

Role Model Strategies

Encouraging Youth to Consider STEM Careers

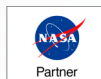


From
SciGirls
pbskids.org/scigirls

Produced by



Made possible by



Role Model Strategies

This Role Model Strategies guide aims to change how youth think about science, technology, engineering, and math (STEM). Using gender equitable practices in STEM education, Twin Cities PBS has produced the *SciGirls* television series, online resources, and hands-on activities, to address this goal. We also offer professional development opportunities for educators to promote this mission.

Why are role models important? Sharing your lived experiences (your background, hobbies, and career goals) with youth can motivate them to pursue a career in STEM. Research shows that these strategies work towards **breaking stereotypes**. Seeing the variety of backgrounds, experience, and perspectives of STEM professionals can help inspire and motivate youth who might not otherwise “see” themselves in STEM. This booklet offers basic training for role models, introducing you to best practices for your volunteer efforts and answering questions you might have.

Why should I be a role model? Experienced role models say helping youth connect to STEM re-energizes them, gives them a chance to collaborate with others in their workplaces, and helps them develop their leadership skills. As a STEM professional, you will make a real difference by becoming a role model. By hosting a field trip at your site, visiting a classroom, or working with a library, after-school program, or summer camp, you can encourage the youth in your community to explore STEM.

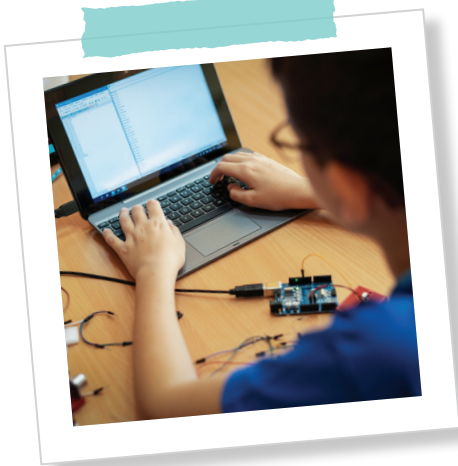
No doubt you will grow your own role model know-how as you progress in your volunteer work!

Mentor vs Role Model

Most STEM professionals using this guide will be acting as role models, not mentors. Mentors have personal relationships with mentees over extended periods of time of weeks to years, often through internships or other longer programs. Role Models have shorter connections (up to a few hours) with individuals or groups. Even though role models have short interactions, they still have a lasting impact on helping youth consider career possibilities!

Table of Contents

Role Model Strategies: Encouraging Youth to Consider STEM Careers	4
Celebrate Your Success	12
Role Model FAQ	14
Tips for Working With Youth	16
Programming Ideas	16
My Role Model Visit	18
References	19



This Material is based on the work supported by the National Science Foundation under Grant No. DRL- 2004085 and DRL- 2115138. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

This publication is based upon work supported by NASA under award No 80NSSC22M0123. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

©2023 Twin Cities Public Television, Inc. All Rights Reserved. SciGirls, associated characters and related logos and indicia are copyright and trademarks/service marks of Twin Cities Public Television, Inc.

Credits: Katie Hessen, Niki Beverly, Claire Ratcliffe Adams, Dillon Connolly, Julie Noyes, Alicia Santiago, writers | Kristin Pederson, Jessica Taylor, Rosalba Giarratano, Karen Peterson, editors | Elaine Kollaja, design

Role Model Strategies: Encouraging Youth to Consider STEM Careers

What do you love most about your job in STEM? When you visit a youth program as a role model, you have a lasting impact, affecting futures by creating positive images of careers in STEM fields. Use the strategies and tips listed here to make the most out of your role model experience – for the youth and for yourself. Becoming an effective role model is a process. Start with just a few tips, incorporating others as you become more confident. And don't forget to have fun!

1. Make a personal connection to create an inclusive learning space. (Suarez et al., 2022; Johnson, K., 2019; Brickhouse, Lowery, & Schultz, 2000; Daniels & Perry, 2003; Extraordinary Women Engineers Project, 2005)

Fostering a welcoming and positive space where learners can be their full selves begins with you. As a role model, you need to make a connection. When youth personally connect with you, they'll be more interested and invested in the experience. This connection works both ways; inviting youth to share information about themselves and draw on their interests in your discussion and activities creates an inclusive learning space that gives youth the ability to explore the intersectionality in their identities.

