

# Virginia Board of Education Agenda Item



**Agenda Item:** H

**Date:** May 23, 2013

<b>Title</b>	First Review of Proposal to Establish the following Governor’s STEM Academies: 1) Fairfax County Public Schools Governor’s STEM Academy at George C. Marshall High School; 2) Harrisonburg City Public Schools Governor’s STEM Academy at Harrisonburg High School; and 3) Montgomery County Public Schools Governor’s STEM Academy at Christiansburg High School		
<b>Presenter</b>	Ms. Lolita B. Hall, Director, Office of Career and Technical Education Services Jeff McFarland, Academy Coordinator, Marshall High School, Fairfax County Public Schools J. Patrick Lintner, Executive Director for Instruction, Harrisonburg City Public School Rick Weaver, Career and Technical Education Supervisor, Montgomery County High School		
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**Purpose of Presentation:**

Other initiative or requirement. Specify below:

First review of proposals to establish the following Governor’s STEM Academies:

- 1) Fairfax County Public Schools Governor’s STEM Academy at George C. Marshall High School
- 2) Harrisonburg City Public Schools Governor’s STEM Academy at Harrisonburg High School; and
- 3) Montgomery County Public Schools Governor’s STEM Academy at Christiansburg High School

**Previous Review or Action:**

No previous review or action.

**Action Requested:**

Action will be requested at a future meeting. Specify anticipated date below:

Date: June 27, 2013

**Alignment with Board of Education Goals: Please indicate (X) all that apply:**

X	Goal 1: Accountability for Student Learning
	Goal 2: Rigorous Standards to Promote College and Career Readiness
X	Goal 3: Expanded Opportunities to Learn
	Goal 4: Nurturing Young Learners
	Goal 5: Highly Qualified and Effective Educators
	Goal 6: Sound Policies for Student Success
	Goal 7: Safe and Secure Schools
	Other Priority or Initiative. Specify:

**Background Information and Statutory Authority:**

Goal 1: The Academy must meet rigorous criteria established by the Board of Education. Students

progress in academic and technical knowledge and skills; and their employability knowledge and skills are monitored and measured annually to ensure successful transition to college and career.

Goal 3: The Governor’s STEM Academy is designed to expand opportunities for the general student population to acquire STEM literacy and other critical skills, knowledge, and credentials that will prepare them for high-demand, high-wage and high-skill careers.

Partnerships establishing academies must include at least one public school division, business and industry, and postsecondary education. On November 29, 2007, the Board of Education approved the criteria to establish a Governor’s STEM Academy. Subsequently, on March 19, 2008, the Board approved the standards for the Governor’s Career and Technical Education Exemplary Standards Awards Program, which all Career and Technical Academies must implement.

The State Council of Higher Education for Virginia (SCHEV) is currently reviewing the attached proposals. Their report and recommendation is expected by June 5 prior to the final review of the proposal by the Board of Education (Attachment B). Staff members of the Virginia Department of Education (VDOE) have reviewed the proposal in the context of the established criteria. An executive summary of the proposal is in Attachment A. Attachment C is the report from the review by the VDOE. Attachment D is the complete proposal.

Currently, there are 18 Governor’s STEM Academies in Virginia. They are located in Arlington County, Carroll County, Chesapeake City, Chesterfield County, Fairfax County, Halifax County, Hampton City, Loudoun County, Lynchburg City, New Kent County, Newport News City, Richmond City, Richmond County, Roanoke County, Russell County, Stafford County, Suffolk City, and Virginia Beach City.

**Summary of Important Issues:**

- 1) Proposal to Establish the Fairfax County Public Schools Governor’s STEM Academy at George C. Marshall High School

Marshall High School Governor’s STEM Academy in collaboration with its partners: Fairfax County Public Schools, Systemic Solutions, George Mason University, Virginia Tech, Positek.net LLC, Tysons Regional Chamber of Commerce, Junior Achievement of Greater Washington, Marymount University, Terra Wi, Cisco Systems, and Watnee LLC, will provide students the foundational skills needed to pursue career pathways within information technology and engineering. The Academy is centrally located within Northern Virginia’s Tysons Corner and twelve miles west of the District of Columbia. Because of its central location, partnerships with local businesses, post secondary articulation and dual enrollment agreements, the Governor’s STEM Academy will be uniquely poised to meet the mission: increase student access to STEM specific instructional programs and pathways in career and technical education; and develop a highly-skilled, diverse STEM high school graduate prepared for postsecondary education or the global workforce. The Academy will have the capacity to enroll 400 students, grades 9-12. During the 2013-14 school year 150 students will be admitted.

