

Career Awareness Transcript:

Narrator: Opportunities to improve the world around us and invent new solutions to society's problems require talented engineers. However, the engineering workforce has not expanded fast enough to meet demand. In fact, diverse ideas that inspire creativity and invention may be getting lost.

Women only make up 10 percent of engineers. Attracting women to the field and integrating diverse ideas into the profession will take a collective effort. Education will, of course, be the key.

Student success in future employment can offer satisfying evidence of an educator's role in recruiting students into diverse careers. That means recognizing the possibilities of early science and math education so educators can better help their students understand the role engineers play in the world.

Marie-Elena Reyes, Frida Kahlo Institute: But there is also this total lack of understanding about what engineering is. What kinds of careers and opportunities are available? I mean, I still, it blows my mind when I talk to a teacher or a student, an undergraduate student, and I'm explaining 'do you know what material science is, do you realize those glasses that you have on, an engineer designed those glasses, an engineer is involved in providing the materials for this chair.' An engineer is, not only builds cars or designs cars, but is involved in almost everything we use.

Narrator: To engage students effectively, educators counteract stereotypes of engineers by making students aware of the diversity of people in the profession, the broad practical applications of the skills, and the meaningful results that engineers produce with their work.

Engineering study opens up a host of career possibilities that are built upon the foundation of problem-solving.

Keeping students' interests relevant can help encourage girls to pursue basic math and science study. For example, a high school student passionate about green energy may find coursework more compelling if she can connect a lesson on weight and lift to the local wind farm.

Showing girls that engineering is about creating innovative solutions to human challenges is a critical aspect to recruitment.

The impact of engineering permeates our everyday lives. The clothes students wear, the chairs students sit on, or the lights by which they read are the result of hard work by incredibly talented people.

Everyday objects provide easy opportunities to introduce young women to engineering. Helping students see how ideas become reality is an important step in introducing and building interest in engineering.

A Gallup Poll taken of teen's top career choices underscored the lack of awareness of engineering by girls. Boys placed "engineer" as the 4th most popular career choice, while "engineer" did not even make the top 10 list for girls. **[Graphic: Awareness of Engineering Careers, Teens' top 5 career choices by gender
Boys: 1. Sports 2. Doctor 3. Architect 4. Engineer 5. Teacher
Girls: 1. Teacher 2. Lawyer 3. Doctor 4. Nurse 5. Fashion]**

However, many of the professions identified by girls as likely career choices draw from the same skill sets prized in engineering. Many girls are interested in engineering; they simply don't realize it yet.

Educators have a unique perspective as students explore ideas and define their interests. Remaining alert to cues from girls' actions and questions, educators can expand a student's thinking about engineering.

Reminding students not to take the things around them for granted will raise questions such as "how do ideas become reality" and "who gets it done." The answer, of course, engineers.

Stephanie Adams, Virginia Commonwealth University School of Engineering:
Initially, I wanted to be an orthopedic surgeon. Well, initially, I wanted to be a pediatrician, and then I injured my knee and I wanted to be an orthopedic surgeon. So, I was really fascinated with artificial knees, and so I understood that engineering was a way to learn about how to design artificial knees, and so that self-need to be able to provide an alternative device for people who had bad knees drove my motivation to want to go into engineering.

Narrator: Educators can provide girls with support by counteracting stereotypes about gender and ability in science and math.

Breaking down the myths through early involvement to build and maintain the confidence of girls is critical to allowing them to explore the wide array of engineering disciplines that may interest them.

The best way to break down myths is to facilitate success and interest in math and science. Hands-on activities and problem-solving make for great ways to introduce new concepts and get students excited.

The FIRST® robotics competition has been a huge success in getting students excited about engineering.

Integrating problem-solving teaching techniques with new technology can be a great way of reaching students.

Try the commercial videogame Roller Coaster Tycoon®, by Atari. It allows players, ranging from elementary school students to adults, to design and build a variety of

amusement park rides. The game draws attention to engineering constraints such as safety, construction cost, and human factors – that is, will the ride make people sick?

But, as educators know, there are many ways to reach students; using different approaches in one classroom allows a variety of avenues for students to grasp ideas that they might otherwise miss out on.

Instructors can integrate some of the most relevant learning styles into the classroom, including: student-centered, experiential, holistic, and collaborative learning.

Being aware of various learning styles allows educators to formulate lesson plans that captivate all students.

- Student-centered learning takes a focus on students and their interests, allowing them the opportunity to investigate problems through their experiences.
- Experiential learning uses real-world examples and experiences for students to learn ideas. Students actually solve problems by working through them, such as building a simple machine in the classroom.
- Holistic learning focuses on the big picture rather than smaller pieces. Students learn best when they encounter whole ideas, events, and materials in purposeful contexts.
- Collaborative learning emphasizes groups of students searching together for understanding. Examples include students breaking into teams to tackle a problem.

