherine Thompson and MIDN 2/C Jennifer Pendleton traveled to Kentucky to facilitate STEM outreach activities at Muhlenberg High School.

Students learned engineering principles by building hoop gliders and catapults. They explored buoyancy as they were challenged to create a neutrally buoyant object out of styrofoam and small

weights.

The event was also a leadership opportunity for 8 Kentucky high schoolers, who were trained a day in advance by the midshipmen to act as additional facilitators during the STEM Day.

The mids encouraged the students to take ownership of the activities and prepared them to run the stations. The mids did their job well, and the event was a success for those who attended.

*March 8, 2014*

*Despite the challenge of bad weather in the days leading up to our event, Mulhenberg County High School was ready to put on a great science fair. The faculty and high school students were very active in organizing the fair and excited that the midshipmen were there to help. The middle school students were very engaged in the projects and fascinated by the demonstrations. Overall, even though turn out was smaller than expected, the event was a success.*

*—MIDN 2/C Jennifer Pendleton*



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***STEM Day***

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***Muhlenberg High School***

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***Kentucky***

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# USNA Polar Science Program: Barrow, Alaska

During Spring Break, midshipmen from the USNA Oceanography Department's Polar Science Program traveled to Barrow, Alaska for a science expedition. As part of the trip, four mids spent a day engaging students in hands-on STEM activities at Barrow High School.

The mids were accompanied by Dr. Pablo Clemente-Colon, Chief Scientist at U.S. National/Naval Ice

Center, and Dr. Ignatius Rigor, from the University of Washington Polar Science Center and Coordinator of the International Arctic Buoy Programme.

The students tested SeaPerch underwater remote-operated vehicles, built mini-buoys, and explored buoyancy.



*March 12, 2014*

*Visiting the Barrow High School and talking about science with kids that someday will become scientists or even maybe Naval Officers was a good motivation to continue working on these types of projects that help developing relationships with the community.*

*- MIDN 1/C Jose Cordova*



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***STEM Day***

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***Barrow High School***

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***Barrow, AK***

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# STEM Spring Break: Illinois and Michigan

During Spring Break, LT Meredith Botnick, professor in the USNA Aerospace Engineering Department, traveled across Illinois and Michigan to promote STEM outreach, and was joined by 3 midshipmen.

LT Botnick brought STEM activities to 3 schools in Illinois, before meeting the mids in Chicago. After a day at the science museum, they traveled to Albion, MI to run a Girls STEM camp at Albion Junior High

School.

They trained a dozen 7th-8th grade girls as leaders, to run STEM modules. The following day, 60 girls from 4th-8th grades attended the day-long camp. The USNA group led a variety of modules, including the science behind tie dye, non-Newtonian fluids, Lego robots, and Vet Neuroscience.



*March 14, 2014*

*I enjoyed helping the girls learn about science and math. They had no idea that tie-dying a t-shirt was chemistry. I learned a lot about how others see themselves based on the environment that they are raised in. I also learned a new way to multiply from a seventh grader. - MIDN 1/C Whitney Heer*

*Being a part of this program was a great opportunity for me. Many of the students admitted to never looking at STEM in the way that we showed it to them, and they said it was a lot more interesting than they imagined. -MIDN 1/C Cullen Hanks*



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**STEM Spring Break**

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**4 cities in Illinois**

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**Albion, MI**

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# San Diego Science & Engineering Festival



Naval Academy faculty member, Mark Murray, Mechanical Engineering, along with 6 midshipmen, traveled to San Diego, CA to host a booth at EXPO Day on March 22. EXPO Day, held at PETCO Park, is the San Diego's Science and Engineering Festival's culminating event with over 130 organizations providing interactive, hands-on activities showcasing STEM.

More than 1200 kids along with their parents

visited the USNA STEM booth at the fair. In a short time, kids had a chance to learn what it's like to be a scientist or an engineer.

"I was able to share my passion for the sciences and for my major in a casual setting," said MIDN 3/C Montana Geimer.