- **Start with an icebreaker** to invite youth to share something about themselves. Icebreakers should come from an inclusive place and relate to the STEM field you are representing. Avoid personal questions and keep it positive and appropriate.
- **Make a connection** with your audience by asking questions and listening to their answers. Ask youth what they know about your field and what they think your day looks like. What sort of problems do they think a job in your field could address?
- **Relate your discussion to their interests.** Ask youth to share ways that what you do might connect to their lives. Ask youth about their backgrounds, interests, and community to better understand how to connect STEM to their lives.
- **Be mindful of the images and graphics you use in your presentations** and consider how they may or may not be portraying inclusive messaging.
- **Plan ahead.** Learn what you can about the youth you'll be meeting ahead of time. Ask questions of the group leader to find out interests and demographics. Invite the group to share information about themselves in advance of your talk.

Break stereotypes

Fostering a personal connection creates a safe space where youth can feel seen and heard. When students feel valued and accepted, they are more likely to feel confident and comfortable pursuing STEM fields, regardless of stereotypes.

2. Share your whole self. (Johnson, K., 2019; Santiago-Martínez, GM, 2022; Suarez et al., 2022; Olsson, M., Martiny, S.E., 2018; Wozolek, B. & Antell, S., 2022)

Sharing all the aspects that make you who you are helps youth learn they do not have to hide parts of who they are to be great at STEM. Intersectionality goes beyond gender identity and should account for other factors (race, economic status, etc.). By sharing your unique perspective and story, you can help inspire the next generation of STEM professionals from diverse backgrounds. It's also okay not to share everything. This is your story and you should share what you want to share.

- **Share personal stories.** By sharing stories and talking about hobbies, family, friends, and pets as well as your work, you can break down stereotypes about STEM. Share that it's possible to have a rewarding career and a personal life. For instance, you might share that you played soccer in middle school or enjoy taking your dog to work.
- **Show photos.** Images or videos from your personal and professional experiences can make your story come alive. Use them to highlight your work, outside interests, favorite places you've traveled, and projects you've worked on. Photos are especially helpful for illustrating what you do, especially for younger audiences and for those who are learning English.
- **Share your pronouns.** Stating your pronouns (she/her, he/him, they/them, ze/zir) creates an inclusive environment where everyone feels comfortable. It is not only about letting people know how you like to be addressed but creates a space where all youth can feel comfortable sharing their pronouns and their whole self, too.

Break stereotypes

Sharing your whole self shows that STEM professionals come from all backgrounds and identities. This helps to dispel the idea that STEM is only for a certain type of person and encourages youth to be themselves in STEM spaces.

Pronoun examples

Many people (cis, trans, and non-binary alike) use pronouns such as he/him/his, she/her/hers, and they/them/theirs. However, some people choose to use neopronouns to express their gender identity, especially if their gender is outside the gender binary. Examples of neopronouns include ze/zir, fae/faer, and ey/em/eir. It is important to respect all pronouns and gender identities, even if they are unfamiliar to you. If you are unfamiliar with the pronouns someone is using, ask politely how to pronounce them and how they prefer them to be used (i.e. "Ey would like you to refer to em with eir preferred pronouns."). Keep in mind that expressing one's gender identity, especially for youth, can be an ongoing process and that gender presentation and preferred pronouns can change over time.

3. Share your STEM journey. (Prieto-Rodriguez, Elena, et al., 2022; González-Pérez S, Mateos de Cabo R and Sáinz M., 2020; Sanchez-Pena, M; Cox, M; McGee, E., 2021; Gibson, 2006; Kekelis & Gomes, 2009; Wolsky, 2011)

Everyone's journey in STEM is unique. Explicit discussions between role models and youth about their STEM journey and career environments helps to engage youth in STEM careers by showing STEM is for everyone.