The Academy will focus on the following two career pathways within two career clusters:

CAREER CLUSTER	CAREER PATHWAY
Information Technology	Network Systems
Science, Technology, Engineering, and Mathematics (STEM)	Engineering and Technology

Students enrolled in the Network Systems pathway will learn about the design, development and management of different types of software programs and hardware. This field requires a rigorous foundation in mathematics and science as well as high technical skills. The study of cyber security is an emerging field with many career possibilities. Digital defense is not only for those working in technology, government, or law enforcement jobs. Cybersecurity affects any business or organization that uses internal computer systems or connects to the Internet to do business, including those in: homeland security, public and private cyber monitoring, health care information protection, energy industry systems protection, banking, education, online retail, product development, and technology products and services. The coursework will focus on systems, networks, and technology. Students will gain specific cybersecurity skills in the ethics and legal issues related to data gathering and protection; engage in real-world plans and processes for common security scenarios, techniques and technologies that protect data and systems; and will learn about ways to detect and defend against cyber attacks.

The Information Technology (IT) lab will include 32 data drops and wireless connectivity for computer workstations, mobile devices, and laser printers. It will be fully equipped for interactive teleconferencing. Students will study collegiate-level software applications such as Microsoft's Network Administration and Security, Cisco CCNA and Healthcare, Oracle, and A+ computer systems technology to optimize interaction, critical thinking, and problem-solving capabilities in the IT field. The lab has two primary zones that allow independent study and group sessions to occur simultaneously. The *Cyber Center* encourages hands-on applications in a virtual lab environment to increase students' ability to reduce vulnerabilities in today's computer network systems. In the *Networking Center*, students will have the appropriate equipment to develop flexible network configurations.

As technology advances across the globe, it is important to have individuals who understand and can support the new technological demands. Network Systems and Data Communications Analysts are predicted to see a 53 percent increase in employment opportunities.

Students enrolled in the Engineering and Technology pathway will engage in rigorous problem-solving experiences. They will learn how to use their knowledge of science, mathematics, logic, and economics to find suitable solutions to real-world problems. The STEM lab will be equipped for 21<sup>st</sup> century learning. The lab will offer collegiate-level applications and sophisticated technologies to optimize research, interaction, and critical thinking among the students. The lab will have two primary zones that allow independent study and group sessions to occur simultaneously. The *Think Tank* will encourage students to think out loud and it will be equipped to support global conferencing. In the *Lab Zone* students will have appropriate equipment for the flexibility to conduct many experiments. An overhead gridding system and large tablespots will allow for optimal connections to equipment, while speakers and microphones transmit throughout the lab. Additional equipment will include a wind tunnel, Computer Numerical Control (CNC) machines, 3D prototype printer, large format printer, plasma cutter, and computer workstations with computer-aided design (CAD) software.

Over the next decade, jobs aligned with advancing technology are predicted to boom as new career opportunities open. Individuals with college degrees and experience working with high-tech laboratory equipment have the most potential for success within this industry.

2) Proposal to Establish the Harrisonburg City Public Schools Governor’s STEM Academy at Harrisonburg High School

As the world and Virginia are changing rapidly, it is predicted that areas such as health, energy, environment, and natural resources will have serious personal, social, and global issues for current and future populations to solve. Outside the typically educational setting, science, technology, engineering, and mathematics (STEM) are integrated naturally to study and solve problems. The proposed Harrisonburg High School Governor’s STEM Academy emphasizes an integrative (I-STEM) learning approach to prepare students for meeting the challenges of today and the near future. The I-STEM model consists of specific units that are collaboratively developed based on the Science Standards of Learning and integrated with those from language arts, mathematics, social science, technology as well as engineering content.

Harrisonburg City Public Schools (HCPS) provides all students in all five elementary schools and both middle schools with daily science and mathematics education including units designed as integrative lessons in I-STEM. By creating a Governor’s STEM Academy, HCPS expects to raise student aspirations and attract more students to postsecondary education in preparation for the career pathways of Engineering and Technology, and Science and Mathematics. The Academy will have the capacity to enroll 296 students, grades 9-12. During the 2013-14 school year 98 students will be admitted.

The Academy will focus on the following two career pathways within the STEM career clusters:

CAREER CLUSTER	CAREER PATHWAY
Science, Technology, Engineering, and Mathematics (STEM)	Engineering and Technology
	Science and Mathematics

In the seventh and eighth grades, students have an opportunity to participate in the Middle School STEM Exploration Academy, where they integrate career and technical education courses with science courses and explore different career options based on their interests. Whether students choose to apply to and enter the Harrisonburg High School Governor’s STEM Academy in either of the two pathways, they will have access to Advanced Placement and dual enrollment science and mathematics courses as well as the opportunity to receive postsecondary certificates including the Governor’s certificate of recognition for the Early College Scholars Program. Students entering engineering and technology pathways will be completers in Engineering Studies. Coursework will be enhanced through integration with physics, algebra II, Earth Science, chemistry, and English. Students in both pathways will take science and mathematics courses their junior and senior years, including several Advanced Placement and dual enrollment courses with the opportunity for mentorships or internships with Academy’s higher education and/or business partners that include: James Madison University, Blue Ridge Community College, Blackwell Engineering, Rockingham Group, Shenandoah Valley Electric Cooperative, Serco, Kawneer, Shenandoah Valley Technology Counsel, and Stanford Research Institute.

Students in the Academy will be immersed in problem and project-based learning in grades nine through twelve. Students in both pathways are required to participate in extracurricular activities including, but are not limited to the Academic Competition Team, Bib Blue ‘Botics (HHS FIRST Robotics team), Environthon, and attendance at local science and mathematics lectures.

