



STEM²Stern

Opening Minds • Capturing the Future

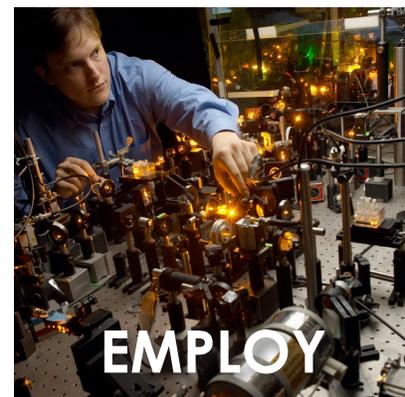
SECURING OUR FUTURE:

The Naval Science, Technology, Engineering, and Mathematics (STEM) Workforce



A Strategic Approach

June 2011





MESSAGE FROM THE SECRETARY OF THE NAVY

The Department of the Navy currently enjoys a high level of technological superiority across the full spectrum of its missions. To maintain this technological superiority, we must nurture a world-class Science, Technology, Engineering and Mathematics (STEM) workforce able to contribute to, and support, a culture of innovation. I am committed to the Department's aggressive leadership role in STEM education, to improve the quality and the quantity of the future STEM workforce, from which we will draw future Sailors, Marines, Engineers and Scientists.



The need is clear -- large numbers of Naval STEM professionals will be retiring over the next few years, and fewer American students are graduating with the preparation and interest needed to pursue STEM careers.

In FY 2010, the Navy portfolio included over \$54 million in direct investments as well as an additional \$20 million from the Department of Defense spread across 180 STEM programs nation-wide. An additional \$108 million was invested annually to support domestic graduate students and research assistants under research grants to academic institutions. These investments are significant but not sufficient. As a result, I have committed to doubling the Department of the Navy's direct investment in STEM over five years, to more than \$100 million dollars.



This Strategic Roadmap presents a path forward for the Navy and Marine Corps – a way to increase our impact on STEM education. This plan provides strategies to address gaps and weaknesses in the current Naval STEM portfolio, and includes exciting new programs that will help increase participation by students and teachers. As the Naval STEM Executive, the Chief of Naval Research will continue to align service-wide STEM education and outreach efforts using this Roadmap as a guide.

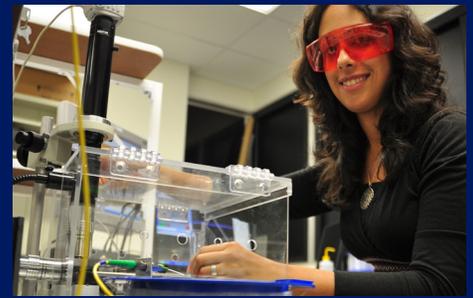
I challenge each of you to enter the discussion and consider how you can take bold steps to partner with us to expand, enhance and increase the effectiveness of the nation's investments in STEM education. More importantly, I challenge you to remember what first excited you about STEM subjects and to consider how the experiences and technologies of tomorrow can inspire the same excitement in our future scientists and engineers.

A handwritten signature in blue ink that reads "Ray Mabus".

The Honorable Ray Mabus
Secretary of the Navy

SECURING OUR FUTURE THE NAVAL STEM WORKFORCE

A Strategic Approach



Recognizing that a healthy Science, Technology, Engineering and Mathematics (STEM) workforce is critical to meeting the Navy and Marine Corps' greatest challenges, the Department of the Navy is committed to doubling its investment in STEM over the next five years. This commitment answers a national call by President Obama to improve our country's STEM education over the next decade.

"Reaffirming and strengthening America's role as the world's engine of scientific discovery and technological innovation is essential to meeting the challenges of this century. That's why I am committed to making the improvement of STEM education over the next decade a national priority."

-- President Barack Obama

The Department of the Navy's STEM Roadmap is built around five priorities that combine best-in-class experiences for students along-side the needs of the Navy for a STEM workforce pipeline. Initiatives include exciting new programs that will increase participation by students and teachers, allow for hands-on and meaningful learning experiences, and meet the underserved where they live. The five priorities are:

- **Inspire** the next generation of scientists and engineers.
- **Engage** students and build their STEM confidence and skills through hands-on learning activities that incorporate Naval-relevant content.
- **Educate** students to be well prepared for employment in STEM careers that support the Navy and Marine Corps.
- **Employ**, retain and develop Naval STEM professionals.
- **Collaborate** on STEM efforts across the Department of the Navy, the Federal government and best practice organizations.

