



Jeff Craver
DAU South Instructor
256-922-8153
Jeffrey.craver@dau.mil



LUNCH AND LEARN

BBP 3.0 STEM Outreach Focus

**Strategic alignment between
workforce needs and K-16
Capabilities**

9 Dec 2015

www.DAU.mil



BBP 3.0 STEM OUTREACH FOCUS

STRATEGIC ALIGNMENT BETWEEN WORKFORCE NEEDS AND K-16 CAPABILITIES

- OSD guidance
 - BBP 3.0 language
- DOD
 - 2015 DoD STEM Strategic Plan
 - Campaign Plan
 - Detailed Overview of Programs
- Example STEM Outreach Initiatives
 - Command and Centers
 - Team Redstone
 - DAU



BBP 3.0 STEM FOCUS

GENERAL GUIDANCE:

“...focused on developing the next generation of STEM professionals,...

...It will encourage and promote DoD and component outreach to foster STEM education and interest in careers in STEM areas.”





FRANK KENDALL: STEM WORKFORCE, BBP 3.0 KEY TO US TECH SUPERIORITY

“I’m encouraging people to be engaged in that world and do whatever you can to encourage young people to go into science, engineering and math because of the service they can provide to society, and because it’s fun,” the DoD undersecretary said.



BBP 3.0 FOCUS AREAS

- Achieve Affordable Programs
- Achieve Dominant Capabilities While Controlling Lifecycle Costs
- Incentivize Productivity in Industry and Government
- Incentivize Innovation in Industry and Government
- Eliminate Unproductive Processes and Bureaucracy
- Promote Effective Competition
- Improve Tradecraft in Acquisition of Services
- **Improve the Professionalism of the Total Acquisition Workforce**



IMPROVE THE PROFESSIONALISM OF THE TOTAL ACQUISITION WORKFORCE

Establish higher standards for key leadership positions

- Establish stronger professional qualification requirements for all acquisition specialties
- Strengthen organic engineering capabilities
- Ensure development program leadership is technically qualified to manage R&D activities
- Improve our leaders' ability to understand and mitigate technical risk
- **Increase DoD support for STEM education**



IMPROVE THE PROFESSIONALISM OF THE TOTAL ACQUISITION WORKFORCE

Increase DoD support for Science, Technology, Engineering, and Math (STEM) education.

This BBP 3.0 initiative is focused on the long term health of the DoD acquisition enterprise, our ability to sustain technological superiority militarily, and the economic well-being of our nation.

DoD and many of our partners in the Defense Industrial Base are already active in promoting STEM education. This activism includes financial and institutional support as well as a great deal of volunteer work. While efforts to encourage young people to pursue STEM related careers now may seem a long way from our immediate concerns, in the long run our society, and our military, is highly dependent on our ability to encourage students to enter and remain in technical career fields.



IMPROVE THE PROFESSIONALISM OF THE TOTAL ACQUISITION WORKFORCE

SPECIFIC ACTIONS:

- ASD(R&E) will formulate and publish an annual “**Campaign Plan**” for voluntary STEM support activities by the DoD acquisition community during the following year. The first campaign plan will be complete and begin execution in October 2015.
- ASD(R&E) will expand the scope of the STEM Board of Directors (BoD) to include more emphasis on engineers by May 2015.
- The STEM BoD will provide a strategic STEM education and outreach **Communication Plan** for DoD senior leaders by June 2015.
- STEM BoD will establish a quarterly STEM support **Award Program** and criteria for local STEM support recognition by May 2015.
- ASD(R&E), in concert with the STEM BoD, will develop and conduct a STEM **Activity Survey** and analyze the results to understand the scope of all DoD K-12 STEM efforts (both direct and indirect funded activity) by December 2015.

DOD STEM

STRATEGIC PLAN FY2016-2020

DoD STEM VISION

A STEM talent pool with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge.

DoD STEM MISSION

Attract, inspire, and develop exceptional STEM talent across the education continuum to enrich our current and future DoD workforce to meet defense technological challenges.

