SciGirls®

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PBS KIDS

SciGirls Seven

How to Engage Girls in STEM

Watch companion videos on SciGirls DVDs or online.

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Welcome to SciGirls

Girl-powered STEM for Tweens

The bold goal of **SciGirls** is to change how millions of girls think about science, technology, engineering, and math—or STEM. Research shows that, for a variety of reasons, some girls begin to lose interest (and confidence in their abilities) in math and science in middle school. **SciGirls** engages girls between 8 and 13 years old, helping them through these challenging tween years to arrive in high school with a positive attitude toward STEM studies and careers.

We know our recipe works: **SciGirls** grew from our successful outreach program, established in 2005. Today we partner with museums, schools, universities, the Girl Scouts of the USA, the National Girls Collaborative Project, and afterschool programs, offering training, videos, and multilingual activities. And the **SciGirls** model is flexible. Partner organizations tailor these offerings specifically for the girls (and boys) in their communities.

So, who exactly are SciGirls? SciGirls are curious about how the world works and empowered to investigate it. SciGirls use their brain power to solve real-life problems, often with help from mentors and their friends. SciGirls find STEM in the most unexpected places, such as in their backyards, at the theater, or on the beach, because they know that STEM isn't just serious business, it's also everyday fun.

Most importantly, every girl can be a SciGirl. **SciGirls** is not only for girls who already "get" STEM, but also for those who are reluctant to dive in. A background in STEM teaches important problem-solving skills and a way to think that is transferable to any field and any career. All girls can conquer the fear factor and become confident, capable explorers of all things STEM. It's the **SciGirls** way!

What about the boys?

When you hear the name **SciGirls**, you might think, "I work in a mixed gender setting, **SciGirls** can't be for me." That's definitely not the case. The strategies that are highly beneficial to girls have also been proven to work with all learners. **Everyone** benefits from a gender equitable approach to STEM.

For more information, go to scigirlsconnect.org.

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Our National Girls Collaborative Project Partners

Thank you for your interest in engaging girls in STEM. Did you know that there's an extensive network of organizations and individuals committed to pursuing this common goal? The National Girls Collaborative Project brings together these groups through local collaboratives and their program directory, which helps organizations and individuals network, share resources, find programs, and collaborate on STEM-related projects for girls. You can list your program at **ngcproject.org/programs.** All programs in the NCGP directory are also featured on the SciGirls website at **pbskids.org/scigirls/find-a-science-club.**

Credits: Barbara Billington, Brenda Britsch, Rita Karl, Sarah Carter, Joan Freese and Lisa Regalla, content | Elsa Angvall and Ben Malley, design | Richard Hudson, Executive Producer | Special thanks: Karen Peterson, National Girls Collaborative Project, Dale McCreedy, The Franklin Institute; Marjorie Bequette, Science Museum of Minnesota; Rebecca Malkovich.

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Program Overview

ON TV

SciGirls airs nationally on PBS, the most trusted media brand for children. Each half-hour **SciGirls** episode follows a different group of enthusiastic, real girls, who collaborate, communicate, engineer, and discover. They're accompanied by two animated characters, a determined SciGirl named Izzie and her best friend Jake, who tie the series together with their ongoing adventures.

The backbone of each **SciGirls** episode is the science, technology, engineering, and math that drive each project. We focus on the process, not the end result. Every experiment may not turn out perfectly, but each episode showcases important characteristics of a STEM project: teamwork, challenges, problem solving, freedom to express ideas, and support from a mentor. We also model important process skills as girls brainstorm, predict, observe, measure, classify, experiment, record, interpret, graph, communicate, and try again. These skills are at the heart of both the scientific and engineering design processes.

online

Izzie also stars as the webmaster of the **SciGirls** website, hosted on pbskids.org, one of the premier educational destinations for young people on the Web. This site is a unique and safe science-centric social network where girls can connect, create personal profiles and avatars, share projects, play games, and watch every episode. Check us out at pbskids.org/scigirls.

ON THE GROUND

SciGirls offers parents and educators resources to support girls, start **SciGirls** clubs, or enhance existing educational initiatives. The **SciGirls** CONNECT outreach program empowers informal and formal educators nationwide to adopt the research-based strategies that best engage girls in STEM. For more information, check out these sites: **SciGirls** CONNECT at scigirlsconnect.org; PBS Parents at pbs.org/parents/scigirls; and PBS LearningMedia at pbslearningmedia.org.

Visit pbskids.org/scigirls for videos and projects.