In support of these STEM priorities, our STEM portfolio includes:

1. High-engagement, long-duration, and hands-on learning K-12 programs, particularly at the middle school level.
2. Programs and practices that target under-represented populations.
3. Naval-relevant content as an integral part of programs.
4. Programs that improve student interest, confidence and retention in STEM.
5. Teacher training and development programs.
6. Partnerships with "Best Practice" programs.
7. Programs that transition the Navy's cutting edge educational technologies into real-world settings for students of all ages.
8. Bridging mechanisms that keep students engaged from early contact through graduation and allow for a continuum of experiences and opportunities.
9. Simple, practical and effective metrics.

"The success of the United States in the 21st century – its wealth and welfare – will depend on the ideas and skills of its population... STEM education will determine whether the United States will remain a leader among nations and whether we will be able to solve immense challenges in such areas as energy, health, environmental protection, and national security. It will help produce the capable and flexible workforce needed to compete in a global marketplace. It will ensure our society continues to make fundamental discoveries and to advance our understanding of ourselves, our planet, and the universe. It will generate the scientists, technologists, engineers, and mathematicians who will create the new ideas, new products, and entirely new industries of the 21st century. It will provide the technical skills and quantitative literacy needed for individuals to earn livable wages and make better decisions for themselves, their families, and their communities. And it will strengthen our democracy by preparing all citizens to make informed choices in an increasingly technological world."

-- President's Council of Advisors on Science and Technology (PCAST)
Report to the President on K-12 STEM Education



PRIORITY 1: INSPIRE

the next generation of scientists and engineers, as well as their parents and teachers.

The Navy's *Inspire* programs are targeted towards students, parents and teachers from across the nation in an effort to raise the awareness and importance of STEM from a very young age. These programs are meant to reach a large number of young, diverse students and inspire them to further explore STEM education and opportunities.

We Will:

- Provide best practice *Inspire* programs aimed at capturing the imagination of young students.
- Expand the number of participants reached through our *Inspire* programs, with a focus on increasing diversity and inclusiveness.
- Increase the number of Naval volunteers in STEM programs.
- Develop mechanisms for effectively bridging from *Inspire* to subsequent *Engage* programs.

The Naval Service already reaches a significant number of young students through its short-duration *Inspire* programs, and therefore, the priority for the *Inspire* programs will be to expand their inclusiveness and impact on under-represented populations. In addition, significant priority will be given to creating clearly defined pathways for students to bridge from *Inspire* to *Engage* opportunities.



PRIORITY 2: ENGAGE

students and build their STEM confidence and skills through hands-on learning activities that incorporate Naval-relevant content.



Many students--particularly from underserved populations (including minorities, females, and students from urban and rural settings)--make decisions by the end of middle school to opt out of STEM education. It is therefore critical to **Engage** students no later than middle school by offering them a variety of hands-on learning opportunities and mentoring experiences, building their STEM confidence and encouraging them to pursue the math and science classes needed to make them STEM eligible in college.

We Will:

- Provide hands-on, long-duration learning programs for students in urban and rural areas using Naval themes and content.
- Develop expanded internship program options for high school juniors and seniors, as well as undergraduate freshman and sophomore students.
- Expand the number of participants across all **Engage** programs, with a focus on increasing diversity and inclusiveness.
- Leverage the resources of our shore commands – especially the Systems Commands, Warfare Centers and Laboratories – by offering expanded hands-on and experiential programs to students and leveraging the expertise of our scientists and engineers.
- Expand STEM programs for teachers and educators, using Naval themes and content, tied to curriculum goals.
- Build formal and informal strategic partnerships with STEM education providers to leverage resources, share best practices, and identify participants.

Long-duration **Engage** programs will be a major area of emphasis over the next five years. Important programmatic gaps have been identified in the current **Engage** portfolio, most notably long duration, high engagement program options for middle school students, as well as appropriate programmatic options for grades 6-12.





PRIORITY 3: EDUCATE

students to be well prepared for employment in STEM careers that support the Navy and Marine Corps.

The Naval **Educate** priority is devoted to developing outstanding STEM professionals at all levels, with Naval-relevant knowledge and skills, so that a meaningful share of this world class STEM talent transitions into the Naval STEM workforce.



