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