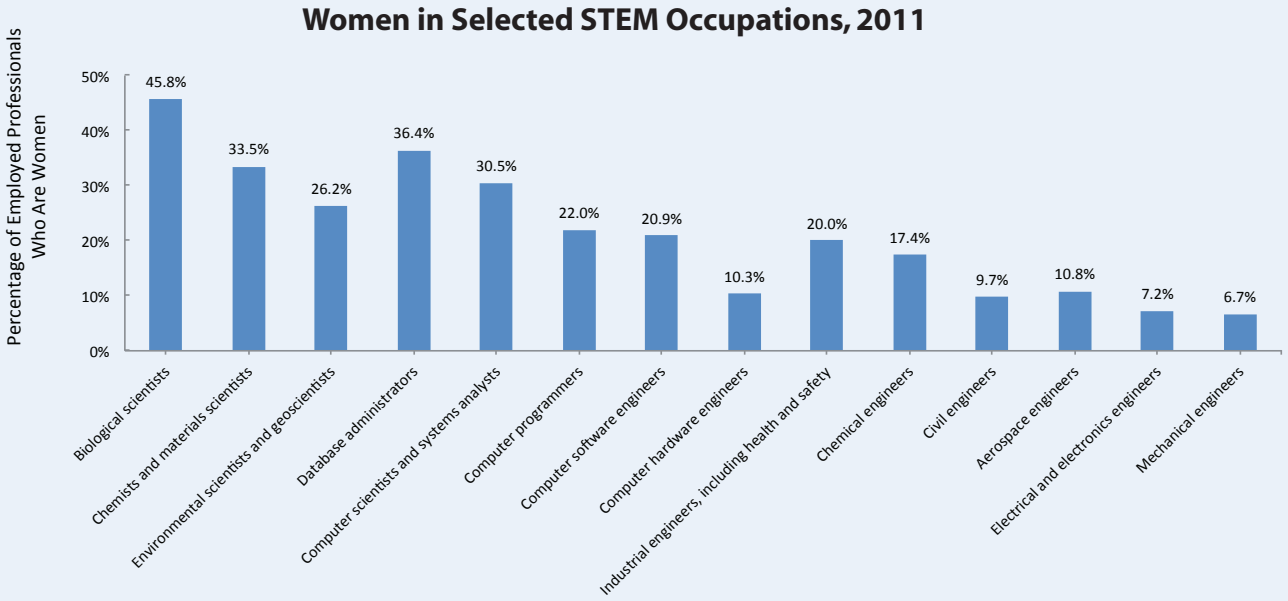
SciGirls

The Big Idea

What the Research Shows

Even though young girls and boys sit side by side in educational settings all across the country, women are much less likely to choose careers in science and engineering (S&E) than men. Although the number of women in STEM fields has increased tremendously over the past half-century, it still is not keeping pace with the rising demand for skilled workers in these areas.

Over the past 10 years, growth in STEM jobs was three times as fast as growth in non-STEM jobs. Between the years 2008 to 2018, STEM occupations are projected to grow by 17.0 percent compared to 9.8 percent growth for non-STEM occupations and STEM workers earn 26 percent more than their non-STEM counterparts (U.S. Department of Commerce, 2011). Although women make up about half the total U.S. college-educated workforce, they represented only 26% of the college-educated workforce in S&E occupations in 2008 (National Science Board, 2012). The simple truth is that Americans cannot remain competitive in STEM fields without more women entering these careers. The graph below shows the number of women who were employed in selected STEM professions in 2011.



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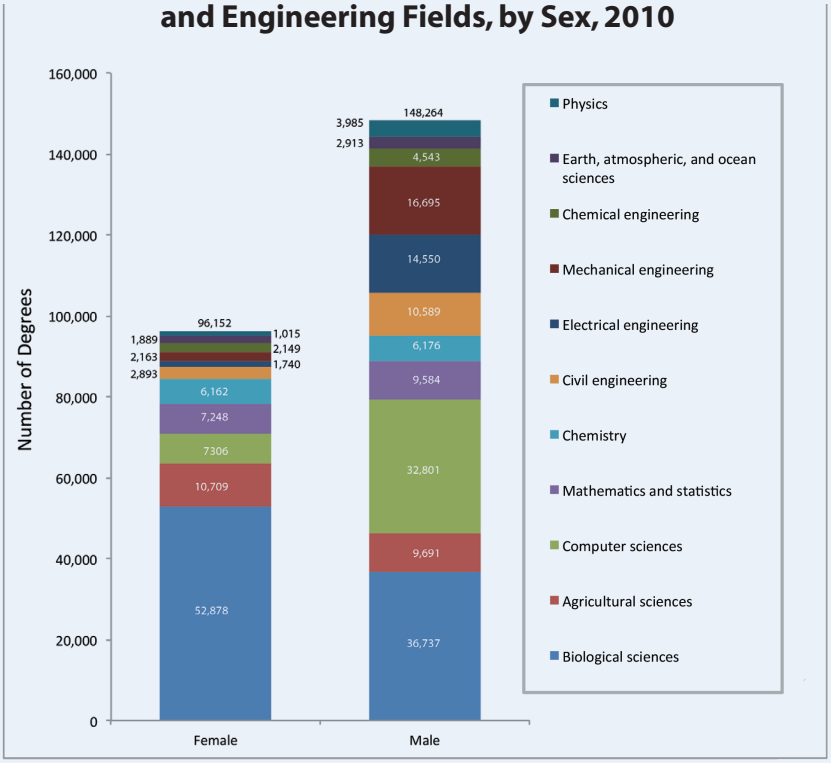
The Big Idea continued

While women are making gains in some fields, the careers in which women are advancing are not the ones in which demand is growing the most. Approximately 58% of the projected increase in S&E jobs is in computers and math (NSB, 2012). But in 2011, the percentage of jobs held by women in computer science was only 26%. Many people argue that encouraging women and minorities in these fields will ultimately improve these professions, maximizing innovation to create products and services that are better representative of all users (Hill, Corbett, & St. Rose, 2010).

But the problem begins even earlier. The graph to the right shows the number of bachelor's degrees earned by women and men in S&E fields in 2010. Women have steadily increased their numbers in some areas of science, including social and biological sciences, but they are still lagging behind in areas such as physics, computer science, and engineering.

Bachelor's Degrees Awarded in Selected Science and Engineering Fields, by Sex, 2010



National Science Foundation. Division of Science Resources Statistics. (2013). *Women, minorities, and persons with disabilities in science and engineering: 2013* (NSF 13-304, Tables 5-1 and 5-2). Arlington, VA: Author. Retrieved from: http://www.nsf.gov/statistics/wmpd/degrees.cfm.