- **Be specific.** It's okay to call out stereotypes. Focus on how your STEM career is attainable to all youth.
- **Talk about the choices you made along the way.** It is reassuring for youth to learn that there are many different paths to a STEM career. It's okay to not have a clear picture of your future and you can change your mind at any time.
- **Recall what first inspired you in STEM.** Describe how you discovered your interests and found your career. Your enthusiasm will shine through when you talk about a favorite class, a role model, an experiment at home, a paper you wrote as a student or a field trip.
- **Describe how rewarding your job is personally and professionally.** What is your favorite part of your job? Share a story about a recent experience, discovery, or opportunity that excited or surprised you. How does your job enrich your personal life? Do you get to travel? Stay active? Does your job or career positively impact your family?
- **Talk about what the future holds for you and your career.** What are you looking forward to learning? What new research or project do you hope to be part of? Seeing how you continue to be excited about your work will inspire youth.

Break stereotypes

By sharing your story and experiences, you can help youth understand that STEM careers are attainable for anyone, regardless of their background and identity, and that there is not just one path in STEM. It can also help to call out stereotypes and biases that exist in the field and show that there are individuals breaking those barriers.

Diversity

Diversity broadly means the variety of backgrounds, experiences, and perspectives of a given group. This can include gender, sexual orientation, race, socioeconomic background, ethnicity, country of origin, physical or mental ability, and more. It is important to remember that diversity is not a label for individual people. "Diverse" does not describe a person who has different qualities than you do. It is a description of the variety within a group or community.

4. Show diversity of people in STEM. (Santiago-Martínez, GM, 2022; Suarez et al., 2022; Prieto-Rodriguez, Elena, et al., 2022; Seebacher, Lisa M. et al., 2021; Sparks, DM, 2017)

As a role model, it is essential to showcase diversity in STEM and reflect the variety of identities and experiences that young people have. Research shows that when young people see role models who look like them and share their experiences, they are more motivated to pursue STEM careers.

- **Increase visibility** by talking about the people you work with, especially people with intersectional identities. Share how the team's varied lived experiences enhance all aspects of your work.
 - DO share a picture of your team.
 - DO talk about multiple people on your team and what they bring to the group.
 - DON'T focus on a singular part of a person's identity.
 - DON'T share information about someone they don't want publicly shared.
- **Share stories** about other role models youth might identify with, both historical and present. Research people from your field that come from varied places and backgrounds so that you can share their story with youth.
- **Acknowledge how diversity increases innovation and creative problem solving within STEM fields.** Example: Having team members with varied skin colors leads engineering teams to design sinks and hand dryer sensors that work for more skin tones.

Break stereotypes

Seeing diversity in STEM through images, role model videos, etc. breaks down the idea that only certain types of people belong in STEM.

Intersectionality

Intersectionality is a term coined by civil rights scholar Kimberlé Crenshaw to describe the lived experience of how all people exist in the world at the intersection of multiple social identities, both visible and invisible. For example, a Black transgender woman experiences the world as all three of those identities (and more) simultaneously and not individually as either Black, trans, or a woman. She may have experiences in common and divergent from other Black, trans, or female people who have their own intersectional identities. Intersectionality is not a list of oppressed identities by which to compare different people but a framework for understanding someone's whole personhood.

5. Encourage learning from setbacks. (Correll, 2004; Dweck, 2006; National Center for Women and Information Technology, 2011; Tough, 2012; Wentzel, 1997)

Teaching youth that working through problems and having experiments fail is a normal part of the scientific and engineering process and that it's okay to make mistakes. Support youth in developing a growth mindset – the belief that intelligence can develop with effort and learning.

- **Promote perseverance.** Share a story of facing a challenge, failing, and the lesson(s) you learned. Your experience will help youth understand how important effort and interest are to success. Describe the value of effort and perseverance. Give an example of how practice and perseverance helped you in school and on the job. Encourage youth to keep a positive attitude about failure. Emphasize that in real life, setbacks are opportunities for learning.
- **Provide specific feedback on things youth can control.** Ask questions that get at the process of learning. “How did you get to that answer?” “How did you decide what to do next?” Offer comments such as, “That’s great the way you and Kate worked together to solve that problem,” or “I can see how hard you worked on that design.”
- **Show that scientists don’t have all the answers!** Don’t be afraid to say that you don’t know the answer. Use this as an opportunity to show problem solving and curiosity.

Break stereotypes

Being open about mistakes, challenges, and life-long learning can help challenge the stereotype that STEM is only for “geniuses” who never make mistakes.