Goal 1: COMMUNICATE

Goal 2: INSPIRE

Goal 3: CULTIVATE

Goal 4.0: PROMOTE

Goal 5.0: ENHANCE

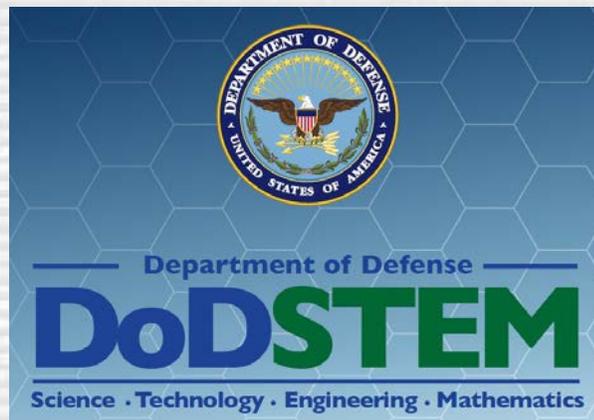
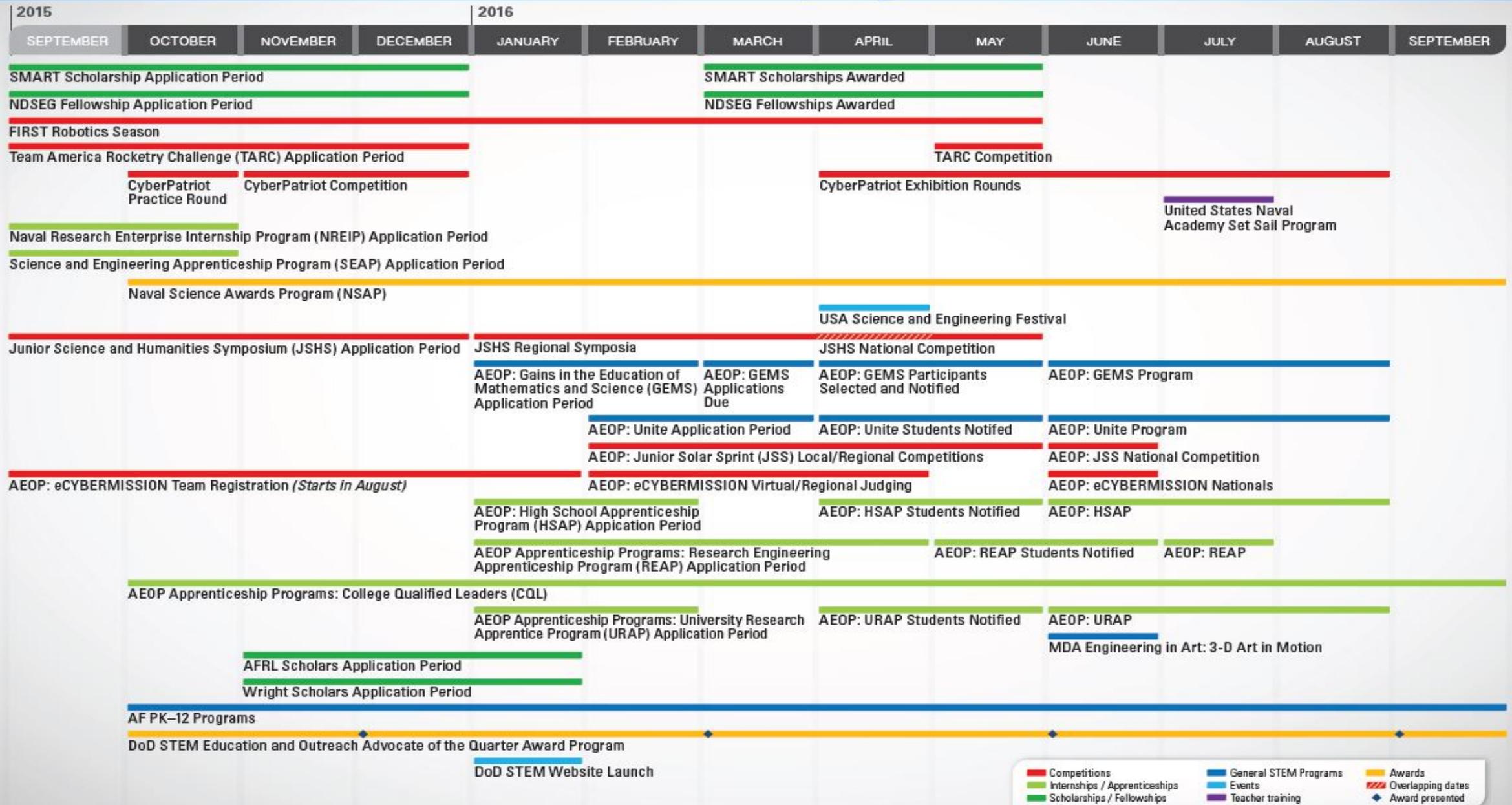


TABLE 1: Programs That Support the DoD STEM Goals

Program Title	INSPIRE youth and public engagement in STEM education and outreach	CULTIVATE the future STEM talent pool	PROMOTE increased participation of underserved groups in STEM
Army Educational Outreach Program (AEOP)- College Qualified Leaders (CQL)		✓	
AEOP- eCYBERMISSION	✓		
AEOP- Gains in the Education of Mathematics and Science (GEMS)	✓		
AEOP- High School Apprenticeship Program (HSAF)	✓	✓	
AEOP - Junior Solar Sprint (JSS)	✓		
AEOP- Research Engineering Apprenticeship Program (REAP)	✓		✓
AEOP- UNITE	✓		✓
AEOP- University Research Apprentice Program (URAP)		✓	
Air Force PK-12 Programs	✓		
Air Force Research Laboratory (AFRL) Scholars Program	✓	✓	
CyberPatriot	✓		
Department of Defense (DoD) Lab Day	✓	✓	✓
First Robotics Competition (FIRST)	✓		
Junior Science and Humanities Symposium (JSHS)	✓	✓	
Missile Defense Agency Engineering in Art- 3-D Art in Motion	✓		✓
National Defense Science and Engineering Graduate (NDSEG) Fellowship		✓	
Naval Research Enterprise Internship Program (NREIP)		✓	
Naval Science Awards Program (NSAP)	✓		
Science and Engineering Apprenticeship Program (SEAP)	✓	✓	
Science Mathematics and Research for Transformation (SMART) Scholarship for Service Program		✓	
STARBASE	✓		✓
Team America Rocketry Challenge (TARC)	✓		
USA Science and Engineering Festival	✓	✓	✓
United States Naval Academy Set Sail	✓		
Wright Scholar Research Assistant Program	✓		