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To prepare our girls for the 21st century workforce, it is crucial to reverse these trends. First, it is important to recognize that girls and boys do not display a significant difference in their *abilities* in math and science. The cause for the gender gap in STEM achievement is social and environmental (Hill et al., 2010). Where gender differences consistently appear is in boys' and girls' *interest* and *confidence* in STEM subjects, starting at a very young age. For girls, this can be linked to a negative self-perception (Halpern et al., 2007). A study by the National Science Foundation in 2003 showed that in grades 4, 8, and 12, females were less likely than their male counterparts to agree with the statements, "I am good at math" and "I am good at science" (National Science Foundation, 2003). Ultimately, these viewpoints matter. If girls do not believe they are capable, they are unlikely to succeed. While the gender gap in STEM interest had remained relatively steady over the past two decades, it is now increasing at a significant rate. Male students are over three times more likely to be interested in STEM majors and careers, compared to female students (My College Options & STEMconnector, 2013).

This is where **SciGirls** can help. It is important to spark and strengthen girls' interest and confidence in STEM subjects before high school, when academic choices will either open or close doors to postsecondary STEM studies and careers (Halpern et al., 2007). The **SciGirls** videos, combined with our gender-sensitive, inquiry-based activities and a community-focused website, can foster girls' interest in STEM and shape their attitudes toward these fields. At the same time, **SciGirls** resources can advance gender sensitivity among educators. With this awareness, educators can recognize and avoid the unconscious behaviors that often contribute to STEM-focused climates that are unfavorable for girls.

Meeting the Challenge

We know that eliminating the gender gap is challenging work. It is difficult to convince administrators, parents, or fellow staff of the importance of this mission. For help beyond the research outlined here, please see our suggested readings on page 18. Your efforts will not only help girls, but will improve the general climate in your educational setting and level the playing field for all learners.

For more information on the importance of STEM encouragement and for tips on how you can help, please see **pbs.org /parents/scigirls/tips.**

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The SciGirls Seven

Proven Strategies for Engaging Girls in STEM

The **SciGirls** approach—for the TV show, website, and educational materials—is rooted in research about how to engage girls in STEM. A quarter of a century of studies have converged on a set of common strategies that work, and these have become **SciGirls**' foundation. We call these strategies the **SciGirls Seven.**

1. Girls benefit from collaboration, especially when they can participate and communicate fairly. *(Parker & Rennie, 2002; Scantlebury & Baker, 2007; Werner & Denner, 2009)*

Girls are energized by the social part of science—working and learning together. Provide opportunities for small group work, and encourage girls to talk about their ideas and consider all possibilities before digging in. Make sure discussions remain respectful and inclusive, and that each girl's contributions are valued. Girls are likely to remember not only what they learned, but also how they felt when they learned it.

> "Whenever you come together with a team, you can find the answer to any question."
>
> Josie, age 12

2. Girls are motivated by projects they find personally relevant and meaningful. *(Liston, Peterson & Ragan, 2008, Lyon & Jafri, 2010; Mosatche, Matloff-Nieves, Kekelis, & Lawner, 2013; Patrick, Mantzicopoulos, & Samarapungavan, 2009; Thompson & Windschitl, 2005)*

Girls become motivated when they feel their project or task is important and can make a difference. Support them using STEM as a tool to explore issues or topics they care about. If they see how STEM is relevant to their own lives and interests, their attraction to these subjects is likely to increase.

3. Girls enjoy hands-on, open-ended projects and investigations. *(Chatman, Nielsen, Strauss & Tanner, 2008; Denner & Werner, 2007)*

SciGirls promotes exploration, imagination, and invention. Encourage your girls to ask questions and find their own paths for investigation.

For more information, go to scigirlsconnect.org

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4. Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents, and preferred learning styles. *(Calabrese Barton et al., 2013; Calabrese Barton, Tan, & Rivet, 2008; Eisenhart & Finkel, 1998; Lyon & Jafri, 2010)*

Encourage girls to develop their own ways of exploring and sharing knowledge, paying attention to the unique learning styles that motivate your group. You may be surprised by what creative, exciting approaches girls come up with when designing investigations, collecting data, and communicating results.

5. Girls' confidence and performance improves in response to specific, positive feedback on things they can control—such as effort, strategies, and behaviors. *(Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 2000; Halpern et al., 2007; Kim et al., 2007; Mueller & Dweck, 1998)*

Self-confidence can make or break girls' interest in STEM. Foster their efforts, compliment their strategies for problem solving, and let them know their skills can be improved through practice. Celebrate the struggle. Wrestling with problems and having experiments fail is a normal part of the scientific process!

6. Girls gain confidence and trust in their own reasoning when encouraged to think critically. *(Chatman, Nielsen, Strauss & Tanner, 2008; Eisenhart & Finkel, 1998; Kim et al., 2007)*

Cultivate an environment in which asking questions and creative thinking are a must. Throughout the centuries, this same trust in logic and re-examination of ideas made advances in science, technology, and engineering possible.

7. Girls benefit from relationships with role models and mentors. *(Holmes, Redmond, Thomas, & High, 2012; Liston, Peterson & Ragan, 2008; Lyon & Jafri, 2010; Mosatche et al., 2013; Weber, 2011)*

Seeing women who have succeeded in STEM helps inspire and motivate girls, especially when they can relate to these role models as people with lives outside of the lab. Role models and mentors not only broaden girls' views of who does science, but expand girls' vision of what's possible in their own lives.

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Tips for Using the SciGirls Seven

In the next several pages, we offer practical tips for implementing the **SciGirls Seven**. Please note that for an activity to be a gender-equitable success, you do not need to incorporate *all* seven strategies. Practice introducing one or two different techniques each time you do an activity and discover what works best for your group.

1. Girls benefit from collaboration, especially when they can participate and communicate fairly.

- **Create a community atmosphere that is open and positive.** Start with activities to "break the ice," involving communication and teamwork for girls who may not know one another.

Icebreaker: Who Am I?

Pin the name of an animal, planet, or female scientist to the back of each girl. Girls must try to guess who they are by asking one question at a time to others in the room. Allow 10 minutes for girls to wander the group asking questions. The answers will help them discover the secret identities written on their backs.