6. Communicate how your work impacts people, your community, and the world. (Buck, Plano Clark, Leslie-Pelecky, & Cerda-Lizarraga, 2008; Frome, Alfred, Eccles, & Barber, 2006; Marlino & Wilson, 2006; National Academy of Engineering, 2008; Plant, Baylor, Doerr, & Rosenberg-Kima, 2009)

Most youth want to make a difference. Highlighting the positive impacts of your work can build interest in your STEM field and show youth STEM careers can make a difference. Emphasize that impacts can happen on a small or large scale. Create experiences that allow youth to explore issues or topics they care about and that impact their lives, families, or communities to help youth see the relevancy of STEM.

- **Use positive messaging to show how STEM makes the world a better place.** Tell stories instead of listing facts and invite the group to share their own ideas of how STEM impacts their lives in positive ways. Focus on possibilities.
- **Describe how your career improves the world.** Share ways your career makes a positive impact. Does it improve safety? Improve efficiency? Alleviate social or environmental problems? Improve health outcomes or affordability? Provide opportunities to others? Improve access to resources? Be sure to share examples of how a STEM career will benefit their communities and families. How does the work in your field provide opportunities to others?
- **Don’t be afraid to share stories of how non-STEM professions are essential to STEM successes.** Example: communications and public engagement professionals are essential to disseminating STEM research and discoveries to the public.
- **Share what you like about your STEM job.** Highlight everyday aspects of your job that make you smile. What do you find personally rewarding?

Break stereotypes

Communicating the impact of your work helps youth see that STEM careers can make a real difference in the world. It can break down the stereotype that STEM careers are only for people who are interested in technology or math but not in making a positive impact on society.





7. Show how STEM is creative and collaborative. (Capobianco et al., 2015; Diekman et al., 2015; Leaper, 2015; Riedinger et al., 2016; Robnett, 2013; Parker & Rennie, 2002; Scantlebury & Baker, 2007; Werner & Denner, 2009; Cakir et al., 2017; Sammet et al., 2016; Boucher et al., 2017; Clark et al., 2016; Leaper, 2015)

Creativity and teamwork are vital for success in STEM projects and careers. Allowing youth to experience collaboration and creativity in STEM will leave a lasting impression.

- **Facilitate a collaborative activity that gives a snapshot of your work.** Doing an activity is a way for youth to experience how to design projects and conduct investigations as well as to satisfy their curiosity about how things work. Explain that teamwork and thoughtful collaboration are essential to your job. Design meaningful team roles that are intellectually engaging and provide opportunities to contribute to the learning process. Offer youth the chance to explain what they are doing and learning.
- **Encourage participation with open-ended questions.** Start by finding out what the group knows about the concepts you plan to introduce. Encourage youth to make predictions before they jump into an activity. Don't save questions for the end. Invite discussion throughout your visit! What do you think a __ does at work every day? What do you already know about __? Ask questions that will help them find connections between their lives and your STEM field.

Break stereotypes

Engaging in interactive, creative, and collaborative activities can help dispel the stereotype that STEM is all about standing in a lab doing experiments or sitting at a desk and doing calculations. It shows that STEM can be fun and hands-on, and that creativity and teamwork are important skills in STEM fields. When you share the creative and collaborative nature of your job, you can create a new picture of STEM professionals.

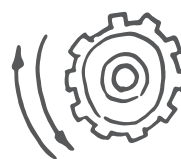
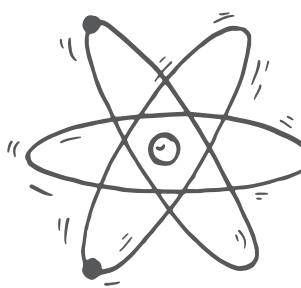
8. Provide resources for support and guidance. (Girl Scout Research Council, 2012; Milgram, 2011)

Highlight the variety of STEM careers available. Encourage youth to identify how their unique skillset (artistic youth can explore design, performance excited kids can do science communication and outreach, etc.) can contribute to STEM fields. Provide support with relevant resources that are gender inclusive. Discuss teamwork and who supports your work.

