

Marlborough High School

AT A GLANCE

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District: Marlborough Public Schools

Superintendent: Maureen Greulich

Principal, Marlborough High School: Charles Caliri

Program: Marlborough STEM Early College High School

Director of STEM ECHS: Daniel J. Riley

Created: 2011

Number of students: 1600

Grades: 5 through 12

Marlborough High School and PSW Youth Careers, the metro-southwest workforce investment board,* collaborate with companies and community organizations in the Marlborough area to support students in their school-to-career pathways. Listed below are some of the industry and educational partners who provide work-based learning opportunities in school and on-site:

- Boston Scientific
- Boys and Girls Club of Metrowest
- Bryley Systems
- City of Marlborough
- Davis Companies
- Dell
- Dow
- FLEXcon
- Framingham State University
- GE Healthcare
- Geisel Software, Inc.
- Hologic
- IPG Photonics
- Jenike & Johanson
- Ken's Foods
- Marlborough Economic Development Corporation
- Mass Mentoring Partnership
- MassMEP
- National Grid
- Operon Resources
- PTC
- Quest Diagnostics
- Quinsigamond Community College
- UMASS Memorial – Marlborough Hospital
- Raytheon
- RSVAA/ Retirees' School Volunteers Association
- SanDisk
- STEM Garden Institute
- Sunovion
- Synopsis
- Wayne J. Griffin Electric, Inc.
- Worcester Polytechnic Institute

*The metro-southwest workforce investment board, Partnerships for a Skilled Workforce, Inc., provides key resources and expertise in employer engagement and work-based-learning to Marlborough HS.



STEM Early College High School: Building the foundation for college & career readiness

Those who hope to succeed in today's rapidly evolving world need to have a solid educational foundation, high levels of technical skills and practical, hands-on experience. Research from the U.S. Department of Labor (DOL) supports that thinking, reporting that more than 70 percent of occupations today relate to science, technology, engineering and math (STEM). And that number is certain to grow.

In 2011, Marlborough High School recognized the importance of integrating these four disciplines into the academic experience and with a grant from the U.S. DOL and the Massachusetts Department of Education (DOE), the district implemented the STEM Early College High School program to prepare students for life beyond the classroom. The STEM program is part of the Pathways to Prosperity Network, an initiative of Jobs for the Future, Inc., and the Harvard Graduate School of Education.

Unlike the traditional high school experience, which delays consideration for higher educational or work opportunities until closer to graduation, the STEM Early College High School encourages students to begin thinking about a career as early as middle school. Dan Riley, Director of Marlborough's STEM Early College High School and Supervisor of Mathematics & Technology 6 – 12, explained that students who operate within a high-level curriculum framework in small learning communities and engage in project-based, work-based and interdisciplinary scholarship with early college opportunities have a better chance of improving their growth mindset and college/career-readiness.

Enhanced learning, in and out of the classroom

The Charles W. Whitcomb School STEAM program serves all middle school students with a model in which teachers from different disciplines – visual arts, engineering and instructional technology – collaborate daily to plan lessons. This model continues with the STEM Early College program beginning in Grade 9, which introduces a higher level of interdisciplinary learning revolving around engineering as its core. Additionally, the school features state-of-the-art equipment, such as PTC's CREO CAD, CNC technology, lasers, 3-D printers, 6-Axial industrial robots, a "fab lab" and other tools to help students hone technical skills and foster critical thinking. During each of the high school years, students are exposed to various stages of post-secondary and career readiness. In Grade 9 students develop self-awareness and explore different disciplines; career mentors help guide students in Grade 10. In Grades 11 and 12, students can select one of four pathways to gain dual enrollment college credits: computer science, biotechnology, healthcare, or engineering; they also participate in internships with local companies.