- **Encourage working in small groups.** Keep in mind that kids should be grouped with different members from time to time.

  - Small groups generally consist of members with assigned roles (e.g., recorder, supplies manager, procedure/time manager). This approach can help motivate participants, but be mindful of stereotypical gender roles, such as girls recording and boys using tools.

- **Speak up promptly if someone makes a distasteful remark, even jokingly.** Set the rules at the start: no teasing or unfriendly talk. Explain why a comment is offensive or insensitive. If conflicts arise, resolve them through group (or pair) dynamics, in which each person voices what they think happened and how it made them feel. Then work on agreement and resolution.

2. Girls are motivated by projects they find personally relevant and meaningful.

- **Look for ways to connect the material to the girls' lives.** If you are teaching an environmental studies lesson, for instance, ask the girls to identify examples of environmental issues in the area where they live and bring information to share from articles in local magazines, newspapers, videos, etc.

- **Demonstrate and talk about your own enthusiasm** for the scientific material, and how it affects you personally. Enthusiasm is contagious!

- **Create a "need to know."** As you are preparing your activities, ask yourself—why would kids need to know this?

  ★ Ask girls to prepare a table of their thoughts, including: what they know, want to know, have learned, and how they can learn more. Use this in groups or individually as a tool for tapping into prior knowledge and encouraging personal reflection.

- **Use case studies.** Kids generally relate to characters who face decisions or dilemmas; they often make connections from the story to their own lives. Using **SciGirls** videos, as suggested throughout our companion activity guides, provides one avenue to accomplish this. Ask girls if they have ever felt like the girls in the video, or ask what similarities they may have seen between themselves and the SciGirls. Visit scigirlsconnect.org for videos and activities.

- **Use follow-up prompts** that focus girls' attention on ideas or assumptions embedded in their first answers. These prompts can help them explore and express what they know even when they aren't sure they know it. For example:

then what?

Tell me more.

Could you give me an example?

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Tips for Using the SciGirls Seven continued

3. Girls enjoy hands-on, open-ended projects and investigations.

- **Try an activity without step-by-step directions.** Don't shortchange your girls by assuming they can't do an investigation without prescribed directions. Release their inner explorers and let them surprise you!
- **Pose questions using "what" or "how."** Instead of, "Is noise considered a pollutant?" try, "How can you test whether noise is a pollutant?"
- **Resist the urge to intervene.** Practice this by keeping your hands in your pockets throughout the activity.
- **Encourage girls to suggest approaches to a problem.** Instead of swooping in to rescue them, encourage girls to problem solve by identifying, drawing, or labeling things they *do* understand.
- **Resist answering the question, "Is this right?"** Highlight unexpected results and suggest ways for girls to investigate further by asking, "How could we figure that out?" or, "What do you think?"

Use Think-Pair-Share!

If girls are struggling, ask them to take a moment and **think** about the question first and then write down their ideas. Next, have girls **pair** up and discuss. Finally, invite pairs to **share** their ideas with the larger group.

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4. Girls are motivated when they can approach projects in their own way, applying their creativity, unique talents, and preferred learning styles.

- **Act as a facilitator rather than as a leader or expert.** Encourage groups to share their plans with you, but emphasize that everyone is learning and discovering together.

- **Let girls communicate their findings using a variety of techniques** relevant to their lives: poetry, music, posters, plays, slideshows, 2D- and 3D-models, drawings, etc.

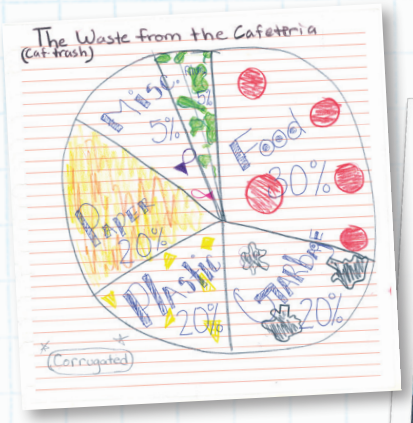
  - Have your girls create their own project pages at pbskids.org/scigirls.

- **Use your girls' language to reiterate their points.** Use a board or large sheet of paper to document each person's participation.

  - Write the idea as you hear it—don't reword unless you have permission from the speaker.
  - When meanings are unclear, restate what the girls said in their own words first, and then ask them to expand on their thinking with, "Tell me more" or, "What makes you think that?"

- **Ask girls to write personal narratives** relating to a particular time or place and share these in small or large groups.

  - A journal or blog (for older girls) provides an avenue for reflection on learning.



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Tips for Using the SciGirls Seven continued

5. Girls' confidence and performance improves in response to specific, positive feedback on things they can control—such as effort, strategies, and behaviors.

- **Reward success publicly and immediately.** Focus on specific contributions such as, "You were really thinking outside the box with that design" or, "I love the way you and Kate worked together to solve that problem."
- **Avoid statements such as, "You are really good at this!"** They send the message that success comes naturally and doesn't require effort or struggle.
- **Convey the same level of respect for and confidence in the abilities of all your girls.** Introduce girls to the good work done by their peers. Share the ideas, knowledge, and accomplishments of individuals with the group as a whole.
- **Let a girl know you believe she can improve and succeed over time.** When you identify a child's weakness, make it clear that your comments relate to a particular task or performance, not to the child as a person. The brain is a "muscle" that can get stronger with time; skills can be improved with practice.

Someone said to me recently, "In your culture, struggle is a bad word," and I thought... "That's right." We talk about it as an unfortunate thing, but when you think about a career in science or math or anything, of course you struggle. That's the name of the game! If you're going to discover something new or invent something new, it's a struggle. So I encourage educators to celebrate that, to say: **"Who had a fantastic struggle? Tell me about your struggle!"**

Carol Dweck, professor of social psychology, Stanford University

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6. Girls gain confidence and trust in their own reasoning when encouraged to think critically.