- **Explain why STEM classes matter.** Regardless of the field of study they pursue, math, science, and tech skills will keep their options open and help in their studies, careers, and everyday lives.
- **Offer avenues for investigating STEM Careers.** Not everyone will relate to your chosen profession. Offer a variety of options relating to the inspirational aspects of the STEM fields. Encourage youth to make the most of STEM opportunities in their community, such as participating in out-of-school clubs, STEM programs in libraries, or volunteering at a local science center. Research out-of-school activities to share with learners.
- **Explore local avenues for non-university career tracks.** What local trade schools, community colleges, or apprenticeship programs exist? Talk about how these careers are important to STEM fields and our local communities. MRI technicians, electricians, and mechanics are all vital STEM professions.
- **Plan ahead.** Talk to local youth leaders or teachers about what opportunities exist for youth in their area. Think about out-of-school time programs, high school offerings, and nearby businesses with a STEM focus.

Break stereotypes

Providing support, resources, and guidance can help make STEM fields feel more accessible to youth from all backgrounds. It can challenge the stereotype that STEM careers are only for people who have access to expensive equipment or exclusive networks.



Celebrate Your Success!

Take a moment to reflect on the importance of your role model accomplishments. Here are some ideas for making the most of your experience by acknowledging your own efforts.

- ★ **Follow-up and invite feedback.** Ask the youth from the program for their input on what they liked about the day and how you can improve. Youth feel empowered when they have a voice in shaping future events.
 - **At the end of your program,** invite feedback from the audience. You can ask kids to fill out a short survey (3-5 simple questions). Make it fun by providing colorful feedback forms, stickers, or let them draw their responses.
 - **Use simple language.** Frame your feedback questions in a way that is easily understandable for children. Avoid using complex language or jargon.
 - **Ask open-ended questions.** Instead of yes/no questions, ask open-ended questions that encourage kids to share their thoughts and feelings. For example:
 - “What was your favorite part of the presentation?”
 - “Is there anything you would like to learn more about?”
 - “How did the speaker make you feel?”
 - **Express gratitude.** Thank your audience for taking the time to provide feedback.
 - **Follow up.** After your presentation, consider following up with the organizer of the event through email to let them know how you implemented the youth’s suggestions. Offer to give another presentation in the future or ask how you can support their STEM programs going forward.

- ★ **Share the experience with coworkers. You may find colleagues who would like to get involved.** Having others participate makes it easier to plan events and field trips. It also expands the pool of role models; each person’s story will connect with different audiences.
- ★ **Remind yourself of your effort.** Place a thank you card or photo from the event on your desk or office bulletin board to remind you of the importance of your effort. As a role model you can inspire a younger generation and support them on the path to a rewarding future in STEM.
- ★ **Share with others.** Let your manager and others at your organization know the value of their support for your outreach efforts. If they allow you to volunteer during the workday or provide resources to support the effort, provide access to the results. It’s not self-promotion; it’s sharing the return on their investment in outreach.
- ★ **Find ways to continue your role model work.** Contact your local middle/high school. Sign up for career fairs. Connect with a local library to speak with youth. Register for online role model databases.



Role Model FAQ

? What about the reluctant youth?

Our efforts are for both youth who “get” STEM, as well as for those who are reluctant to dive in. Your work can help foster STEM identity in all youth.

? How can I help youth who might not think a STEM career is for them?

Providing information about scholarships, financial aid, student loans, and work study helps them understand that college is not beyond their reach. This information is especially important for youth who will be the first in their families to pursue higher education. Don't be shy. If you were the first generation in your family to attend college, be sure to share your experience. Not all STEM careers require college degrees! Talk about the importance of trade schools and non-traditional pathways and careers.

? What other needs are there in the youth-serving STEM community?

¿Hablas español? There is value in exploring the needs of the youth STEM community, acknowledging the power of multilingualism. Talk about how knowing a second language is an asset in your travels and work. Languages like Spanish or American Sign Language (ASL) offer English learners confidence and highlight the advantages of being multilingual in STEM.

? Who do I use these strategies with?

These role model strategies are highly beneficial to work with all youth, including those from underrepresented communities. Everyone benefits from an equitable approach to STEM learning—including working with role models. We do not discriminate based on gender identity, gender expression, or sex assigned at birth. These role model resources, which are culturally relevant to all youth, can advance gender sensitivity among educators.

? I am interested in being more involved. What else can I do?

Consider becoming a mentor. If appropriate, you can expand your role model work to assist youth who are working on a class project related to your work, looking for an internship, writing a resume, or selecting a college.