Fiscal Year 2016 DoD STEM Campaign Plan





2016 STEM CAMPAIGN ACTIVITIES

- **FIRST Robotics**
- **Team America Rocketry Challenge (TARC)**
- **CyberPatriot**
- Naval Research Enterprise Internship Program (NREIP)
- Science and Engineering Apprenticeship Program (SEAP)
- USA Science and Engineering Festival
- Junior Science and Humanities Symposium (JSHS)
- AEOP: Gains in the Education of Mathematics and Science (GEMS)
- MDA Engineering in Art: 3-D Art in Motion



FIRST Robotics

DoD STEM Campaign Program

Mission

- Our mission is to inspire young people to be science and technology leaders, by engaging them in exciting Mentor-based programs that build science, engineering and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.

Impact

- **More Than Robots.** *FIRST* participation is proven to encourage students to pursue education and careers in STEM-related fields, inspire them to become leaders and innovators, and enhance their 21st century work-life skills.





Team America Rocketry Challenge

- The Team America Rocketry Challenge (TARC) is the world's largest model rocket contest and the aerospace industry's flagship program designed to encourage students to study science, technology, engineering and math (STEM).
- Sponsored by the [Aerospace Industries Association \(AIA\)](#), the National Association of Rocketry (NAR) and more than 25 aerospace and defense companies, TARC provides middle and high school students the opportunity to design, build and launch model rockets in a competition among approximately 4,000 students nationwide each year.

September 2015 – April 2016: Qualifying rocket launches and score submissions (across the U.S.)

April 4, 2016: Qualifying flights due

April 8, 2016: Top 100 teams announced

May 13, 2016: Rockets on the Hill reception (Washington D.C.)

May 14, 2016: TARC 2015 Final Fly-off at Great Meadow (The Plains, Va., 45 minutes outside of D.C.)