- **Support an environment free of "instant answers."** By working through a problem, girls will experience a sense of achievement and confidence that will increase their motivation to learn. When you simply give kids the solution, you rob them of the chance to think for themselves.

  - Address girls' anxiety about not getting the answer by refocusing their attention on the problem at hand. Build on what they do know to move forward.

- **Think like scientists and engineers.** It is okay to make mistakes; there is more than one way to solve a problem. Experimentation may never lead to an answer, but rather to new questions. Practice developing alternative explanations for results.

- **Meet a question quota.** Insist on each girl asking a certain number of questions each day.

- **It's okay to disagree.** Stress the importance of considering different approaches and viewpoints.

  - When disagreements arise, allow each girl to voice her viewpoint while all others listen and record the main points. Remind girls of the importance of using solid evidence when making a claim. Consensus may be difficult and perhaps unnecessary, but listening to one another is important.

> **My mother made me a scientist** without ever intending to. Every other Jewish mother in Brooklyn would ask her child after school, "So? Did you learn anything today?" But not my mother. "Izzy," she would say, **"did you ask a good question today?"** That difference—asking good questions—made me become a scientist.
>
> Isidor Isaac Rabi, winner of the Nobel Prize in Physics, 1944

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Tips for Using the SciGirls Seven continued

7. Girls benefit from relationships with role models and mentors.

- **Invite guest speakers,** who work on the subjects you are studying at all levels, including high school, undergraduate, and graduate students, along with professional scientists.
  - Probe visitors to describe what their work looks like along with how they identify and ask questions, answer them, and share information with others.
  - Remind them to talk about their hobbies, interests, family and life outside of the lab.
  - Share the **SciGirls Role Model Strategies** to help them prepare for the event. Download this resource at scigirlsconnect.org/page/role-models.
- **Invite guest scientists to help lead an activity.** If you are unsure of their comfort level working with children, pair them with other educators or leaders. The experience will be valuable for both the students and the scientists!
- **If you can't get someone live, show videos.** Use **SciGirls** episodes to showcase peers as mentors. Or checkout our female scientist profiles and mentor moments at scigirlsconnect.org.
- **Encourage mentor pairings** for individual efforts such as science fair projects.

FabFems

The FabFems directory is a national database of women in STEM professions who are inspiring role models for young women. The FabFems directory is accessible to young women, girl-serving STEM programs, and other organizations that are working to increase career awareness and interest in STEM. Search for role models, or become a FabFem, by visiting fabfems.org.

Activity Makeover
Applying the SciGirls Seven

Pages 16 and 17 show how to take traditional science or engineering activities and apply the **SciGirls Seven**, making subtle shifts in how the activities are presented. In these examples, we model incorporating a few strategies at a time. (Refer to pages 7 and 8 for full explanations of each strategy.) You can do the same with your activities and watch your girls' confidence soar!

Miniature Hovercraft

Supplies for each group

- an empty thread spool
- a 4-inch square of cardboard
- white glue, or a hot-glue gun
- a sharpened pencil
- a balloon (12 inch, when inflated)

1) Glue the bottom of the empty spool to the center of the cardboard square.

2) Use the sharpened pencil to punch a hole in the cardboard that lines up with the center of the spool.

3) Blow up the balloon. Hold the bottom without tying it.

4) Get your partner to hold the spool for you. While pinching the neck of the balloon, stretch the bottom over the top of the spool, release the neck, and lift off!

5) Experiment with different sizes and shapes of cardboard to get the **best hover** out of your balloon hovercraft. Give your hovercraft a shove along a smooth tabletop, and see how far it goes.

Strategy 3
Have a table full of additional supplies to promote creative solutions to the hovercraft design: old CDs, water bottle caps of various shapes and sizes, an assortment of tape, scissors, push pins, paperboard cereal boxes, etc.

Strategy 4
Ask girls to write a story, poem, or song describing how hovercrafts are used to rescue families or animals in flooded coastal areas or along rivers.

Strategy 6
Once hovercrafts have been constructed and tested, change the focus from "best hover" to fastest craft, farthest hover, or maneuverability/ steering through a course. Ask girls to redesign their craft to meet the new challenge.

Strategy 7
Invite a rescue worker who may use hovercrafts or an engineer who designs them.

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What's in an Owl Pellet?

Supplies for each group

- a commercially prepared owl pellet
- a magnifying glass
- tweezers
- 2 sheets of white office paper
- a bone identification chart of small rodent skeletons
- non-latex gloves

Strategy 1
Distribute only one glove per person. This not only saves on gloves, it encourages cooperation. One girl utilizes tweezers while the second holds the pellet.

1) Practice excellent hygiene when handling the owl pellets. Keep hands away from eyes, nose, and mouth.

2) Carefully unwrap the owl pellet from its foil. Gently break it apart by hand.

3) Sift through the pellet, looking for bone pieces. Most pellets contain recognizable skull, jaw, leg, or rib bones from small rodents, such as a mouse or a vole. Use tweezers to remove bones from the pellet debris.

4) Lay out each bone on a clean sheet of white paper.

5) Count the number of bones in the pellet, and identify each by matching it to one on the chart.

6) Try laying the bones out in a rough skeleton arrangement. Parts of the skeleton may be missing; discuss why that might be.

7) Wash hands thoroughly when finished.

Strategy 2
Talk about the types of owls that live in your area. Or, create a story emphasizing the importance of studying owl pellets. For example, "You're a veterinarian. A man brings in his pet owl, who got sick from something it ate the night before. By identifying the ingredients of the owl's last meal, you can help it recover."