? What if someone asks a question I'm not comfortable answering?

Don't feel pressured to share anything you don't want to share. Acknowledge their question, encourage them to pursue answers elsewhere (if appropriate). It's ok to say “that's outside the scope of what we are talking about today, but I'd be happy to discuss more later...”.

? What if I'm nervous about being a role model?

There's no one way to be a role model. Being comfortable and your most authentic self is the best way to inspire youth. Think about what you need to feel comfortable and confident when engaging with learners.

? What actions can I take to make sure I'm not misgendering someone?

Providing nametags to youth and wearing a nametag with your pronouns can create a welcoming space for youth to feel comfortable sharing their pronouns if they choose to. When addressing youth, call them by their name instead of using pronouns.

? What actions can I take to connect to youth with backgrounds different than my own?

Remember there are many types of diversity. There may be something in your story beyond the surface that will make a connection. You can also show diversity in your job. Share how the team's varied lived experiences enhance all aspects of your work.



Tips for Working With Youth

- ★ Open-ended questions encourage more engagement from all youth, regardless of their background or prior STEM knowledge. Questions such as “What do you notice?” “What does this remind you of?” or “Turn and tell your neighbor a memory you have of...”.
- ★ If you don’t know the answer to a question, don’t be afraid to say “I don’t know, let’s find out together!”
- ★ Icebreakers are a great way to get youth talking and engaged in your visit. Icebreakers should come from an inclusive place and relate to the STEM field you are there representing. Icebreakers should not pressure youth to share personal information.
- ★ Youth are people. Treat them with respect and dignity.

Programming Ideas

Consider doing an activity with youth! Hands-on, inquiry-based STEM experiences that incorporate practices used by a STEM professional let youth take ownership of their own STEM learning. Youth can engage in meaningful STEM work that will positively impact their identities and re-define how they see STEM.

You can find easy to use activities at the following sites:

- SciGirls on PBS LearningMedia: pbslearningmedia.org/collection/scigirls/
- STAR Net STEM Activity Clearinghouse: clearinghouse.starnetlibraries.org/
- JPL Teach: jpl.nasa.gov/edu/teach/
- NISE Net Activities: nisenet.org/browse-topic
- NASA Science Activation: science.nasa.gov/learn

Explore tools that make virtual programs more interactive. For example, you could imbed poll questions into your presentation or invite participants to use annotating tools to draw on your slides. If you are giving a virtual presentation to a live audience at a place like a library, work with the staff ahead of time to see if they can provide materials for hands-on activities that you can guide them through. Schedule a practice session prior to the presentation to make sure all tech equipment is working properly.

Role Model Strategies: Encouraging Youth to Consider STEM Careers

Quick Reference

- 1. Make a personal connection to create an inclusive learning space.**
- 2. Share your whole self.**
- 3. Share your STEM journey.**
- 4. Show diversity of people in STEM.**
- 5. Encourage learning from setbacks.**
- 6. Communicate how your work impacts people, your community, and the world.**
- 7. Show how STEM is creative and collaborative.**
- 8. Provide resources for support and guidance.**

Find the complete Role Model Strategies Guide at pbslearningmedia.org/collection/scigirls

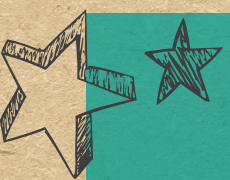


Produced by



Made possible by





My Role Model Visit

About you:

What are your hobbies? (see Strategy 1)

Think back to when you were inspired to enter your field. Why did you want to do what you do for your career? (see Strategy 3)

What about your work is collaborative? (see Strategy 7)

What challenges did you face in your STEM journey? (see Strategy 5)

How does your work/field make a positive impact on people, your community, or the world? (see Strategy 6)

How do my personal experiences help me in my career? (see Strategy 2)

Before your visit:

- ☐ Is your visit in-person or virtual?
- ☐ Will you be doing an activity? If so, what will you need?
- ☐ Will your outreach program partner provide the activity materials or do you need to bring them?
- ☐ If virtual, did you test your tech?
- ☐ Do you have STEM resources to share with the youth?

After your visit:

Reach out to your program partner to find out what went well and where you could have made changes. Be kind to yourself! No program goes perfectly. Don't be afraid of your own setbacks. Remind yourself of your effort by placing photos or thank you cards from your visit where you can see them.