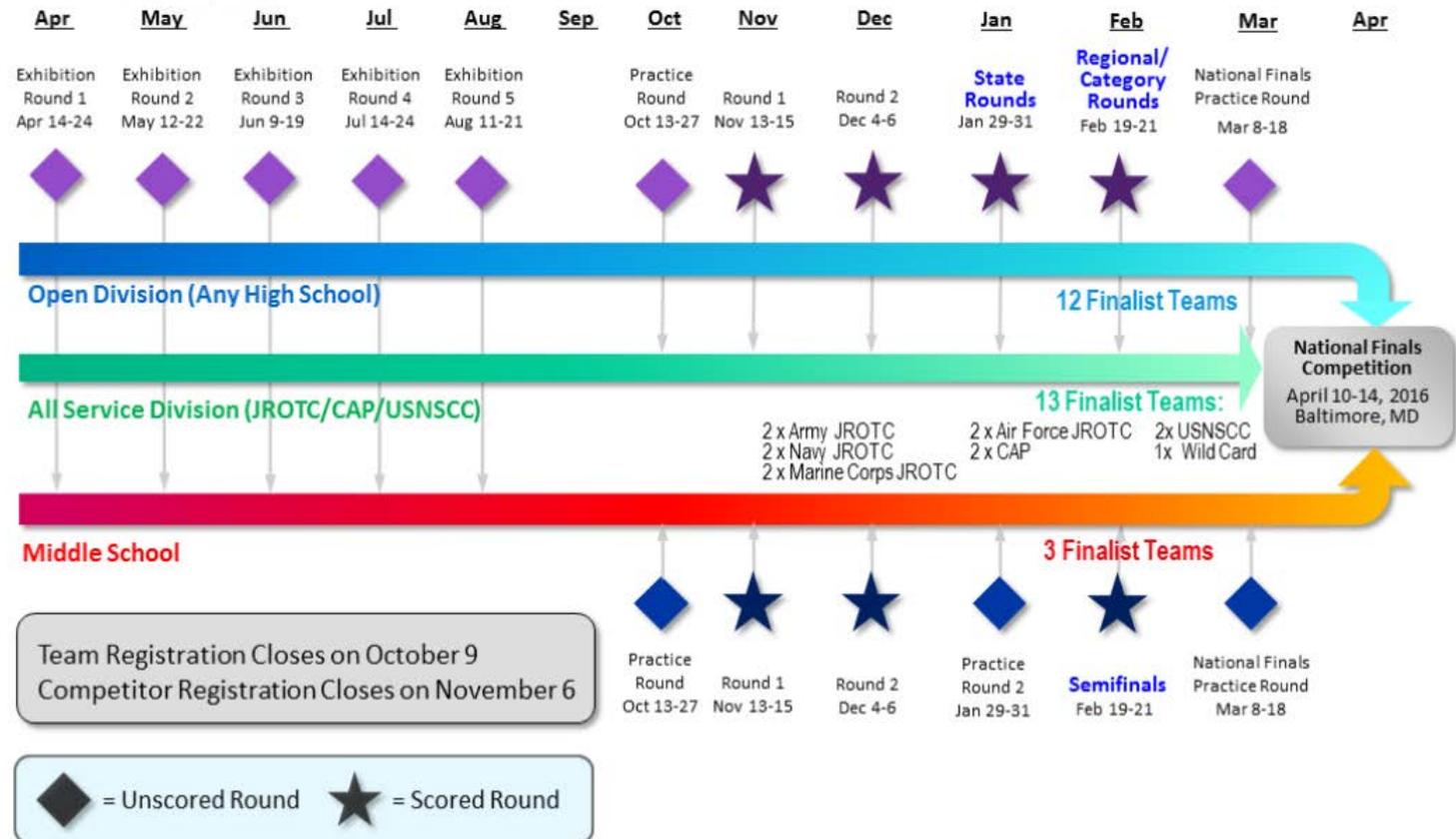
CyberPatriot

THE NATIONAL YOUTH CYBER DEFENSE COMPETITION

AFA CYBERCAMPS

ELEMENTARY SCHOOL CYBER EDUCATION INITIATIVE

CP-VIII COMPETITION TIMELINE (2015-2016)





DOD STEM DEVELOPMENT PROGRAM OFFICE

RESEARCH DIRECTORATE

Office of the Assistant Secretary of Defense for
Research and Engineering (ASD(R&E))
4800 Mark Center Drive (Suite: 17C08)
Alexandria, VA 22350-3600

Email: osd.pentagon.ousd-atl.mbx.stem@mail.mil

Follow us on: www.dodstem.us (Coming January 2016)



■ IMPORTANCE OF STEM PARTNERSHIPS

- Partnerships with STEM professionals connect K-12 students and teachers with real world experiences in science, technology, engineering and mathematics.
- Research shows that providing opportunities for students to see themselves excelling in STEM activities and exposing them to professionals with similar cultural backgrounds increases the potential in students, especially for girls and under-represented minorities, to develop foundational skills in STEM.



COMMAND / CENTER EXAMPLES

Flexible Aviation-Classroom Experience (FLEXACE)

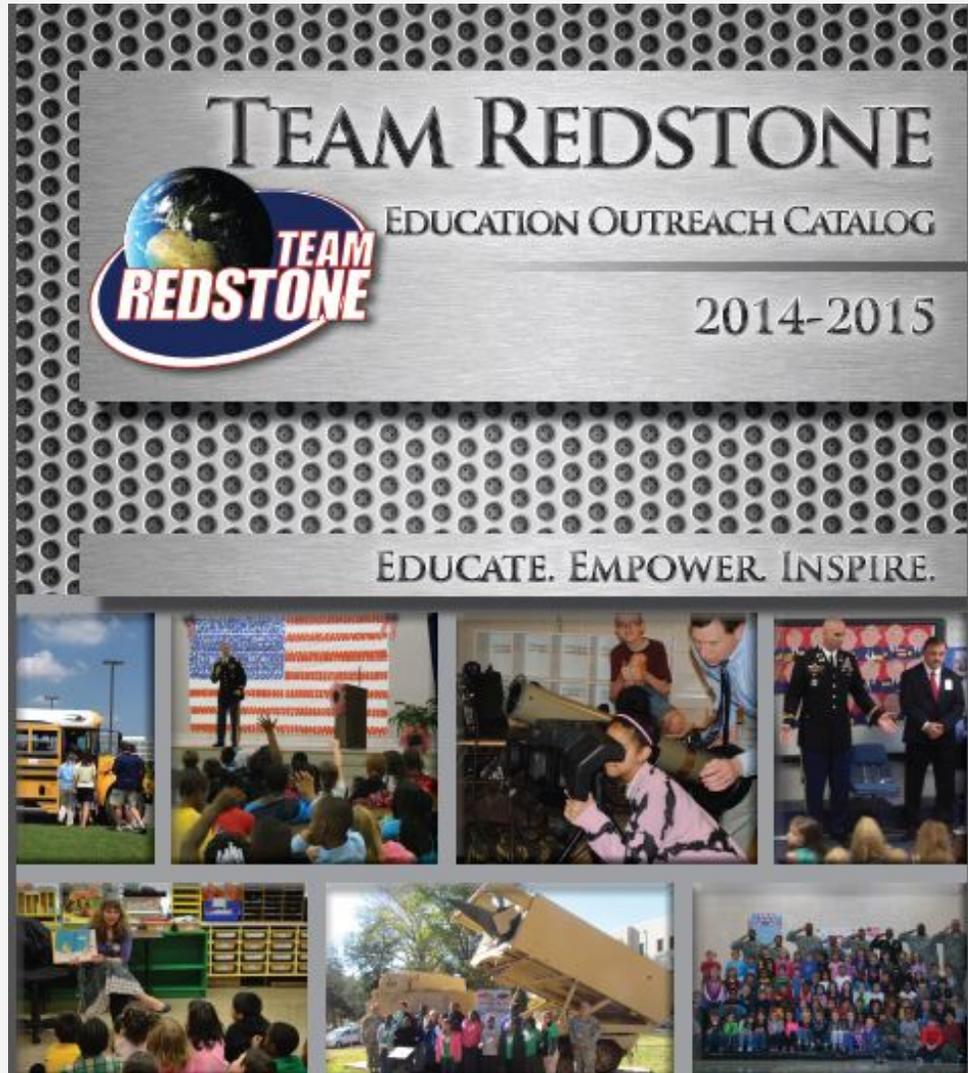
- Test Resource Management Center's workforce outreach for STEM and uses a simulated, networked environment (with interface to T&E ranges) for hands-on learning
 - Students participate as surrogate test operators in various aviation testing scenarios and develop skills in training and development and testing.