Strategy 5
Some girls may be "grossed out" by owl pellets. Encourage them to participate by handling the pellet before dissection or picking up the bones to identify them after dissection. Patience with squeamish girls can empower them to get closer to the pellets. Offer words of praise, even for small steps toward participation.

Strategy 7
Invite a mentor from a nearby raptor center to bring a live owl and discuss its role in the food chain. Or take a field trip!

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★ = suggested readings

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Equitable Practices for Engaging Youth in STEM Micromessaging

"Micromessages are small, subtle, often unconscious messages we send and receive in the form of word choice, gesture, treatment, or even tone of voice. These messages can be either positive (microaffirmations) or negative (microinequities). Without awareness, educators, parents, other adults, and even peers may inadvertently send microinequities that discourage students from engaging in courses, and ultimately careers. This is particularly salient in nontraditional careers where less than 25% of one gender is represented, such as many career and technical education (CTE) and science, technology, engineering, and math (STEM) fields."

-National Alliance on Partnerships in Equity (NAPE)

Micromessages Affect Self-image, Self-efficacy and STEM Identity

- Microaffirmations (positive) encourage and motivate youth.
- Microinequities (negative) discourage and devalue youth.
- Micromessages have a greater impact on the performance of underrepresented youth, i.e., youth of color, with disabilities, socioeconomically disadvantaged, limited English proficient, etc.

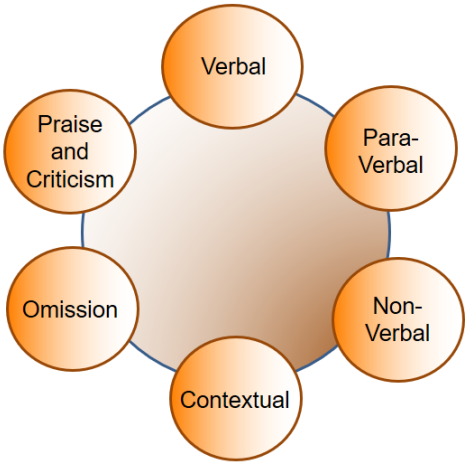
Brain Teaser

A father and his son were in a car accident. Both father and son were injured but taken to different hospitals. The son is taken to a hospital where the surgeon says, "I cannot operate because the boy is my son."

Why can the surgeon not operate?

Stereotypes are Communicated through Micromessages:

Micromessages are communicated in many ways:



Steps to minimize microinequities:

1. Address your biases
   a. Observation & critical reflection
2. Counteract micro-inequities by building microaffirmations

Steps to maximize microaffirmations:

1. Know what youth bring to your setting.
2. Be aware of the micromessages you are sending, both positive and negative.
3. Make a concerted effort to practice micro-affirmations and counteract micro-inequities.
4. Work with peers and mentors to identify unintended biases that impact youth attitudes and performance.
5. Make your youth setting culturally responsive.
6. Be diverse in the examples used with youth to illustrate concepts and ideas.
7. Plant micro-affirmations in your daily conversations with youth.
8. Teach youth how to use micro-affirmations when communicating.
9. Take advantage of professional development opportunities that address micromessaging.
10. Educate parents in the use of micromessaging at home to encourage youth through affirmation to believe in their dreams.

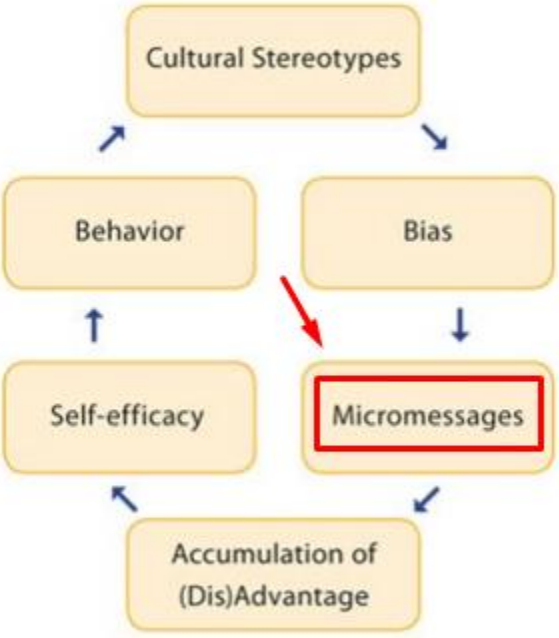
Examples of microinequities:

- Chronically mispronounce select youth names
- Tolerate calling out answers from some but not others
- Discipline boys more severely than girls for similar behaviors
- Avoid eye contact with select youth
- Sigh when certain youth get the wrong answer

Examples of microaffirmations:

- Meet and greet youth at the door
- Listen whenever youth are talking
- Assign females and males to activities based on skill, not gender
- Celebrating the backgrounds and cultures of all youth
- Ensure setting and curriculum are culturally responsive

FIGURE 1. **NAPE Culture Wheel**



Think about:

ONE thing you will start saying or doing…
ONE thing you will stop saying or doing…

Resource:
National Alliance for Partnerships in Equity – www.napequity.org

National Girls Collaborative Project

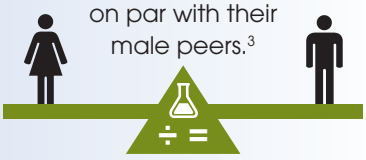
The State of Girls and Women in STEM

August 2016

K-12 Education

Girls and boys do not significantly differ in their abilities in mathematics and science, but do differ in their interest and confidence in STEM subjects.[1,2]

Female students' achievement in mathematics and science is on par with their male peers.[3]



Female and male students' participation in high level mathematics and science courses is similar, except for computer science and engineering.[3]

Female and male students took AP exams in some subjects at roughly the same rates in 2013, but males were more likely to take advanced level AP exams, including calculus BC, physics B, and physics C.[3]

Male students enrolled in AP computer science at a much higher rate than female students.[3]

Higher Education

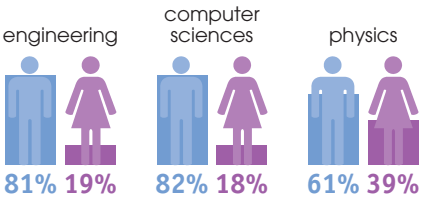
The rates of science and engineering (S&E) **coursetaking for women shift at the undergraduate level** and gender disparities begin to emerge.