The program's structure enables students to determine the best path for their particular skills and aptitudes. By taking foundational courses that are common among all six pathways, students come to understand more about themselves and are able to make a conscious decision about their futures. "We allow them to have a say in what they will do," said Riley. "They see a relationship between their passions and how it benefits them to explore career interests through Naviance and other career guidance tools. When students gain regular and intensive practice with technical and teamwork skills, motivation, confidence and resilience for the real world of industry grows, and they understand how to shape that goal." Students also love the excitement of learning along with teachers, as staff gains new skills through training in CREO software, the Kuka robot and other technologies.



Earlier this year, eight female students attended the Girls STEM Summit at Regis College where they participated in a variety of experiments and faced unique problem solving challenges. In one exercise students created a model using the vertebrae from dead sharks to measure the age of the creature; the data will be used to inform government officials as they establish fishing legislation. The Summit inspired students to persevere in STEM, as they mingled with college students and toured the campus.

Jen Maciel hailed the experience as “eye-opening,” realizing that the principles she is learning in school also apply to life beyond the classroom. Fascinated by a chromatography experiment, Sheila Sossavi noted that the strong scientific foundation she is building through the STEM Early College High School program presents better opportunities after graduation.

These events tend to validate what the students are doing in the classroom, according to Patrick McColl, engineering teacher for Industrial Robotics, STEM Electronics and Exploring Engineering. “They feel respected that others are recognizing their ideas,” he said. “They see the reason for learning different skills.”

Liz Dehoratius, Early College Counselor, emphasized that taking responsibility is also one of the keys to the curriculum. By working in teams, much like college students and industry do, the students have an opportunity to build educational, real world and soft skills, which gives them an advantage over their peers when they begin post-secondary studies. “These students end up being group leaders,” Riley said, adding that the foundation they receive at STEM Early College High School eliminates the need for remediation upon entering college.

While classroom learning and in-school activities are a critical part of school-to-career development, students need ongoing practice with workforce skills. Laura Bilazarian Purutyan, PSW Career Specialist, works with Marlborough High teachers and counselors to connect the dots between school and work through employer engagement and work-based-learning. Throughout the academic year and summer period, students and staff have opportunities through the members of the Career Speakers Bureau to visit companies, conduct informational interviews and gain technical insights about different STEM disciplines. PSW Youth Careers aims to link employers, students and teachers together so that stakeholders can learn from each other and innovation can happen. “Our industry partners get to consult with students on project-work-days as they progress through the Engineering Design Process. Career mentors also share their professional experience, help students practice the professional elevator pitch and provide tips about résumés, interviewing and workforce culture. Industry partners can get to know the problem-

solving capacity and teamwork of students by advising extra-curricular STEM clubs, such as the Robotics Club and Real World Design Challenge team.” Many industry partners return year after year for rewarding encounters with students at STEM Expos and Science Fairs. The summer work-based-learning program allows students to investigate interesting careers inside a company, while being accountable for real project outcomes.

The benefits of partnership

Partnerships with local academic institutions and companies provide an added benefit for students in the STEM Early College High School program. Academic experiences through Framingham State University (FSU) and Quinsigamond Community College (QCC) help to ease the transition into the world of higher education. Juniors and seniors are invited to take writing courses at FSU, while QCC offers online and on-site courses in a variety of core subjects as an early pathway to college. More than half of the classes for the full associates degrees take place on the QCC campus and the others at Marlborough High School. These professional relationships enable students to obtain a minimum of 12 credits up through an Associate’s Degree and pursue multiple labor market opportunities.

Several local companies (See Box) provide internship opportunities and clearly see a return on investment in working with the students. “Employers need to know what kind of schools they have in their communities. From a company standpoint, they can recruit the best employees for the future,” Riley said.

The success of the STEM program is clear – 100 percent of students enrolled have completed the program and 97 percent are continuing their education at a college or university. Marlborough High School has become a model for the Commonwealth and has gained international recognition. Its STEM Early College High School program serves as a prime example that this type of learning produces positive results for students, businesses and the greater community. Riley said, “We have a duty to strengthen the STEM pipeline and help students secure a viable middle class job. When students leave Marlborough High School they have the basic requirements and are ready for their chosen pathway.”