We Will:

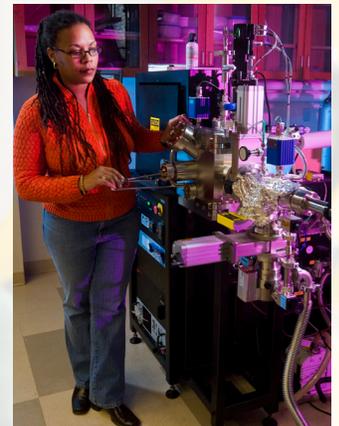
- Support programs aimed at reducing the attrition of STEM students during their first two years of college.
- Expand high-performing STEM **Educate** programs, such as co-ops and fellowships, to reach more students.
- Ensure that our Higher Education STEM programs develop and enhance specific Navy-relevant STEM knowledge and skills, including National Naval Responsibility skills.
- Expand new program options for masters-level students.

Currently, key **Educate** programs support only a few hundred participants annually. A top priority for the Naval **Educate** portfolio will be to target college freshmen and sophomores to help ensure that they finish their STEM degrees. In addition, these programs will seek to ensure that the production of STEM graduates is aligned with Naval workforce needs.

PRIORITY 4: EMPLOY,

retain and develop Naval STEM professionals.

Ensuring the development of the Navy's sustained technological superiority will require a stable workforce and a culture of innovation and continuous learning. Accordingly, the Navy and Marine Corps will support, develop and encourage high potential STEM professionals and faculty researchers through a variety of professional development opportunities.



We Will:

- Continue to provide research opportunities for outstanding faculty researchers, and cultivate a network of world-class academic research institutions willing to collaborate with the Navy and Marine Corps.
- Foster a culture of continuous learning within the Naval science and engineering community by providing specialized research and educational opportunities for high potential employees.
- Cultivate a STEM workforce that reflects the demographics of our country.
- Strengthen STEM Professional retention programs within the Navy and Marine Corps that help to meet Naval STEM workforce needs.

The 2010 DoN Acquisition Workforce Strategic Plan, calls for a restoration of the Scientific and Engineering talent to maintain our technological advantage. This **Employ** priority is critical to ensuring that the Department of the Navy attracts the highest quality technical talent, and retains and nurtures that talent once it has joined our STEM workforce.

PRIORITY 5: COLLABORATE

on STEM efforts across the Department of the Navy, the Federal government and best practice organizations.



A strong Naval STEM program requires **Collaboration** -- a broad exchange of best practices, common metrics, and lessons learned, as well as simple and streamlined administrative processes, program coordination, and policy issues.

We Will:

- Establish an effective coordinating body for Naval STEM, managed by the Office of Naval Research, which facilitates collaboration across the Department.
- Develop and promote common policies and tools to support STEM education.
- Establish a “one-stop” Naval STEM information portal for public dissemination of Naval STEM programs.
- Create strategic partnerships with other federal agencies, services, stakeholders and best practice organizations.
- Establish consistent, meaningful and practical metrics to be applied across the program portfolio.
- Leverage the Navy’s extraordinary expertise in education technology research to improve STEM learning opportunities for students of all ages.

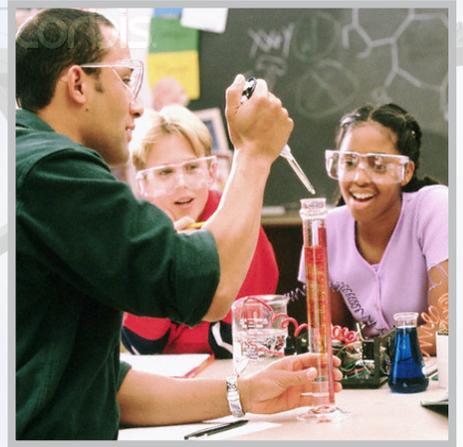
The Naval STEM portfolio is made up of over 180 localized outreach and education efforts across the country. The **Collaborate** priority recognizes the importance of a well-coordinated and centrally-supported STEM effort.



GOVERNANCE AND IMPLEMENTATION

The Naval STEM Coordination Office is managed by the Office of Naval Research, under the direction of the Chief of Naval Research and serves as the primary advisor to the Secretary of the Navy for STEM issues. The Naval STEM Coordination Office works with the Naval laboratories, Systems Commands, Warfare Centers, and other research and education institutions to maximize the impact of the Navy’s entire STEM education portfolio. This office is coordinating across the Department to develop policy and guidance that will empower a robust portfolio of STEM initiatives to strengthen our pipeline of future scientists and engineers.

This strategic roadmap will be implemented over five years. The Naval STEM Coordination Office will serve as the central point of contact for implementation. Over the next five years, the Inspire, Engage, Educate, Employ and Collaborate priorities will provide the framework through which we can achieve these goals.



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