57% • **50%**

Women earn 57% of bachelor's degrees in all fields; 50% of bachelor's degrees in S&E.[1]

Within S&E, men and women tend to study different fields.

Men earn a majority of bachelor's degrees awarded in: [1]



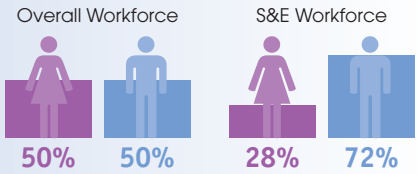
Women earn a majority of bachelor's degrees in psychology, biological sciences, and social sciences.[1]

Underrepresented minority women make up **16%** of the population, but only earn:

- **3%** of bachelor's degrees in engineering
- **5%** of bachelor's degrees in computer sciences
- **7%** of bachelor's degrees in physical sciences [2]

STEM Workforce

Women remain underrepresented in the science and engineering workforce, with the **greatest disparities occurring in engineering and computer sciences.**



Women constitute 50% of the overall workforce and 28% of the S&E workforce.[1]

62% • **48%** • **25%** • **15%**

Female scientists and engineers are concentrated in different occupations than men, with relatively high shares of women in the social sciences (62%) and biological and life sciences (48%) and **relatively low shares in computer and mathematical sciences (25%), and engineering (15%).**[1]

Minority women comprise **fewer than 1 in 10 employed scientists and engineers.**[2]

[1] STEMconnector & My College Options. (2013). *Where are the STEM Students? What are their Career Interests? Where are the STEM Jobs?*

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Partially funded by a grant from the National Science Foundation, GSE/EXT: National Girls Collaborative Project: Building the Capacity of STEM Practitioners to Develop a Diverse Workforce, Grant No. HRD-1532643.

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STEM

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Opportunities to Close the Gap

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Visit the Student Research Foundation for a related, student-focused research clearinghouse, with relevant information about career, academic, and life pathways. The Student Research Foundation collaborates with the Research Consortium on STEM Career Pathways and others to provide the community with the most current information.

OVERVIEW

The United States faces a well-known challenge: it must develop a larger, qualified workforce in Science, Technology, Engineering and Math (STEM) to thrive in a technology-driven global economy. The US Bureau of Labor Statistics estimates that employment in STEM-related fields will increase by 1 million between 2012 and 2022[1].

One solution to this challenge is to attract more professionals from talent pools historically underrepresented in the STEM pipeline – i.e., women, African Americans, Hispanics, and Native Americans. This solution requires effective K-12 strategies. Students' voices can help shape those strategies to ensure they are smart and relevant.

The Research Consortium on STEM Career Pathways conducted a national survey of high school students in STEM classes during Spring 2015. This report draws on those data to identify opportunities, challenges, and promising practices for leveraging equity to meet STEM workforce needs.

Data from this sample of 7,325 student respondents suggest: 1) Equity efforts *can* increase the STEM workforce and 2) Realizing that potential requires *strategic efforts.*

Attracting and retaining females in the STEM pipeline requires:

- Boosting STEM career confidence
- Increasing STEM career aspirations

Attracting and retaining racial/ethnic groups historically underrepresented in STEM calls for:

- Ensuring stronger academic foundations in STEM
- Addressing unique barriers

> Failure is information-we label it failure, but it's more like, 'This didn't work, I'm a problem solver, and I'll try some-thing else.'
>
> - Carol S. Dweck[2]

Despite the fact that students, regardless of race, ethnicity, or gender, begin from the same place – rating STEM as extremely or very relevant to their future careers – obstacles remain.

But there are solutions:

- Support creative learning in all STEM classrooms
- Address structural inequalities that contribute to an unequal STEM playing field

Taken together, these interventions can infuse the STEM pipeline with new talent to close the gap between supply and demand today – and to close the opportunity gap tomorrow.

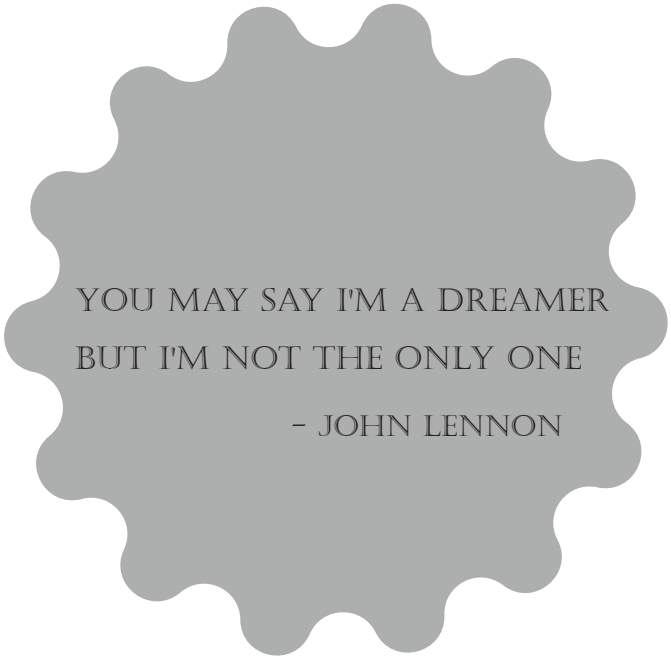
INTRODUCTION

Imagine every US student has an opportunity for a high-paying, in-demand career that inspires and engages.