According to the Virginia Workforce Connection, as of September 10, 2012, there were 14,200 unfilled professional, scientific, and technical services jobs in Virginia. Graduates seeking well-paying careers need not search far if their skill sets are a match for the opportunities. In Harrisonburg and neighboring Rockingham County, there are many science and technology-oriented businesses and industries looking to hire talented, well-educated workers. The positions available include those requiring some college and experience as well as those requiring engineering associates degrees, Masters of Engineering, and Doctorates.

Students graduating from the Harrisonburg High School Governor's STEM Academy will have a strong academic preparation for entering a four-year college majoring in a wide variety of STEM fields. They will be well-prepared to continue education in any of Virginia's high-demand fields of economic growth as identified by the Virginia Economic Development Partnership, including: food processing, clean energy, biotechnology research and development, federal security agencies and providers, information technology, aerospace, and global logistics.

3) Proposal to Establish the Montgomery County Public Schools Governor's STEM Academy at Christiansburg High School

The proposed Montgomery County Public Schools Governor's STEM Academy will be located at Christiansburg High School; however, some of the Academy courses will be offered at the division's other three high schools as well. Students who attend the smaller high schools will be eligible to continue a chosen program of study at Christiansburg High School with transportation provided. The Academy will have the capacity to enroll 150 students, grades 9-12. During the 2013-14 school year 65 students will be admitted.

Virginia Employment Commission data indicates that the manufacturing industry employs the second largest number of all industries and ranks fifth in the current number of advertised job openings in the New River Community College Region (see Appendix B). Montgomery County is the largest county served by the New River Community College. Jobs related to STEM, manufacturing, and information technology career clusters are in the top ten occupation groups represented by jobs advertised in the same region. The Montgomery County Governor's STEM Academy in collaboration with its partners: Virginia Tech, Montgomery County Department of Economic Development, New River Community College, Jeld-Wen Interior Doors, Automation Creations, OWPR Architects and Engineers, Moog Components Group, and NRV Competitiveness Center, will offer a program of study to expand students knowledge and skills in STEM literacy as it relates to advanced manufacturing. Students will gain the knowledge and skills needed to succeed in the technologically-rich workplace by learning how to work in teams, communicate effectively, and apply the principles and skill sets in STEM fields. A FIRST Robotics design and build team project will be the co-curricular component for all six pathways in the following chart. This project will be scheduled as an after school course to allow students from all pathways to participate.

The Academy will focus on the following six career pathways within three career clusters will prepare students for programs leading to bachelor’s degrees, two-year associate’s degrees, Virginia Community College System diplomas and certificates, apprenticeships, and employment.

CAREER CLUSTER	CAREER PATHWAY
Science, Technology, Engineering, and Mathematics (STEM)	Engineering and Technology
Manufacturing	Manufacturing Production Process Development
	Production
Information Technology	Programming and Software Development
	Information Support and Services
	Network Systems

The FIRST Robotics program is built around a series of year-long elective courses taught by teachers from career and technical education (CTE), mathematics, and science in an after-school setting. This program is supported by Virginia Tech mechanical engineering students and professors. High school students achieve a level of familiarity and literacy in engineering and other STEM content while university students apply their engineering skills as mentors.

During the junior or senior year, Academy students will have the opportunity to apply their knowledge of STEM, as well as 21<sup>st</sup> century skills, in a real-world work experience by participating in job shadowing, internships, and/or cooperative experiences related to their chosen career path.

The pathways will have clear postsecondary objectives outlined through articulation with New River Community College, Radford University, and Virginia Tech. Every pathway in the Academy will culminate in a program of study at one of these three institutions. Whenever possible, both academic and CTE courses will be offered as dual enrolled courses through New River Community College or through the network of Project Lead the Way colleges (see Appendix D).

In summary, the Governor’s STEM Academy will provide awareness and opportunity for students and will increase the number of well-trained workers in areas that have been designated as high demand and high tech in business and industry. Offering parallel pathways with multiple post-graduation objectives will help students choose the best path before high school graduation.

**Impact on Fiscal and Human Resources:**

Funding for implementation must be provided at the local level.

**Timetable for Further Review/Action:**

The proposed beginning date is school year 2013-14 for the following:

- 1) Proposal to Establish the Fairfax County Public Schools Governor's STEM Academy at George C. Marshall High School
- 2) Proposal to Establish the Harrisonburg City Public Schools Governor's STEM Academy at Harrisonburg High School
- 3) Proposal to Establish the Montgomery County Public Schools Governor's STEM Academy at Christiansburg High School

**Superintendent's Recommendation:**

The Superintendent of Public Instruction recommends that the Board of Education accept for first review of the following:

- 1) Proposal to Establish the Fairfax County Public Schools Governor's STEM Academy at George C. Marshall High School
- 2) Proposal to Establish the Harrisonburg City Public Schools Governor's STEM Academy at Harrisonburg High School
- 3) Proposal to Establish the Montgomery County Public Schools Governor's STEM Academy at Christiansburg High School