References

Assessing Women and Men in Engineering (AWE) Project. <https://www.engr.psu.edu/awe/misc/about.aspx>.

Brickhouse, N. W., Lowery, P., & Schultz, K. (2000). What kind of a girl does science? The construction of school science identities. *Journal of Research in Science Teaching*, 37(5), 421-458.

Buck, G. A., Plano Clark, V. L., Leslie-Pelecky, D. L., Lu, Y., & Cerda-Lizarraga, P. (2008). Examining the cognitive processes used by adolescent girls and women scientists in identifying science role models: A feminist approach. *Science Education*, 92(4), 688-707.

Çakır, N. A., Gass, A., Foster, A., & Lee, F. J. (2017). Development of a game-design workshop to promote young girls' interest towards computing through identity exploration. *Computers & Education*, 108, 115-130.

Capobianco, B. M., Ji, H. Y., & French, B. F. (2015). Effects of engineering design-based science on elementary school science students' engineering identity development across gender and grade. *Research in Science Education*, 45(2), 275-292

Correll, S. J. (2004). Constraints into preferences: Gender, status, and emerging career aspirations. *American Sociological Review*, 69(1), 93-113.

Daniels, D. H., & Perry, K. E. (2003). "Learner-centered" according to children. *Theory into Practice*, 42(2), 102-108. Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.

Diekman, A. B., Weisgram, E. S., & Belanger, A. L. (2015). New routes to recruiting and retaining women in STEM: Policy implications of a communal goal congruity perspective. *Social Issues and Policy Review*, 9(1), 52-88

Extraordinary Women Engineers Final Report. (2005) http://www.eweek.org/site/news/eweek/ewe_needs.

Frome, P.M., Alfeld, C. J., Eccles, J. S., & Barber, B. L. (2006). Why don't they want a male-dominated job? An investigation of young women who changed their occupational aspirations. *Educational Research and Evaluation*, 12(4), 359-372.

Gibson, D. E., (2006). Role models. In J. H. Greenhaus & G. A. Callanan (Eds.), *Encyclopedia of Career Development* (pp. 701-703). Thousand Oaks, CA: Sage.

Girl Scout Research Institute. (2012). *Generation STEM: What girls say about science, technology, engineering, and math*. New York: Girl Scouts of the USA.

Gladstone, J., Cimpian, A. (2021). Which role models are effective for which students? A systematic review and four recommendations for maximizing the effectiveness of role models in STEM.

González-Pérez S., Mateos de Cabo R., and Sáinz M. (2020). Girls in STEM: Is It a Female Role-Model Thing? *Front. Psychol.* 11:2204. doi: 10.3389/fpsyg.2020.02204.

Johnson, K. (2019). *S.O.G.I.E. Handbook: Sexual Orientation, Gender Identity, and Expression Affirming Approach and Expansive Practices*. One Circle Foundation.

Kekelis, L., & Gomes, L. (2009). Bridging the engineering workforce gap through community outreach. *American Water Works Association Journal*, 101(8), 52-59.

Marlino, D., & Wilson, F. (2006). Career expectations and goals of Latina adolescents. In J. Denner & B. L. Guzman (Eds.) *Latina girls: Voices of adolescent strength in the United States* (pp. 123-37). New York: New York University Press.

Milgram, D. (2011). How to recruit women and girls to the science, technology, engineering, and math (STEM) classroom. *Technology and Engineering Teacher*, 71(30), 4-11. National Academy of Engineering. (2008). *Changing the conversation: Messages for improving public understanding of engineering*. Washington, DC: National Academies Press.

National Center for Women and Information Technology. (2011). How can encouragement increase persistence in computing? *Encouragement works in academic settings* (case study 1 & 2).

Retrieved from <http://www.ncwit.org/resources/how-can-encouragement-increase-persistence-computing-encouragement-effective-work-settings>.

Olsson, M., Martiny, S.E. (2018). Does Exposure to Counterstereotypical Role Models Influence Girls' and Women's Gender Stereotypes and Career Choices? A Review of Social Psychological Research.

Parker, L. H., & Rennie, L. J. (2002). Teachers' implementation of gender inclusive instructional strategies in single-sex and mixed-sex science classrooms. *International Journal of Science Education*, 24(9), 881-897.