NAWCTSD and DoDEA will work together to develop modeling and simulation strategies to support learning STEM content.

- Involve students in hands on experiences so they become participants, not mere listeners or observers;
- Mimic the activity so well that there is little difference between the simulated environment and the real one;
- Motivate students to learn through deep involvement in the activity so that interest in learning is more about the activity and the subject matter develops by doing, and;
- Encourage students to enhance the activity by contributing their own ideas.

TEAM REDSTONE

REDSTONE ARSENAL, HUNTSVILLE, AL

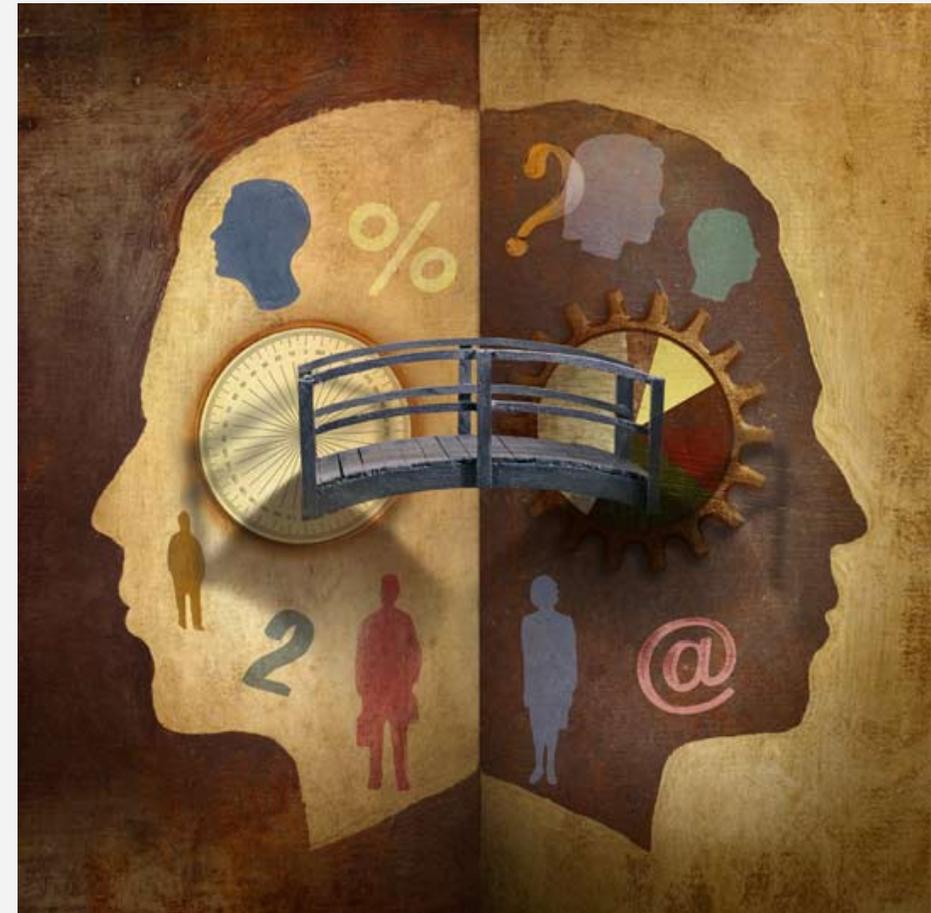


Introduction to Redstone	2
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Redstone Organizations	
Army Materiel Command	4
Army Contracting Command	5
ATF-National Center for Explosives Training and Research	6
Aviation & Missile Life-Cycle Management Command	7
Aviation & Missile Research, Development, & Engineering Center	8
Defense Acquisition University	9
Defense Intelligence Agency-Missile & Space Intelligence Center	10
Engineering and Support Center - Huntsville	11
FBI-Hazardous Devices School	12
Fox Army Health Center	13
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DAU AND STEM

DAU is responsible for the
Current Acquisition
Workforce STEM
Education

But, can we do more to
influence the next
generation...?

