

Quinsigamond Community College

STEM Center of Excellence

*A collection of K-12 Outreach Programs focused on Science,
Technology, Engineering, and Math*

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Quinsigamond Community College

- Located in Worcester, Massachusetts
 - ❖ Urban environment with economic challenges
 - ❖ Population of just over 200,000 full-time residents
 - ❖ 47 school district - Worcester Public Schools (WPS)
 - ❖ Over 55% minority population
 - ❖ 88 different languages dialects
 - ❖ 25,000+ student population
- 12 competing colleges in City
- 7,500 student population
- 70+ degree programs
- 90%+ students stay in Worcester area

QCC's Interest in Outreach

- Expose underrepresented and economically disadvantaged students to modern technology as part of *service to the community*
- Increase number of local students attending college
- Improve student preparedness
- Provide student awareness of career possibilities
- Improve community economics
- Increase enrollment within QCC

QCC's STEM Center of Excellence



Collection of programs that serve the local community with STEM K-12 Outreach opportunities:

- ❖ Robotics
 - ❖ Innovation First's VEX platform
 - ❖ FIRST's FRC competition
- ❖ Women (and Youth) in Technology
- ❖ Summer Technology Academy
 - ❖ Advanced Robotics Intensive
 - ❖ Technology Academy
 - ❖ Technology Academy for Girls
- ❖ Engineering Challenge

Funding

- Mostly private
 - ❖ National industry: including Microsoft, Bank of America, Sovereign Bank
 - ❖ Local industry: including EMC, Intel, Boston Scientific
 - ❖ Local Foundations: including Fred Harris Daniels Foundation, Greater Worcester Community Foundation
- Limited state and federal grants

Target Audience

- Students in the Worcester Public Schools
 - ❖ Priority for family income levels < \$27,000
 - ❖ Average “B” and “C” Student
 - ❖ Gender
 - ❖ Always 50% Male/Female
 - ❖ Sometimes Female Only
 - ❖ Interested in STEM Topic (often IT)
 - ❖ Past experiences with QCC
- Participating Students Must:
 - ❖ Complete Application Process
 - ❖ Agree to Behavior and Attendance Requirements
 - ❖ Attend Planning Meeting w/Parent or Guardian

Best Practices

- Focus on Science, Technology, Engineering, and Math (STEM)-related subjects
 - ❖ Utilize a “STEM is *everywhere*” approach
 - ❖ Present hands-on *project-based* curriculum that builds upon previously learned Science & Math for relevance
 - ❖ Expect high level of performance to show students what they are capable of with hard work
 - ❖ Present broad array of technical subject matter
 - ❖ Integrate *21st Century Skills*
 - ❖ Provide take-home technology component to allow students to continue learning
 - ❖ Participate in mentoring activities for students (by working professionals, QCC faculty, and QCC students)
 - ❖ Make it **FUN** always

Best Practices, *continued*

- Visits to QCC to utilize college laboratories
- Field trips to businesses to witness STEM subject matter in action
- Career planning and college preparation
 - ❖ Introduction of STEM careers and educational requirements
 - ❖ Preparing students for college and the admissions process
 - ❖ Local college STEM-related program offerings
 - ❖ College Placement Preparation and Testing
- Open House for family, friends, and sponsors
 - ❖ Encourage parental involvement
 - ❖ Give away prizes for achievement
- 75% of funding goes to classroom supplies
- Get students and parents involved in defining curriculum

Sample Curriculum for *Robotics*

- Learning robotics basics
 - ❖ History
 - ❖ Fundamentals
 - ❖ Physics and related structural design
 - ❖ Sensors
 - ❖ Electrical / Electronics
 - ❖ Programming
 - ❖ Use in Business
- Understanding engineering life-cycle
- Planning projects
- Introducing challenge
- Developing the team and product
- Participating in competitive challenge



Sample Curriculum for *Women in Technology*

- GPS
- Power Sources
- Environmental Engineering
- Multimedia Web
- Integrated Devices
- Information Technology
- Crime Scene Investigation
- Physics of Golf
- Aerospace Engineering
- Robotics





Sample Curriculum for *Summer Technology Academy*

Build Your Own Personal Computer

- ❖ Building Desktop PC from OEM Components
- ❖ Developing Your Users Manual
- ❖ Install Operating Systems (Windows and Unix)
- ❖ Managing Desktop (Users, anti-virus, Internet access, etc)
- ❖ Installing and Using Peripheral Devices
 - ❖ Printers
 - ❖ Cameras
 - ❖ Music Players
- ❖ Using Basic End User Software (Open Office, Greeting Cards, Open Source)
- ❖ Developing Computer Programs
- ❖ Developing Multimedia Web Pages



Sample Curriculum for *Engineering Challenge*

Organize teams by school:

- Design and build a bridge to hold the most weight
- Design and build a plane to fly the furthest
- Develop a program to calculate age
- Design and build a structure to support an egg drop from the highest distance

Evaluation

- Pre and post subject matter testing
- Pre and post attitudinal surveys
- Focus groups
- Instructional experience surveys
- Mentor experience surveys
- Track via database, students' STEM-related course choices, extracurricular activities, standardized test scores, and even college program choices

Program Summary

- Programs have grown over last 5 years on a yearly basis from:
 - ❖ Small number of participating students (maybe 20 to 50 total) to approximately 600
 - ❖ Budget of a few thousand to a few hundred thousand
- Student success indicators include:
 - ❖ Pride in students' accomplishments
 - ❖ Most students seek out additional QCC-sponsored activities
 - ❖ Through surveys, students show increased interest in STEM topics and careers
 - ❖ These students are beginning to show up as QCC students in Business, Technology, and Engineering programs