

Planting the seed: Local organizations create opportunities for girls interested in STEM careers

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Several days a week during the school year, a group of high school girls from around the region gather after school at Carnegie Mellon University's Field Robotics Center to prepare for an international robotics competition. Known as the **Girls of Steel**, they tie their hair back with bandanas as they fine tune robots—channeling their mascot Rosie the Riveter. With a wink toward robotics, their version of the icon sports a bionic arm.

CMU's creative technology nights exposes middle school girls to computer science.

Programming that encourages girls to explore science, technology, engineering and mathematics (STEM) are important because women are both underrepresented in these fields and face barriers to achievement in these areas at school and at work, says Theresa Richards, coordinator of Carnegie Mellon University's Field Robotics Center's **Girls of Steel FIRST** (For Inspiration and Recognition of Science and Technology) Robotics Program.

"Despite being 50 percent of the workforce, women hold only 25 percent of STEM jobs in our country," says Linda Ortenzo, director of STEM Programs at Carnegie Science Center. "We are all losing out in this equation. Having enough skilled workers in STEM careers is vital to our global competitiveness, so we can't afford to omit the contributions of so many women."

Girls of Steel is just one of many such programs in the Greater Pittsburgh area devoted to nurturing girls' interest in pursuing careers in STEM fields. These programs are developing young women's' skill sets and pairing them up with mentors in STEM careers, helping to shatter stereotypes and grow a more balanced next generation of mathematicians, scientists and engineers.

Carnegie STEM Girls program manager Nina Barbuto says: "We can all help girls to feel confident in their studies—boys too. Helping to level the playing field for women in STEM is not just women's battle, it's everyone's battle."

STEM MENTORS CHANGE GIRLS' MINDS

Linda Ortenzo describes herself as a lifelong learner.

"I have always been interested in STEM — even before we called it that," she says. "I enjoy exploring scientific discoveries that reveal the secrets of our world, and the innovations that shape how we live."

The Carnegie Science Center's Chevron Center for STEM Education and Career Development has a program called **Carnegie STEM Girls** for middle school and high school girls who are curious about

science, engineering, math and computer programming. Its companion website [CanTEEN](#), [Career Exploration](#) is an innovative resource to inspire girls to see themselves in STEM careers through gaming and online activities. These initiatives encourage tweens and teens to challenge and expand their knowledge of diverse STEM subject matter with connections to related professions, potential career paths and women making a difference.

“They don't have to be the science fair winners,” says Nina Barbuto, Carnegie STEM Girls program manager. “It is as much about learning the topics as it is exposure to new opportunities and futures.”

As the STEM acronym works its way into the American lexicon, outlets like Carnegie STEM Girls are becoming more widespread. Though there were some organizations that gave girls a glimpse at careers in science and math fields when Ortenzo was a child, she says they lacked the kinds of hands-on experiences and interactions with female STEM professionals that Carnegie STEM Girls provides.



“Programs like Carnegie STEM Girls are critical to reversing this trend by engaging girls in STEM activities, showing them how they can make a difference in the world through STEM careers, and communicating that these fields definitely are for them – especially during middle school when girls are most likely to lose interest in these subjects.”

The U.S. Department of Education agrees that women are vastly underrepresented in STEM fields and has assessed that this is often a lack of confidence and a self-concept that suggests these topics are for boys that has played a role in the gender gap.

Carnegie Science Center's STEM Girls watch a demonstration.

“Carnegie STEM Girls exists as a way to help [girls] to continue confidently through their middle and high school years,” says Barbuto. “Though the Carnegie Science Center has been supporting this cause since 2005, the topic of how we as a society project what ‘girls should be’ has been a hot topic. Girls can be as good (and sometimes better) in STEM topics than boys.”

Another offering through the Carnegie Science Center is [Tour Your Future](#); a year-round career exploration program that connects girls ages 11–17 with local female STEM professionals in their workplaces. The program introduces girls to a range of job opportunities, such as zoology, accounting, computer science and chemical engineering.