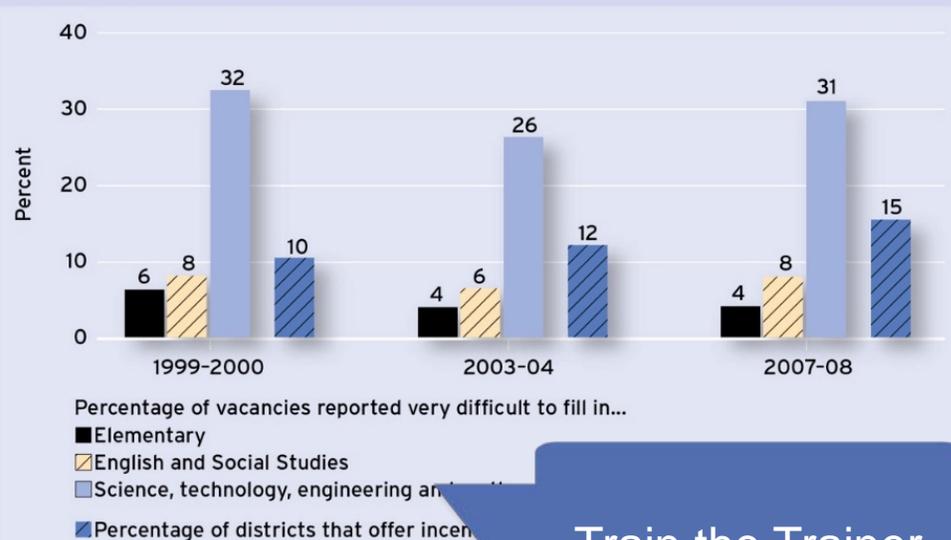


DAU STEM EDUCATION OUTREACH VISION

AS AN EXTENSION OF OUR STRATEGIC PLAN

Math and Science Teachers Wanted (Figure 4)

Schools report greater difficulty filling teaching positions in math and science than in other areas even though an increasing number of districts offer pay incentives in areas that are difficult to staff.



SOURCE: Authors' calculations using data from the Schools and Staffing Survey

Train the Trainer

DAU Core Competency - Educate the Adult in the Equation - Just as in the Acquisition Workforce

Support STEM Teachers and Administrators to reach and educate secondary school students to become interested and prepared to enter into the DoD Workforce

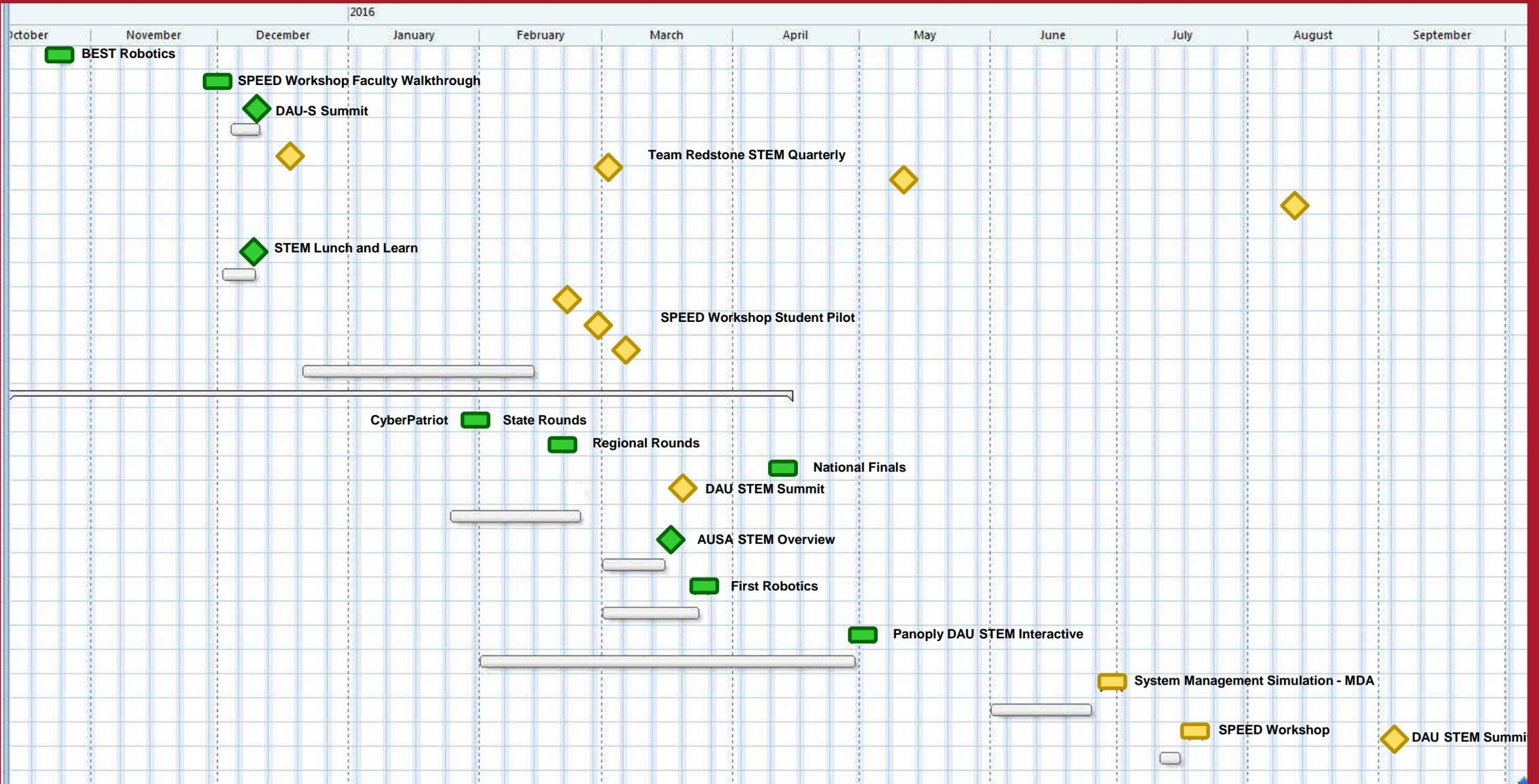
Understand and address STEM education challenges between current workforce and K-16 STEM teacher / student skills and abilities

