A GUIDE FOR ROLE MODELS

Engage
Connect
Inspire
Acknowledgments

This project was truly a partnership. We would like to thank our partners at the Society of Women Engineers, particularly Randy Freedman, SWE Outreach Manager, who shared their time, experience, and lessons learned. We would also like to acknowledge members of the Boston, Puerto Rico, and Alabama SWE sections who reviewed earlier versions of this guide.

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This material is based upon work supported by the National Science Foundation under Grant No. HRD-1153882.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the view of the National Science Foundation.
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ABOUT TECHBRIDGE
Techbridge was launched in 2000 in Oakland, California with a mission to inspire girls in science, technology, and engineering. Our vision is to create a future where girls and other underrepresented groups will play a larger role in these fields and where all girls will have the opportunity to explore the wonders of science and engineering. Since its inception, Techbridge has served more than 5,000 girls in after-school and summer programs in the San Francisco Bay Area, and through partnerships with Girl Scout councils, Techbridge has reached thousands of girls nationwide.

Our role model program is one of our most important—and impactful—parts of the Techbridge program. Interacting with girls one-on-one, role models share their passion for their professions, answer questions and dispel misconceptions about working in science, technology, engineering, and math (STEM) fields, and inspire girls to study and pursue a career in STEM. We encourage you to become a role model in your community and to help inspire a girl to change the world through STEM.

“The value of increasing the participation in engineering of women and other underrepresented populations goes beyond increasing headcount. Innovation will flourish when the richness of different perspectives, approaches, experiences, and values are leveraged as a workplace team collaborates in creative ways to generate new ideas.”

Betty Shanahan, Executive Director and CEO, Society of Women Engineers

The Society of Women Engineers (SWE)

For over half a century, SWE has provided women engineers a unique place and voice within the engineering industry. The goals of SWE are to “Stimulate women to achieve full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life, and demonstrate the value of diversity.”

SWE outreach programs inspire the next generation of women engineers. SWE members engage young girls in the possibilities of a rewarding career path through workshops and interactions with SWE role models.
The Role Model Difference

“I think what makes a really good role model is the desire to give back.”

Josetta Jones, Patent Attorney, Chemical Engineer, and Role Model

Research shows that role models are important for expanding career options and exposing girls to STEM careers. While two-thirds of young children—girls and boys—say that they like science, differences in confidence and interest in STEM begin emerging in middle school. In high school, girls may enroll in as many advanced math and science courses as boys do and perform just as well, but fewer high school girls plan to pursue technical majors in college, particularly in engineering and computer science.

The current representation of women and other underrepresented groups in STEM fields remains alarmingly low:

- The U.S. Department of Commerce reports that only 14% of engineers are women and that 5.3% of STEM workers overall are from underrepresented groups.¹,²
- At the college level, women account for only 18.4% of those earning a bachelor’s degree in engineering.³

But there is a need for role models, and they do make a difference:

- Less than 50% of high school girls know a woman in a STEM career.⁴
- Eighty-seven percent of Techbridge program participants say that field trips and role models made them more interested in working in technology, science, or engineering.⁵
- Exposing girls to female role models helps to counteract negative stereotypes about women and STEM.⁶,⁷

⁶ Buck GA et al. (2008) Examining the cognitive processes used by adolescent girls and women scientists in identifying science role models: A feminist approach. Science Education.
Who Is a Role Model?

A role model is someone whose own passion and enthusiasm help motivate others and inspire them to see possibilities for their own future. As a role model, you have the opportunity to increase interest and participation in STEM careers, especially for girls and underrepresented groups, through the simple act of sharing your own stories and experiences. It’s also a chance to dispel negative stereotypes and myths around women working in STEM fields that often hold girls back from exploring their interest in science. Being a role model can also invigorate your own professional life by developing your leadership skills. It can remind you of why you chose your career and what you love most about it.

Being a role model is fun, rewarding, and can change a girl’s life. At Techbridge, we’ve seen firsthand the impact a role model can make and just how much everyone gains from the experience.
Step 1: SETTING OVERALL THEMES AND GOALS

Whether you are going to visit a classroom or present at a SWE WOW! event, be sure to talk with the organizers hosting the event to review the agenda and goals for your visit. Consider the following questions:

- What are the organizers’ goals for the event?
- How much time will you have with the girls?
- Will you be doing a hands-on activity? If so, what?
- What is the objective of the activity?
- What materials do you need?
- What are your responsibilities and expectations for the day?

