

Mentor Programs Help Girls Engineer Their Futures

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Women continue to lag behind men in engineering in terms of degrees awarded, presence in the field and sheer numbers. But several mentorship programs are helping to attract girls and young women to the profession.



Claire Zaccheo, center, with student engineering team.

NEW YORK (WOMENSENEWS)--While many of her peers are in the throes of deciding what college to attend next fall, New York City high school student Claire Zaccheo has known for months where she's going. Last November Zaccheo was accepted by the engineering program at Manhattan College in Riverdale, N.Y. The summer before, she participated in a special high school mentorship program there for young women and minorities interested in engineering.

Today, less than 10 percent of the nation's engineers are women and few are enrolled in college and graduate engineering programs. The situation has very gradually improved for engineering bachelor's degrees during the last 40 years; in 1966, women earned 0.4 percent of baccalaureates and by 2004, the most recent year for National Science Foundation statistics, that had risen to 20.5 percent.

Beyond college, women's numbers dwindle further. In 2004, women received 21 and 31 percent of engineering and computer science master's degrees, respectively. That's low, compared to women earning 59 percent of master's degrees awarded in biology. According to a recent study by the National Academy of Sciences and the National Academy of Engineering, "with each step up the academic ladder, from high school on through professorships, the representation of women in science and engineering drops substantially."

Zaccheo's interest in pursuing engineering in college began in spring 2006. She had always wanted to be a chemist but she enjoyed accelerated math and regular physics classes. Her guidance counselor mentioned engineering so Zaccheo read up on it. She attended Manhattan College's three-week Women and Minorities Engineering program the following summer. The program provides high school students the opportunity to audit classes and labs in all the engineering prerequisite courses and subspecialties.

In a chemistry lab, they made silly putty out of glue and detergent. They also split into groups to build wooden structures. Then they stacked telephone books on top of them to see whose structure was stronger. They also took a field trip to the New York engineering firm of Thornton Tomassetti and met engineers in the design and forensics departments. Manhattan College Associate Professor of Civil Engineering Walter P. Saukin, who directs the summer program and is on both the national and New York boards of directors for the Architecture, Construction and Engineering (ACE) Mentor Program of America, suggested that Zaccheo apply to its after-school program. ACE becomes partners with local engineering entities such as New York City's Transit Department and commercial construction firms. The Transit Department donates employees' time, its space, supplies and snacks.



Students use engineering skills to construct robots.

Reaching Out for New Talent

ACE was founded in 1994 by 17 New York City construction firms that saw the need to reach out for new talent.

The firms "adopted" about 90 students from local high schools. Since then, 30,000 students have participated nationally in the program, including 13,000 young women, or 48 percent of the total. The program went national in 2000 and now there are 90 locations with 8,500 students and 2,400 mentors, and 71 more locations are interested in starting chapters. To date, ACE has donated over \$5.4 million in scholarships to participants.

Zaccheo, a 17-year-old senior at Notre Dame Academy in Staten Island, goes to the city's Transit Department offices in lower Manhattan every other Tuesday from 4 to 6 p.m. There she joins a team of 23 other teens from the New York metropolitan area. An engineering mentor helps the teens design and construct a model of a recreation center of their dreams. The students have designed it, complete with a swimming pool, bowling lanes, a basketball court, a theater, library, technology center and food court. In May the students--about one-third of whom are female--will present their model to nine other local ACE teams.

Zaccheo calculated square footage and assured that the model was to scale. The students started out using spaghetti and gum drops to design a building and fashioned a bridge out of paper and tape. As the year progressed, they used thick paper to build their model.

"I like working with numbers," says Zaccheo. "And I like the teamwork because members have different strengths. Some are more spatially oriented."

Stressing Communication Skills

Her mentor Frank Mondello, a Transit Authority civil engineer, says students learn not only engineering principles, but that engineers must communicate with one another. "The relationships are interdisciplinary and very personal," he says. "I see that as the biggest issue we must convey to students."

Cosema Crawford, the first female chief engineer of New York City Transit's Capital Management Program, instituted several national mentoring programs when she took over the department five years ago. Besides the ACE partnership, they include Future City and FIRST (For Inspiration and Recognition of Science and Technology). Crawford pitched a business case to her bosses, arguing that their work force is aging and will need engineers in the future. She also wanted kids to understand that engineering is fun and the skills they happily used in their workshops are the same as those they would use as professional engineers.

"I'm convinced it's easier to take a New York kid and turn her into an engineer," she says, "than to get an engineer from Ohio to come to New York."

Several middle-aged women who work in clerical jobs in Crawford's department helped launch her scholastic mentoring program at a fair at the Transit Department's offices in October 2002.

Crawford says many of the women expressed a wistful interest in what they witnessed that day.

"I found it very moving that as they listened to speakers describe various mentoring programs, they agreed that if there had been similar programs in their schools when they were young, they wouldn't be secretaries to engineers," Crawford says. "They'd be engineers themselves."

Attracting Girls to Their Futures

Future City, for seventh- and eighth-grade students, and FIRST, for elementary through high school kids, are also attracting girls nationwide. FIRST teaches robotics--which encompasses electrical engineering and computer science. Founded in 1989 and based in Manchester, N.H., the program has reached 130,000 students who built 10,652 robots with the help of 37,000 mentors

In February, a student team of two females and one male from St. Thomas More Catholic School in Baton Rouge, La., won the National Engineers Week Future City competition for their project. Named Mwindi, meaning "light" in a dialect of the Republic of Congo, it is a model of an energy self-sufficient community that would sell its renewable excess electricity to other cities.

Future City began in Alexandria, Va., in 1992 and attracted as many girls as boys by 1999, says New York regional coordinator Karen Armfield, a geotechnical engineer with the New York City firm DMJM Harris. She says girls are often particularly responsive to the socially valuable roles that engineers can play.

"Girls learn that civil engineers help the community by designing its infrastructure or that environmental and biomedical engineers help clean up contamination. When girls see the benefits engineers can bring and their important role in society, rather than looking only at math and science, then engineering becomes a choice they consider."

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