DAU STEM EDUCATION OUTREACH SPECTRUM



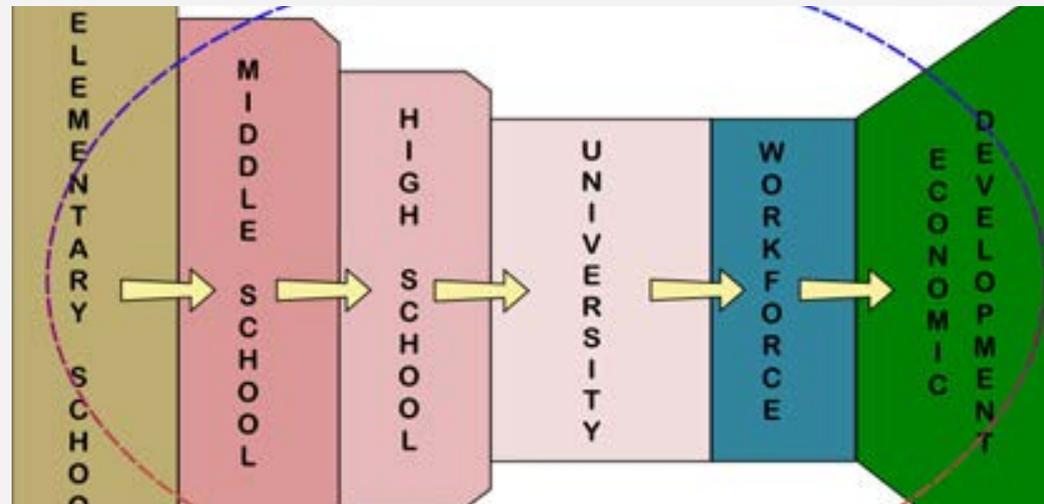
DAU-South Initiative strives to provide support to local and regional STEM Educators and Students through Curriculum Development, Teaching, Mentoring, and Event Support.

FY 2016 DAU SOUTH STEM CAMPAIGN PLAN



DAU SOUTH OFFERED STEM WORKSHOPS

Teacher and Student STEM Team-based, Problem-Based Workshops help bridge the gap between Secondary Education and Current Workforce Requirements



STEM PROBLEM-BASED ENHANCED EDUCATOR DEVELOPMENT



Workshop

STEM Educator Professional Development

THE SPEED WORKSHOP FOCUS

- STEM Educator Professional Development
- STEM Team Problem-based curriculum planning and development workshop
- 7th-12th Grade STEM Educators



Integrated STEM Curriculum
Development Team

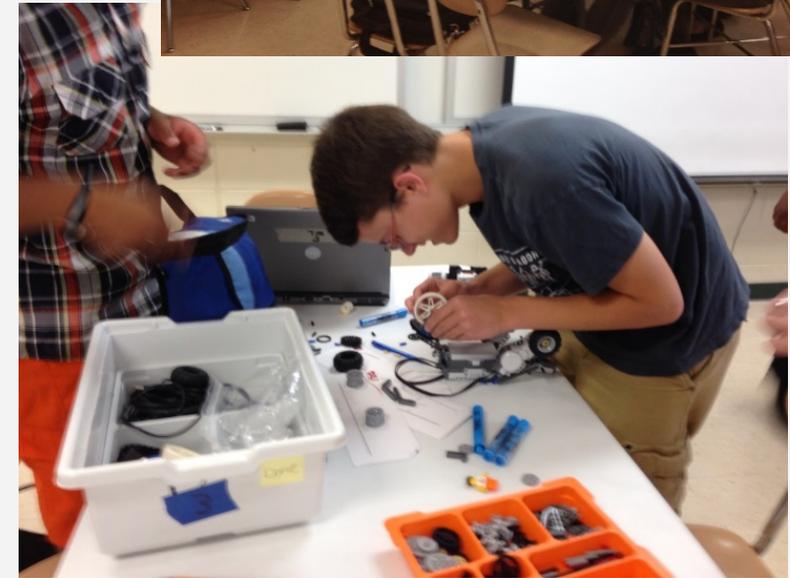
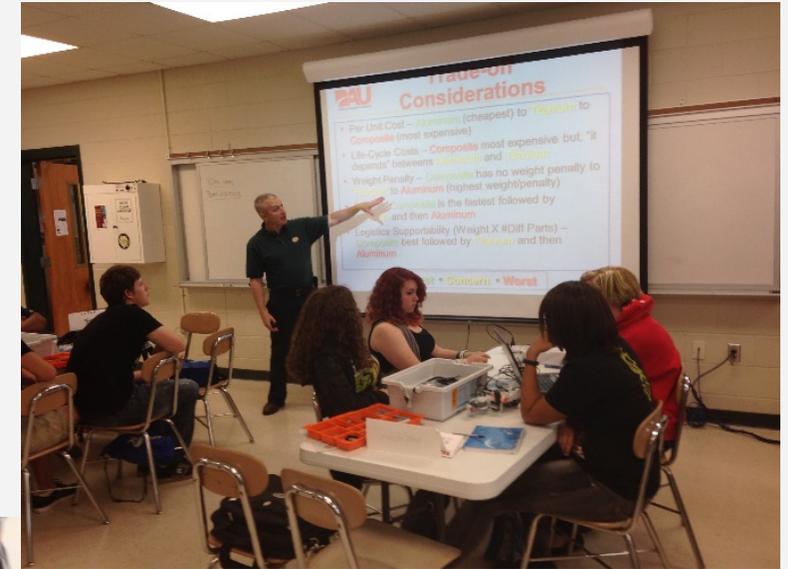


STEM Educator Lead

SYSTEM MANAGEMENT SIMULATION

DOD PRODUCT CONVERTED TO STEM

- Generate interest in engineering and technology careers
- Increase knowledge of engineering and system management
- Provide opportunity for hands-on, practical application of engineering processes
- Have fun!