Fostering personal connections, providing positive messaging about STEM, making meaningful tie-ins to your career, and promoting exploration and curiosity—these make up the foundation of your interactions with the girls. As you begin to plan your visit, think about what you want the girls to take away from this experience and what important lessons you want to share. Before meeting the girls, think about:

- What drew you to your particular field?
- What factors did you consider when choosing this type of work?
- What surprised you about your career path?
- What obstacles did you encounter and how did you overcome them?
- What do you find inspiring in your work?

Personal Connections

Creating personal connections is at the center of being a role model. These connections help you break through and inspire a girl’s interest in STEM studies and careers. The strategies and tools in this guide are a means of helping you create meaningful connections with the girls you will work with. You make a connection through listening, sharing, engaging in activities, becoming familiar with the girls, and supporting them in identifying their career goals.

Before your event, find out as much as possible about the girls you will be working with. The hosts may be able to provide you with brief bios for the girls. Letting the girls know a bit about you beforehand is also helpful. One possibility is to provide the girls with a Bio Card about you, your work, and your interests.
Sample Role Model Bio Cards

Mechanical Engineer

Mechanical Engineers design and test different kinds of machines. Think of all the machines you use like appliances and automobiles. They are designed by Mechanical Engineers who find out what we need and how to make them so they’re safe and functional.

As a Mechanical Engineer, you could design and build a bike that is easy to pedal up hills, machinery that makes toys, an aircraft carrier, a sailboat—anything that moves! The annual salary is $80,580 which is about $38 per hour.

Nancy's Biography:
When I was in middle school I wanted to be a surgeon. In high school, my favorite teacher suggested I try computer science. I decided I liked building things better, so I tried Mechanical Engineering. It was the perfect major for me because I got to design and work on hands-on projects.

As a Ph.D. student at the University of California Berkeley I build models of manufacturing equipment and test them on computers. Berkeley has an environmentally friendly manufacturing program, which I love.

How to do it:
To become a Mechanical Engineer, be sure to take advanced math or science classes like trigonometry and calculus. You’ll learn statistics, strength of materials, design, and physics.

If you like learning about how things work, get your parent’s permission and try taking apart things in your house like old hair dryers, coffee machines, or a lawn mower. Find information about your local engineering society and learn about opportunities like internships or camps.

Nancy Diaz
Master's in Mechanical Engineering

Packaging Engineer

Packaging Engineers combine engineering, design, and marketing all into one career. As a Packaging Engineer you work with many different people and you can work in many different industries. You use your creativity and problem solving skills to develop packaging for products so they stay in mint condition for customers to buy, attract them to the product and keep contents contained. Having good communication skills is very important.

As a Packaging Engineer you might test new packaging materials for food to see if it would survive a long truck drive or rainy weather. The average annual salary is $51,391 annually which is about $24.70 per hour.

Ann's Biography:
When I was in middle school I knew I wanted to work in science. I enjoyed science class, and loved to learn about new things. I took a college tour in high school of the School of Engineering and when I toured the Packaging Lab I was fascinated that it was a profession.

At my job I write specifications (design rules) for packaging materials, test them and talk to suppliers about new ideas. I also get to work with our sales and marketing team to develop new products and packaging ideas.

Ann Cheng
Degree in Applied Science

How to do it:
To become a Packaging Engineer like Ann take classes like physics, economics, and higher math. Ann suggests you take a variety of classes in college so you can identify what you really have a passion for. Look for opportunities to job shadow someone in the field you are interested. Too many times you may be interested in a certain field only to find out that your imagined career path is much different in reality!
Messages about Engineering

We are all flooded with different messages throughout the day—from the media, from school or work, from our family and friends. The message that many girls get about engineering is that it’s “difficult, boring, and just for boys.” To begin to change the way that girls think about engineering, it’s important to highlight the creative and collaborative nature of this field. With the right experiences and role models, girls can begin to see engineering as fun and inviting.

Here are some guidelines to help you communicate positive messages about STEM professions in general and of engineering in particular:

- Girls want to make a difference in the world. Let them know that engineers and scientists make a positive impact on society and the world around them.
- Explain that engineers are creative problem-solvers who help shape the future.
- Show that engineering is essential to our health, happiness, and safety.
- Be dynamic! Your enthusiasm and passion for your work will make the girls excited to learn about your career and perhaps follow in your footsteps.

How will you use positive messaging to describe your career?
• Highlight engineering inventions by women or minorities.
• Discuss overcoming struggles and challenges.

Connecting to Careers

It can be challenging for young people to find meaningful connections between an activity and a career or a real-life situation. Throughout your interactions with the girls, make an effort to illustrate these connections. As you do an activity together, show how it relates to your work or a real problem. If an activity does not relate directly to your job, try to draw more general connections, such as working collaboratively or using the engineering design process. For example:

• If you are a mechanical engineer leading a chemical engineering activity, talk about how the engineering design process the girls are using in the activity is what you use to solve a problem at work.
• Share with girls that, just as they are working in groups, teamwork is also essential to your work.