“With a range of programs from after school to on the weekends, some of the most important contributions we make are connecting girls with STEM role models,” says Barbuto. “Through all of our programs, even those online, we aim to introduce girls to real women in STEM careers. Those connections can be a similar love of animals, biology, outer space, or through liking the same music or even marshmallows! I have many great stories about how girls meeting a STEM role model through our Tour Your Future program had an impact.”

DEMYSTIFYING COMPUTER SCIENCE

Creative Technology Nights is a free drop-in program that focuses on exposing middle and high school girls to creative technologies. Held weekly throughout the semester at Carnegie Mellon University, TechNights is an outreach program of **Women@SCS**, a CMU School of Computer Science organization that works to promote, create and encourage women's academic, social and professional opportunities in the computer sciences and promote the breadth of the field and its diverse community.



Girls experiencing computer science at TechNights.

Carol Frieze, director of Women@SCS, knows a lot about gender myths and stereotypes in STEM fields, particularly in computer science. It's a topic she has researched extensively alongside the culture of computing, broadening participation in computing fields and diversity issues. In fact, while a doctoral student pursuing a Ph.D. in cultural studies in computer science at Carnegie Mellon, where she is now on the faculty, she wrote her thesis on the role of culture in women's participation in computer science.

"We started TechNights in 2005 as a way to expose more middle school girls in the Pittsburgh area to technology and computing skills," says Frieze. "We want to encourage them and demystify computer science so that many more girls will consider computing studies in their future. We want to show them they can do it and provide a social environment where they can meet others who are interested in technology."

TechNight topics vary and have focused on robotics, movie making, algorithms and programming to name a few.

"The sessions are taught by our students and we have many terrific volunteers who make great role models for the kids," says Frieze.

Frieze is also the director of **SCS4ALL**, a School of Computer Science wide graduate and undergraduate organization working to promote diversity in the school and to broaden interest, understanding and diversity in computing fields through outreach.

"Girls and women are seriously underrepresented in the field of computer science nationally—this is often because they don't get encouraged, they don't get a chance to learn the skills needed and they don't know what computer science is. Computer science and computing generally is where the well-paying and creative jobs are now — and will be in the future!"

GIRLS OF STEEL

The mission of CMU's Field Robotics Center is to "determine the future of field robotics by casting the vision, and creating the technology, robots and leaders of tomorrow."

Girls of Steel, its **Robotics** team for young girls, is one way the center works toward achieving its mission.

One of only 31 FIRST Robotics Competition all-girls teams in the world, Girls of Steel builds a new robot each year to complete specific tasks and compete against robots built by other FIRST teams at the international championship. This past year, teams competed in an event called Aerial Assist, where competing alliances scored points by throwing balls over a truss, catching balls, and putting as many balls in goals as possible.

Elizabeth Bianchini, a recent Fox Chapel High School graduate who will study engineering at the Massachusetts Institute of Technology this fall, was on the Girls of Steel team for three years. Despite an interest in STEM, she wasn't immediately sold on the program.

"I always knew I wanted to do a STEM field, but I thought I'd do something more artistic than robots," Bianchini says. "But then, once I joined Girls of Steel—it gradually convinced me that this was the cooler side of STEM fields."



"[Girls of Steel] offers hands-on opportunities for girls to learn about STEM through experiences outside of the classroom, in a safe place where they can be smart and feel empowered," says program coordinator Theresa Richards. "Through this program, we aim to raise girls' awareness of STEM careers and engage more girls in STEM... Students have opportunities to learn both business and technical skills, such as writing a business plan, leading a meeting, how to teach CAD, or program a robot using Java, during the year-long program."

The Girls of Steel FIRST Robotics team.

Bianchini says her peers are what she enjoyed most about being involved with Girls of Steel.

"The more into robotics you are, the cooler you are," she says. "But with other places, it tends to be the opposite."

The team's mission statement, created by the girls, is "To find success in the empowerment of girls through well-developed skills in STEM.

Richards says: "The most important contributions of programs like [Girls of Steel] are opportunities—opportunities for girls to learn from male and female mentors and role models who are scientists, educators, and students in STEM fields, opportunities for girls to compete with other robotics teams, opportunities to grow by teaching new girls on the team, opportunities to inspire even younger students through attending or leading outreach events or starting robotics teams for younger students, and opportunities to lead by offering and promoting student leadership of the team. ▲