TEAM REDSTONE STEM QUARTERLY

STEM COMMUNITY AWARENESS AND SUPPORT NEEDS

Active Redstone STEM Outreach Member

- Team Redstone Catalogue

DAU Hosted for 2 years

- Meeting Site on Rotation
 - NASA Education Center Space and Rocket Center



Attend meetings and respond to support requests

- Panoply Partnership
- BEST and FIRST Robotics
- Career Fair and other Mentoring Support

DAU SOUTH STEM EDUCATION OUTREACH

EXAMPLES OF INDIVIDUAL STEM SUPPORT

Mentors

- CyberPatriot
- High School Competition Robotics Teams
- Math Tutors

Event Support – Robotic Competition and Career Fairs

- BEST and FIRST Robotics Program Support
- DAU has provided hands on displays and personnel at several elementary and middle school STEM related career fairs

Speakers

- Girls in Engineering

CYBERPATRIOT

- CyberPatriot is the National Youth Cyber Education Program
- At the center of CyberPatriot is the National Youth Cyber Defense Competition
- DAU is in its 2nd year supporting the CyberPatriot program
- DAU provides Technical Mentor support to Huntsville High School
- 1st Year (2014) 1 Team with 8 team members
- 2nd Year (2015) expanding to 3-5 Teams with 25+ team members
- Expanding to other school systems



BEST Robotics Support



DAU InSight Article

STEM: BEST Robotics Competition

By: Jeff Craver, Professor of Systems Engineering and Technology, DAU-South

In 2003, Tennessee Valley "Boosting Engineering, Science and Technology" (BEST) Program was created by a small group of volunteers who worked at various engineering based companies in the Huntsville, AL area. The mission of Tennessee Valley BEST (TVB), is to impact K-12 Science, Technology, Engineering, & Mathematics (STEM) education across North Alabama and South Central Tennessee, via school participation in BEST Robotics. BEST excels at preparing today's youth to become technologically proficient, thus better prepared for leadership roles in tomorrow's workforce.

On 30/31 October 2015, DAU South, in support of BBP 3.0 STEM Focus Area, [http://www.acq.osd.mil/fo/docs/betterBuyingPower3.0\(9Apr15\).pdf](http://www.acq.osd.mil/fo/docs/betterBuyingPower3.0(9Apr15).pdf), provided six volunteers (both personnel and family), to judge all categories and specialty areas in the BEST Robotics Competition; which included the Annual Tennessee Valley Robotics "Pay Dirt 2015" Competition. Those judges were Seth Shepherd (DAU-S) and wife Elaine Shepherd, Marsha Dollarhide (DAU-S) and husband Lenard Dollarhide, Jeff Craver (DAU-S) and Wally Tubell (DAU-S). The judging was an all day event where the majority of student teams presented during this portion of the competition.

Eight student teams competed in the Robot Performance Competition category. Three to eight student teams competed in other subject categories.

The BEST competition consisted of five categories:

- Project Engineering Notebook
- Marketing Presentation
- Team Exhibit and Interviews
- Spirit and Sportsmanship
- Robot Performance



DAU and MDA Judges



DAU SOUTH STEM CAREER FAIR SUPPORT



Who designs and builds Robots

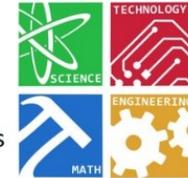


Using the latest Lego Mindstorm EV3 kit, young people design and build robots.



Robots like Baxter could have a significant effect on the job market.

Skills Required for Robotics Engineers



- Critical Thinking – applying logic and reason
- Reading Comprehension - duh
- Judgment and Decision Making - consequences
- Quality Control Analysis - inspection
- Operation Monitoring – is it working correctly
- Complex Problem Solving – breaking a problem down
- Mathematics – another duh
- Active Listening – your focus needs more focus
- Systems Analysis – how does your widget affect the big picture
- Troubleshooting – figure out what's wrong and fix it



BBP 3.0 STEM SUMMARY

- OSD and DoD STEM Support Guidance
- DoD 2016 Campaign Plan in place
 - Plan provides established areas to get involved
- Align Your STEM Outreach with Leadership's Strategic Goals
- Do Something!

RESOURCES AVAILABLE AT DAU BLOG SITE AT [HTTPS://DAP.DAU.MIL/COP/DAULLBLOG/DEFAULT.ASPX](https://dap.dau.mil/cop/daullblog/default.aspx)

- Implementation Directive for Better Buying Power 3.0...Undersecretary for Defense (9Apr15)
- DoD STEM Strategic Plan (2015_1022_final)
- FY 2016 DoD STEM Campaign Plan
- Team Redstone Education Outreach Plan (2014-2015)
- DAU South Best Robotics Home Video