



George C. Marshall Governor's STEM Academy Fairfax County Public Schools

Marshall Governor's STEM Academy offers premier elective programs in engineering and information technology pathways to over 200 students from seven different high schools. The engineering courses include Aerospace Science, Geographic Information Systems, and STEM Robotics Systems. The information technology courses include Computer Systems Technology, Network Administration, Cisco, and Cybersecurity. Many students earn valuable industry recognized certifications and participate in world-class field experiences through partnerships with academia and industry.

The mission at the STEM Academy is to provide a student-centered learning environment that uses evidence-based practices such as problem-based learning (PBL) and project-based learning scenarios to help students transfer their learning to real-world situations and challenges. Dynamic STEM engineering projects such as printing an e-NABLE prosthetic hand with a 3-D printer for handicap children around the world incorporates 21st century skills such as global awareness and health literacy. FIRST Robotics requires students to build a fully functioning robot that can perform a number of functions such as picking up tote boxes and navigating debris-ridden areas. Students use AutoCAD to design, create the code in open source, build the robot using metal working tools and equipment, and test and tweak the mechanical and electrical components to increase and maximize performance. These types of innovative classroom learning experiences motivate students to develop their skill sets in computer programming, design, and demonstrate workplace readiness people skills.

Information technology students compete in cybersecurity competitions such as the Air Force CyberPatriot competition which requires students to think cognitively and work together to solve complex computer and network problems. Students in the Governor's STEM Academy have successfully competed against 2000 teams from across the county earning the opportunity to compete in the national finals of CyberPatriot for the past four consecutive years. We are in the top one percent in the country competing and have earned the Center of Excellence designation from the Air Force Association. Over 250 students interested in cybersecurity have also participated in our three summer cyber camps which are taught by recent STEM Academy graduates and professional cyber engineers from MITRE Corporation. Students study Windows 7 and 8, Linux, Ubuntu, Server 2008, and digital forensics. Marshall's cybersecurity club has over 80 active student members, 16 teams participating in CyberPartiot, three all-female teams and is taught by upper classman in the club. STEM competitions have a huge impact on student learning, such as higher-order thinking and collaboration which is in high demand in today's global economy.

Since the inception in 2013 as a Governor's STEM Academy, an active advisory and planning committee interested in building a K-12 STEM pipeline has been developed. The advisory and planning committee is comprised of academia from Virginia Tech, George Mason University, and Northern Virginia Community College, industry representatives from Exxon-Mobil, MITRE, and Northrop Grumman, and elementary, middle, and high school principal representatives. Collaboratively a vision, mission, and core values based on service, integrity, respect, innovation, and teamwork has been created. We developed three STEM subcommittees:

→

- Literacy and Awareness
- Advanced Skill Development
- K-Job Integration

We have implemented project charters for each of our three goals:

1. Develop an outreach group to recommend courses and alignment within the IT and Engineering pathways.
2. Design and develop frameworks that align with today's business trends and VDOE competencies.
3. Create a Marshall STEM Credential (MSC) to officially recognize students for meeting the requirements established by business partners, academia, and industry.

Governor's STEM Academy students have participated in activities the classroom. These activities include touring the Naval Research Labs in Washington, DC where scientists study the processes that drive space weather. Students have toured the Nike Laser facility that uses fusion similar to the sun and thermonuclear weapons that someday could lead to unlimited supply of carbon-free electrical energy. They have toured the Federal Aviation Administration Command Center (FAA) where they learned first-hand about the FAA's cybersecurity measures, policies towards satellites, and their relationship with airlines and airports around the U.S. Students have also toured the Defense Cyber Crime Center which provides digital forensics, cyber investigative training, technical solutions development, and cyber analytics for the Department of Defense. Students have toured Cisco Customer Service Center in Herndon, VA and met senior computer and electrical engineers that are working on new platforms for healthcare institutions. They learned the importance of computer programming, coding, cybersecurity, and eagerly anticipate the next generation of the 5 G cell phones that will be available in 2020.

The opportunities for students who are STEM-proficient are endless. Connecting exciting career opportunities and maintaining classroom engagement is critical for encouraging our greatest resources to explore their interests in a STEM-related field.

Respectfully,

Jeff J. McFarland, Administrator
Marshall Governor's STEM Academy