MIDN 3/C Luke Riewestahl added, "The reason I love doing STEM is seeing the kids experience the 'light bulb moment' when their eyes light up after seeing an experiment."

*March 22, 2014*

*Demonstrating science experiments with the students of San Diego to discover what was happening and how it was happening was an awesome experience. As if the science we were showing was a puzzle, each and every kid thought their way through the problem... no matter how right or wrong. After guidance from a Midshipman, they were empowered knowing that they came to a conclusion on their own. This type of hands-on learning was an incredible experience of which I was fortunate to be a part.*

*—MIDN 3/C Rylan Tuohy*



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*Science & Engineering*

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*Festival*

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*San Diego, CA*

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# Perot Museum of Science & Nature: Dallas, TX



Dallas high school students stepped into the role of scientists and engineers at a STEM Day hosted by the Perot Museum of Nature and Science in Dallas, TX, in partnership with USNA.

100 Junior ROTC students, from 13 Dallas area schools, participated in a full day of STEM activities led by 6 USNA midshipmen and faculty members, Angela Moran and Patrick Caton, along with Perot Museum

educators.

Students learned about aerodynamics, helicopters, wind energy, and engineering, using hands-on activities. They designed and built hoop gliders, model airplanes, paper 'whirligigs', and wind turbines.

Students learned first-hand the science of flight and the process of engineering, and greatly enjoyed the challenge.

*March 27, 2014*

*The JROTC students from the Dallas school districts were a great group, and many seemed highly motivated. I think our team of midshipmen and faculty were able to engage them really well with short engineering experiences and get some of them thinking more about science and engineering in college.*

*—Prof. Patrick Caton, Mechanical Engineering*



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*Perot Museum of*

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*Science & Nature*

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*Dallas, TX*

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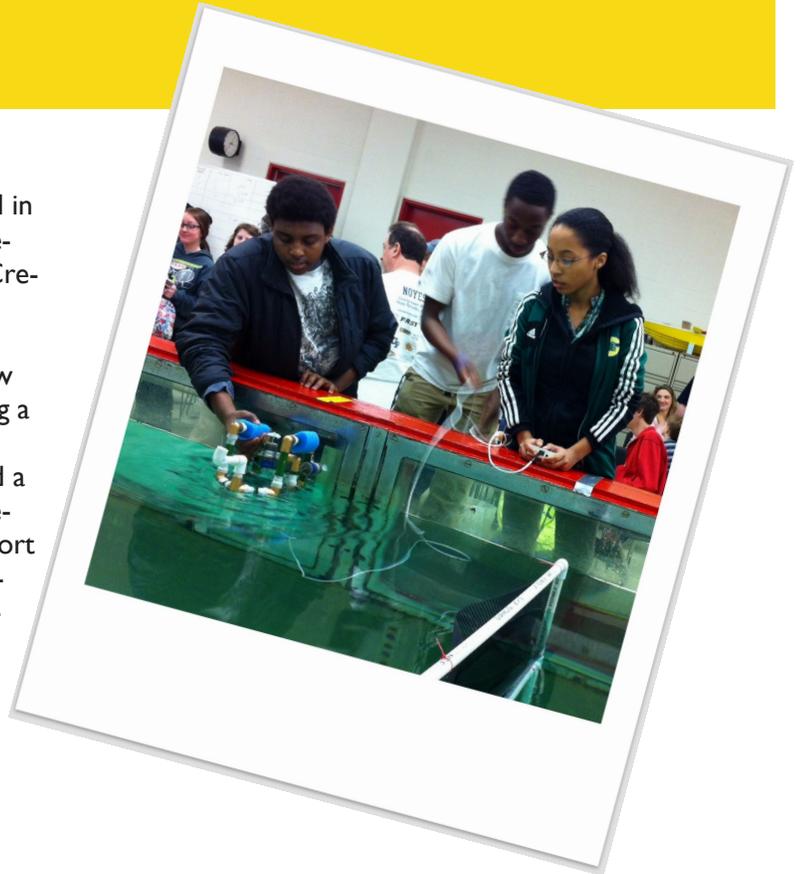
# SeaPerch Regional Challenge: Annapolis, MD

135 teams from 35 middle and high schools in Maryland, Virginia, and Washington, DC traveled to the Naval Academy to compete in the Maryland Regional SeaPerch Challenge. With up to 5 students per team, there were 440 students, 39 teachers, and numerous parents and supporters in attendance. The event was supported by 25 faculty, staff and volunteers along with 20 midshipmen.