Engineering study provides a way to integrate math and science instruction and show its applications in the real world. It also lays the foundation for a possible career in the field.

Communicating the benefits of an engineering career is a straightforward way to draw young women to the field.

Engineers can earn a healthy salary right out of school, with recent graduates of 4-year engineering programs earning upwards of \$60,000 a year.

Engineers work in groups and teams and frequently have contact with professionals with diverse backgrounds and expertise.

Engineers also are needed everywhere. They work in big cities and small towns, in laboratories or on project sites, working to solve energy, transportation, and environmental challenges.

The attraction to engineering can begin with the realization that work in the field directly improves people's lives. To achieve that, exposure to engineers can be essential. Even high-performing math and science students may opt for other career paths if they are not made aware of the diverse day-to-day lives of engineers.

Global teams, site work, first-of-a-kind projects, engineered solutions to meet essential human needs. Perhaps the best approach to drawing interest to engineering is with role models who can offer examples of these. Unfortunately, there are not enough female

engineering role models in our country – and fewer, if any, present in the everyday lives of young women.

Rose Marra, *University of Missouri*: So, young students, I think they're more directly exposed to the professions of doctors and lawyers. Little kids go to the doctor. They see that firsthand; maybe it's not always a positive experience, but they know that doctors help people so identifying with that career I think is pretty easy, it's really just right there for them. They may or may not be aware that they're meeting people that are engineers.

Susan Metz, *Stevens Institute of Technology*: Even the science and medical breakthroughs and all of the equipment, the arthroscopic surgery. Who created that equipment? The doctors didn't do it. The doctors use it, but engineers created all of that equipment.

Narrator: Women at all stages of their academic and professional engineering careers can serve as effective role models. Educators looking to find professionals to speak to their classes can share their expertise on student interests to help prepare engineers to translate their passion effectively to younger audiences.

Just as role models help increase awareness of opportunities, mentoring provides another effective tool for educators to cultivate and nurture interest in engineering.

Stephanie Adams, *Virginia Commonwealth University School of Engineering*: I think as faculty go to conferences and interact with people, same deal, you know, extend invitations for folks to come and be in your classroom. And I think part of the mentoring relationship is you can mentor by design or you can mentor by connection. So, I tend to think the more people you put in front of people who look like them and speak their language, the people are going to find a connection.

Narrator: Mentors motivate, coach, and guide students to help them solve problems, set goals, and make critical academic and career decisions.

Mentoring needs differ at different academic levels.

In primary school, mentors focus on making math and science fun and showing how engineers apply these subjects in practical ways.

In middle school, mentors provide encouragement and practical advice for math and science education.

And, in high school, mentors look to nurture interests, keeping students engaged and on an engineering pathway.

Just as the implementation of new recruitment or mentoring activities can help to increase awareness, evaluation and assessment activities also play a critical role in fostering diversity.

By identifying what does and does not work, educators can refine and improve messages, events, and programs. One of the simplest assessment approaches is to actively listen for feedback from students.

Karen Tonso, Wayne State University: Many colleges are working very hard to recruit more women students, are taking a lot of effort to recruit more women students, but they've failed to ask questions about how it is that engineering operates on women differently than on men. What is it that makes it more difficult for women to become full-fledged members of the engineering community?

Narrator: Taking the time to sit down and talk to students is an invaluable tool in understanding their needs and also evaluating education programs or recruitment approaches.

Focus groups are another tool for gathering feedback. In a focus group, a moderator will typically lead a small-group discussion, to collect in-depth insight.

According to a report by the National Science Board, focus groups, consisting of women and underrepresented minorities, have shown that they want more collaborative approaches to school and work. They also want a greater emphasis placed on how engineering addresses socially important problems.

It is important to give every student a voice for input. In larger groups formal surveys are a useful tool to accomplish this goal. Follow-up surveys can provide better data on long-term effects of a program or activity.

Encouraging women to explore the field of engineering takes a concerted effort among parents, teachers, and administrators. With significant challenges to be addressed in the years and decades ahead, society will need to expand the field to include recruits with diverse ideas and experiences in order to continue to improve life in the world around us.

Susan Metz, Stevens Institute of Technology: I think engineering is an incredibly creative, innovative enterprise and if you're focusing on one group of people, you'll never get the breath of solutions to problems and processes that we need to address issues for all kinds of people. So, in any given conversation when you're in a group of people with different backgrounds and experiences, it's a more interesting conversation and the outcomes are usually much more creative.