Note: When explaining the real-life applications of an activity, keep in mind that younger girls may relate more to home, school, or community than to national or global connections.

Inspiring Curiosity through Inquiry Practices

Exploration is a powerful way to develop knowledge of engineering concepts. The National Research Council defines scientific inquiry as "the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Scientific inquiry also refers to the activities through which students develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world." The following tips will help you encourage inquiry practice and strengthen girls’ own natural curiosity:

• Encourage girls to make predictions.
• Have them record their observations and data.
• Help them think through their recorded evidence to formulate a new idea.
• Challenge the girls to apply what they have discovered to other situations.
• Probe them with questions throughout the activity about how or why they did things.

Step 2: INTRODUCTIONS AND ICEBREAKERS

“I told my story from the beginning. I told my story about how I gradually became an engineer, and it built this excitement in me, and I remembered how much I loved being an engineer, and that enthusiasm built and it showed through.”

*Lyn Gomes, Mechanical Engineer and Role Model*

Taking time to share something about you and to learn more about the girls is essential to making an impact. Through icebreakers and personal introductions, you can begin to connect with the girls you’re working with.

**Introducing Yourself**

Introducing yourself to a room full of girls may seem daunting, but remember that they are there to learn from you and about you. Here are some ideas you might include in your introduction:

- What you like to do for fun.
- Where you went to college and what that experience was like.
- How you got into your career.
- What you like about your career.
- What struggles you faced and what you learned from them.

Try to make your introduction as interactive as possible. Simple things like moving around the room and making eye contact with the girls go a long way toward creating rapport and making everyone feel comfortable.

Another important means of building rapport is through open-ended questions and conversation. Talking with the girls will give you information that can help you direct the conversation to their concerns and interests. As you talk with the girls, encourage them to ask you questions.
Many girls struggle with developing a picture of their future. Learning about the choices and decisions you made throughout your school life or career can go a long way toward forging connections with your group. Consider sharing:

- The path that led you to your career.
- The process you follow at work to create a product or to get a job done, and how this relates to what the girls might be doing in school.
- Times in your life when you worked hard to find ways to overcome challenges.

Some guidelines to keep in mind:

- Don’t just talk at the girls—you will lose their interest. Ask questions to keep the conversation moving and provide plenty of opportunities for the girls to participate.
- If you use a PowerPoint presentation to introduce yourself, include lots of pictures and be sure to keep text and slides to a minimum.
- Bring in props related to your work. Props help provide a better understanding of what it is you do, help everyone focus on what you are saying, and can help you stay on track and talk clearly about the different aspects of your job. A good general rule is: the more visuals, the better!
**Icebreakers**

Starting your session with an interactive and fun icebreaker warms up the group and sets the tone for the event. It can also give you some initial information about the girls in your group that can help guide the discussion and activity. Icebreakers can help to . . .

- Make girls feel more comfortable with one another and with you.
- Introduce new scientific topics, vocabulary, or careers.
- Gauge girls’ level of background knowledge on a particular topic.

*Visit our website at www.techbridgegirls.org for sample icebreakers.*

**Step 3: LEADING HANDS-ON ACTIVITIES**

Hands-on activities give girls a snapshot of your work and show how creative and interactive science and engineering can be. Activities can go a long way toward dispelling the stereotype of the isolated scientist alone in a lab or the engineer with her nose in a book. Try to engage the girls in activities that are fun, showcase your career, and bring to light important concepts in science and engineering. Remember, even if the chosen activity does not directly relate to what you do, make every effort to find connections. Draw on ideas like collaboration or the design process that carry over throughout the disciplines.

Before your event, talk with the event organizer to discuss the type of activity that best suits you and your work. The event organizer will likely be able to provide ideas and resources for you. If your company or SWE section regularly engages in outreach, it may already have prepared activities that are closely tied with your group’s practices or products.

As you plan your hands-on activity, here are some guidelines to keep in mind:

- Consider the age group you will be working with and whether the activity is age-appropriate.
- Determine the relevance of the activity to topics the girls may be learning at school and how it connects to your own job or studies.
- Don’t get too complex. Consider time and location restraints, the skill level and size of the group, and the cost of materials.
- Practice the activity! This will help you anticipate where girls might have difficulty so you can develop strategies and questions to help them through it. What will you do if the activity doesn’t work? What can the girls learn from this experience? An unsuccessful activity is your opportunity to teach girls about the design process and the opportunity to redesign, about perseverance, and about learning from mistakes.
Technobabble

As you prepare for a visit, keep in mind both the amount and the level of technical information you will use. Don’t be shy about using terminology that is important to your work; we learn new vocabulary largely by exposure. Just be sure that you define what you are talking about in a way everyone will understand. Challenge yourself to express the complexity of your work in simple terms and kid-friendly language.