SeaPerch is an underwater remote operated vehicle, built by the students prior

to the competition.

Each team was evaluated in 3 categories: Launch, Design & Teamwork, and Creativity & Engineering. At the launch, teams tested their SeaPerch in the tow tank in missions including a speed trial and obstacle course. Teams answered a series of questions to determine their level of effort and understanding of design, concepts and teamwork. Mids also judged each SeaPerch on aesthetics, robustness and creativity.



At the end of the day, the 10 top-scoring teams competed in the final competition. In this trial, known as "The Heist", a mesh vault wall with a latched door was set up across the lane in the tank. On the other side of the wall, there were boxes of various weights with handles, waiting to be retrieved. Competitors had to maneuver their SeaPerch to lift the latch

and push open the door to the vault, retrieve one box at a time, bring it back through the door of the vault and to the surface at the starting line. A challenging task, one team managed to retrieve four boxes.

The top 10 teams were invited to compete at the National SeaPerch Challenge in May at the University of Southern Mississippi in Hattiesburg.



# USA Science & Engineering Festival: Washington, DC



A robot doing pushups. Underwater gliders. Building electrical circuits with play dough. Blowing up marshmallows. These were some of the things students and families got to see and do at the USNA STEM booth during the 3<sup>rd</sup> annual USA Science & Engineering Festival. The 3-day event, held April 25-27 at the Convention Center in Washington, DC, was attended by more than 325,000 visitors.

Visitors to the USNA

STEM booth participated in a variety of hands-on activities designed to excite students about STEM. 48 midshipmen and 8 faculty members staffed the booth, interacting with thousands of visitors of all ages.

The mid volunteers excelled at explaining STEM concepts to visitors using engaging activities. They also serve as role models and inspiration for youth who may contemplate a STEM career.

*April 27, 2014*

*Volunteering at the Science Festival was my first experience with STEM outreach. Without a doubt it was one of the most rewarding experiences I've had thus far at the Academy. The interest and engagement of the children and adults as I explained different processes was truly humbling. STEM is on the rise and I'm glad to have even had a small part in it!*

*- MIDN 2/C Corey Grey*



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***USA Science & Engineering  
Festival***

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***Washington, DC***

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# SeaPerch Showcase: Annapolis, MD

The Naval Academy hosted a SeaPerch Showcase on May 2<sup>nd</sup>. 5th grade students from 27 public schools in Anne Arundel and Prince George's County were invited to test their SeaPerch, an underwater remote operated vehicle that they have built during the year at their schools.

360 students, accompanied by 30 teachers as well as parents and chaperones, spent the day doing hands-on STEM activities. 33 faculty, staff and volunteers along with 5 midshipmen led the activities.

Students launched their own SeaPerch in the tow tank, tested it in a speed trial and obstacle course, and maneuvered it to retrieve floating rings. For many groups, this was the first time they tested their SeaPerch in the water. Staff was on hand to assist groups in needed repairs and last-minute fixes, so that every group had a successful trial.



Students participated in additional STEM challenges throughout the day. Students were challenged to engineer neutrally buoyant “flinkers”, designed to neither float nor sink.

In another activity, students designed rockets made of straws. Shouting, “Fire in the hole!”, students used compressed air to launch their rockets at a target.

During the day, stu-

dents also visited the Naval Academy Museum, and completed a STEM scavenger hunt. They answered questions about objects in the museum relating to STEM topics.

The event was a wonderful culmination for these students, who worked hard this year on building their own SeaPerch and are growing into young engineers.

*Many thanks to NDEP, ONR,  
DoDEA, OSD and  
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