Plant, E. A., Baylor, A. L., Doerr, C. E., & Rosenberg-Kima, R.B. (2009). Changing middle-school students' attitudes and performance regarding engineering with computer-based social models. *Computers and Education*, 53(2), 209-15.

Prieto-Rodríguez, E., et al. (2022). Investigating the Impact of an Outreach Intervention on Girls' STEM Identity Formation. *International Journal of Gender, Science and Technology* 14.2 183-206.

Riedinger, K., & Taylor, A. (2016). I could see myself as a scientist. *Afterschool Matters*, 1.

Robnett, R. (2013). The role of peer support for girls and women in the stem pipeline: Promoting identification with stem and mitigating the negative effects of sexism (Doctoral dissertation, University of California, Santa Cruz).

Sammet, K., & Kekelis, L., (2016). Changing the Game for Girls in STEM: Findings on High Impact Programs and System-Building Strategies. Stemnext.org.

Sanchez-Pena, M; Cox, M; McGee, E. (2021). The factors affecting the persistence of Latina faculty: A literature review using the intersectionality of race, gender, and class.

Santiago-Martínez, M.G. (2022). Intersectionality in STEM. *ASBMBTODAY: The American society for biochemistry and molecular biology*.

Scantlebury, K., Baker, D., Sugi, A., Yoshida, A., & Uysal, S. (2007). Avoiding the issue of gender in Japanese science education. *International Journal of Science and Mathematics Education*, 5(3), 415-438.

SciGirls Seven Strategies. Retrieved from http://www.pbs.org/teachers/includes/content/scigirls/activities/engineering/scigirls_engineering_sg7.pdf.

Seebacher, L. M. et al. (2021). Is Science for Everyone? Exploring Intersectional Inequalities in Connecting with Science; *Front. Educ.*, 15 July 2021 Sec. STEM Education Volume 6 - 2021 | <https://doi.org/10.3389/educ.2021.673850>.

Sparks, D.M. (2017). Navigating STEM-worlds: Applying a lens of intersectionality to the career identity development of underrepresented female students of color.

Suarez, et al. (2022). STEM as a cover: towards a framework for Queer Emotions, Battle Fatigue, and STEM identity.

Tough, P. (2012). *How children succeed: Grit, curiosity, and the hidden power of character*. New York: Houghton Mifflin Harcourt.

Wentzel, K. R. (1997). Student motivation in middle school: The role of perceived pedagogical caring. *Journal of Educational Psychology*, 89(3), 411-419.

Werner, L., & Denner, J. (2009). Pair programming in middle school: What does it look like? *Journal of Research on Technology in Education*, 42(1), 29-49.

Wolsky, M. (2011). Engineering a change in perception: Engineer Your Life and Design Squad. *The Bridge Linking Engineering and Society*, 41(2), 30-36.

Wozolek, B. & Antell, S. (2022) Curricula of oppressions: queering elementary school norms and values, *International Journal of Qualitative Studies in Education*, 35:9, 980-992, DOI: 10.1080/09518398.2022.2035460.



Why are role models important?



Seeing people who are historically underrepresented in STEM, who have succeeded in these fields, helps inspire and motivate youth who might not otherwise “see” themselves in STEM.

Why be a role model?

Experienced role models say helping youth connect to STEM re-energizes them, gives them a chance to collaborate with others in their workplaces, and helps them develop their leadership skills.

Role Model vs Mentor

Most STEM professionals using this guide will be acting as role models, not mentors. Mentors have personal relationships with mentees over extended periods of time of weeks to years, often through internships or other longer programs. Role Models have shorter connections (up to a few hours) with individuals or groups. Even though role models have short interactions, they still have a lasting impact on helping youth consider career possibilities!

What is STEM?

STEM (Science, Technology, Engineering, and Math) describes the combination of scientific inquiry and engineering design in hands-on personally relevant learning experiences and integrate technology and mathematics into all aspects of the investigation. STEM learning opportunities foster skills such as critical thinking, creativity, problem solving, communication, and collaboration. STEM is an important topic in education today because these fields are important growth areas for the U.S. economy.



Special Thanks

Thank you to our project partners at NASA Science Activation, Space Science Institute, and National Girls Collaborative Project!