To help you prepare, practice different ways of conveying complicated or technical information:

- Are there any visuals or analogies you could use to convey the meaning of a word, concept, or practice?
- Is there an interactive way to describe a word or concept?
- Can you boil down your job to its essential components?

Throughout your visit, layer your conversations with select technical terms that are important to your work. When you introduce new words, acronyms, or concepts, repeat the definition more than once throughout the visit to make sure that everyone understands. Define and break down words as you use them with the girls, and apply them to real-life examples. The more that they hear key vocabulary, the more likely it is that they will begin to understand and use the words themselves.

Some girls may already be familiar with the terms or concepts you introduce. To gauge their level of familiarity, ask the group about the topic. This is an opportunity to have girls contribute and describe the concepts in their own words. After girls have completed the hands-on activity and had an opportunity to see the scientific terms and concepts in action, be sure to ask them to describe what they’ve done in their own words.
What Were You Thinking?

Model problem-solving by narrating your thoughts as you try something new or challenging like putting a puzzle together. You might feel silly at first, but letting everyone hear what you are thinking brings the engineering design process to life. Modeling your own thought process also demonstrates to girls that there are many ways to think through a challenge.

Through modeling, you can also show girls how to keep a positive attitude about failure. Emphasize that in real life, designs frequently fail; engineers simply take their lessons learned and go back to the drawing board. Setbacks are opportunities for learning.


Questions are a critical component of inquiry practice. Encouraging and valuing questions from the girls helps them understand that their ideas are important. A few open-ended questions to use during the hands-on activity you are leading?
simple strategies can help stimulate question-asking throughout the activity and ensure that they fit the age and comprehension-level for your group.

Being a role model is actually really rewarding and satisfying. Transferring that passion and seeing that passion light up in a particular girl - it makes me really happy that I’ve done what I had sought out to do, and that is to motivate and empower these girls that they can do anything they want if they really put their minds to it.

Judy Wan, Scientist and Role Model

Asking open-ended questions such as, “Tell me how you came up with this design?” and “Why did you choose to incorporate that particular design element?” can get girls into the practice of using evidence to develop rationales for their designs and encourage them to be intentional. Tailor your language and level to challenge the girls, but still at a level that’s comfortable for their age and familiarity with the subject. Questions can also guide them to feel more comfortable trying out designs that may fail but will ultimately increase the chance of success with their hands-on project.

Giving the girls enough time to think of an answer is also important. Providing girls with a little wait time to answer questions will help increase responses and girl-initiated questions.

Higher-level questions are those that ask girls to analyze, synthesize, or apply what they have been working on. These types of questions encourage girls to be critical thinkers. Be sure to use higher-level questions throughout your interactions with the girls. For example:

- What changes would you recommend to improve your design?
- What would happen if . . .?
- What do you see as other possible outcomes?
- What are the applications for this?

Feedback

Feedback is an important part of the learning process. Constructive feedback can motivate girls, instill confidence, and help them overcome challenges. Here are some tips for providing feedback to the girls you work with:

- Be positive but accurate. For example, “You are doing a great job thinking through the wheel

If you have a girl struggling with an activity, what kind of specific feedback could you offer to help her complete the challenge?
design for your car.”

- Refer specifically to what the girls are doing.
- Don’t wait until your closing discussion to review what the girls did—provide feedback throughout the activity.
- Provide a little “think time” so the girls can reflect on their work as well and ask you questions.
- People react differently to feedback, so keep in mind how much feedback you are giving and how you’re presenting it.
- Younger groups may easily misunderstand verbal feedback. Consider demonstrating what you were talking about in addition to using words. For example, showing a group the strength of a triangle may be easier for them to understand than just telling them.

It’s also important to encourage the girls to provide constructive feedback to their peers as they work together on an activity. Providing feedback develops their critical thinking skills and is an important part of the inquiry process. If you ask girls to give each other feedback, make sure that they understand how to do so in a positive and constructive way.

Features of constructive feedback:

- It provides guidance and supports the learning experience. A great way to do this is to offer feedback by posing questions that break down the steps and actions of their work, analyze what’s occurring within the work, and get a better understanding of the process they followed.
- It comes with high standards. Feedback may challenge the girls to take risks and will encourage them to meet that challenge.
- It emphasizes the value of effort and persistence. For example, praising a peer by telling them that they are really smart does not show them that it was their effort and persistence that helped them succeed. Pair compliments with evidence from their work.

Here are a few sentence starters to use:

- I really like how you . . .
- I saw you were using a lot of effort when . . .
- This is really interesting because . . .
- The strengths of your design are . . .
Staying on Track

Hands-on activities are engaging, but if girls get confused, lost, or frustrated, they can get off track. Observe how the girls are interacting and talking with one another. Circulate around the room and take note of what you see and hear:

- Are there girls who are not participating or individuals who are taking over? Often, pairing girls and giving them specific roles and tasks for the activity can alleviate tension and encourage collaboration.
- Do some girls appear lost or disengaged? Talk to them and find out why. Use questions or demonstrations to guide them back on track. Resist the urge to complete the activity for them just to ensure that they catch up with the others. If they are truly stuck or have completed the activity early, consider modifying or extending the activity as needed.
- Does one girl generally work faster and finish earlier than the others? Giving her a role as a helper may keep her busy. She can circulate and report back or help others who are not as far along.

If you have one group of girls who seem disinterested in the activity, what would you do to engage them?
Crowd Control

Before your event or visit, talk with the event organizers to review expectations for the group. Find out beforehand if you are going to be working alone with the girls or if there will be someone to assist you. If you are not working alone, offer to share the responsibility of managing the group, and review the techniques that you think are most effective with your co-leader.

Review your behavior expectations or practices with the group before you get started.

Here are some group-management tips:

- Establish eye contact with the girls when you are asking and answering questions.
- Get the girls’ attention before talking.
- Invite girls to rephrase directions or questions to make sure they’re understood.
- Move around the room, and increase your proximity to restless girls.
- To quiet a group, send a silent signal, such as raising your hand.
- Give a quiet reminder if the girls are getting too loud.
- Redirect the girls’ attention if they are distracted by someone or something.
- Invite the girls’ active engagement by posing questions (instead of talking on and on).
- Make the girls aware of the time limits, and remind them throughout the activity (e.g., you have five minutes before cleanup).
- Offer a choice. If there are girls who are having a difficult time paying attention during the activity or presentation, provide an alternative activity for them if possible. There may be something these girls can do quietly and independently, such as journaling or creating a picture or diagram of the activity.
- Use humor. Most events are informal, and everyone is there to learn and have fun, so enjoy your time with the girls.
- Throughout the visit, provide positive reinforcement to the girls that highlights their effort and thinking. This will encourage them to stay on task.

Getting Attention

Camp counselors have a trick to get everyone quiet. It’s really fun—let’s try it now:

Clap once if you can hear me! [Clap]
Clap twice if you can hear me! [Clap clap]
Step 4: REFLECTION

Girls often do hands-on activities at STEM events, but they may just see them as fun lessons rather than problems or challenges that engineers may take on in their careers. Girls need opportunities to reflect on the STEM activity in order to get the bigger picture. Reflection is an important part of the learning process. Through reflection, girls gain a greater understanding of their experience, become more aware of the knowledge and skills they have developed, identify their strengths and areas for improvement, and develop an action plan to continued exploration.

Developing Meaning through Discussion

Group discussions provide an opportunity for girls to expand their understanding of concepts. When girls see the implications of an activity through real-world applications, it becomes both meaningful and memorable. Discussions are an important part of your time with the girls and should happen throughout a role model event.

Here are some tips for conducting a group discussion:

- Establish guidelines so that everyone can be heard—this is key to a successful discussion.
- During the discussion, provide “restatements” as needed. Restating what a girl says shows respect for both the person and the question, while at the same time clarifying for the sake of discussion. This strategy is particularly helpful when a girl is struggling with a question or concept.
- Ask open-ended questions—those that do not require one right answer.
- Be aware of your body language. Making and maintaining eye contact, smiling, and showing curiosity and interest can go a long way toward creating an inviting and open atmosphere for the discussion.
Some girls may be hesitant to speak up during a large-group discussion. To encourage everyone to participate, provide opportunities for small-group discussions and ask groups to appoint a spokesperson to share highlights of their conversation.

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Remember . . .

Don’t sweat the small stuff. Accidents and mistakes will happen. Use these as opportunities and teachable moments. Becoming a role model is an opportunity to engage with girls and open up a world of possibilities for them. Plan and prepare as much as possible, but know that when and if something goes wrong, you have the poise and know-how to keep moving forward.

**Recommended Reading for Role Models**

*Changing the Conversation* (www.engineeringmessages.org/)