Imagine the US has an adequate supply of highly trained and innovative workers to fill STEM jobs at all levels.

Imagine the US is the undisputed global leader of technology, innovation, and manufacturing – fueling an economy where parents see an even more promising future for their children.

These dreams can be reality if more high school students in STEM classes persist in the STEM pipeline and pursue STEM careers.



DEFINING STEM

Scholars, policy experts, and advocates agree the nation faces challenges fueling the STEM pipeline. They do not share a common definition of STEM careers[3]. We chose among alternatives based on our goal of closing the gap between workforce supply and demand[4]. Thus, social sciences, health careers, and accounting are excluded from the definition of STEM fields in this report.

Between classroom and career, the STEM pipeline loses many students who may enjoy and thrive in a STEM career. All demographic groups suffer losses. However, groups historically underrepresented in STEM fields suffer the greatest losses. The two largest of these groups are: 1) females and 2) African American, Hispanic, and Native American males.

- Whites and Asians comprise 72.4% of the US workforce, but 85.5% of the STEM workforce[5].
- Women are 47% of the US workforce, but only 25% of the Computer and Mathematical Sciences and 13% of the Engineering workforces[6].

Plugging leaks in the STEM pipeline is not only about equity, but an issue of economic urgency.

- By 2044, "minorities" will be the new "majority" of the US population[7].
- By 2020, the majority of US children will be members of racial/ethnic "minorities"[8].
- Today, nearly half of the engineering and advanced manufacturing workforce is approaching retirement[9]; new entrants to the STEM workforce are too few to replace them.

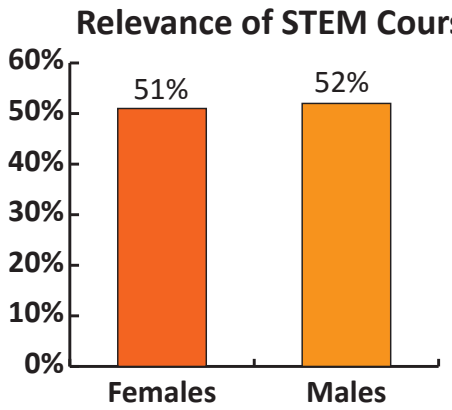
Destination Imagination, National Alliance for Partnerships in Equity, National Girls Collaborative, and the Educational Research Center of America formed the Research Consortium on STEM Career Pathways to address these needs.

FINDINGS

A Majority of High School Students see STEM Courses as Career Relevant, Regardless of Race/Ethnicity or Gender

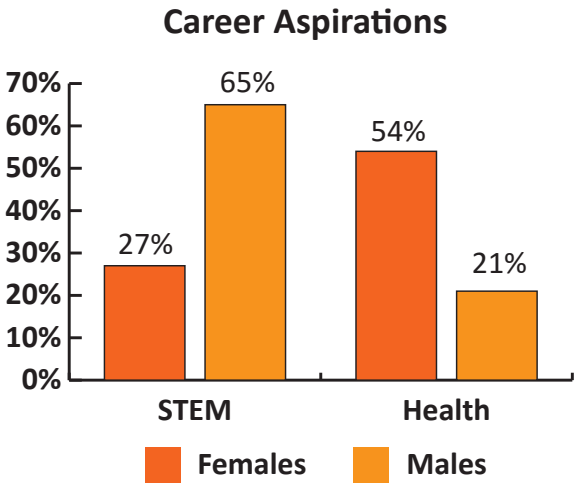
GENDER & THE STEM PIPELINE

Majorities of females and males rate STEM courses as "very" or "extremely" important to their future careers.



However, when presented with a list of 100 career options and allowed to choose up to two to consider, males were much more likely to aspire to STEM careers – and only STEM careers[10].

- Females are 38 points *less* likely than males to aspire to a STEM career.
- Males and females channel STEM's career-relevance into different career pathways with females preferring health careers over STEM.
- A gender gap in STEM aspirations may make it harder to retain females in the STEM pipeline.

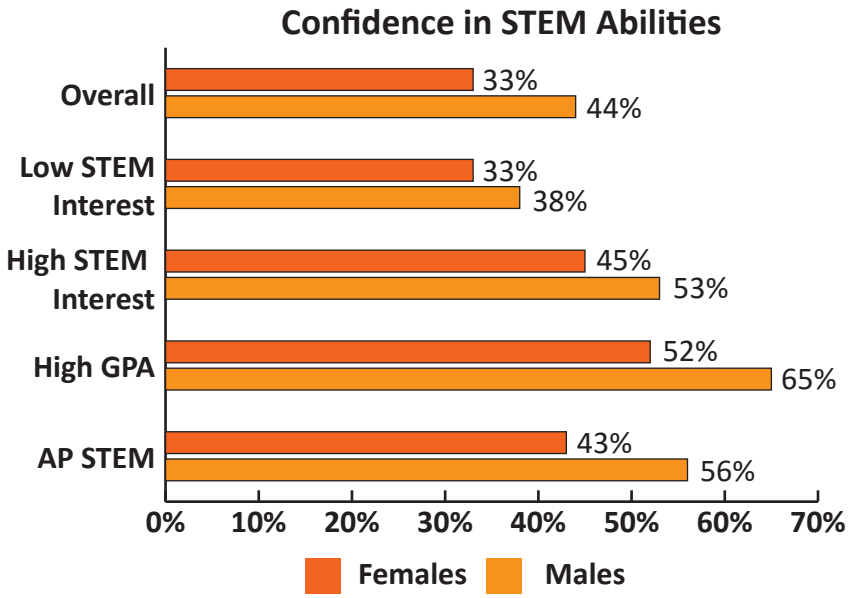


STEM CONFIDENCE

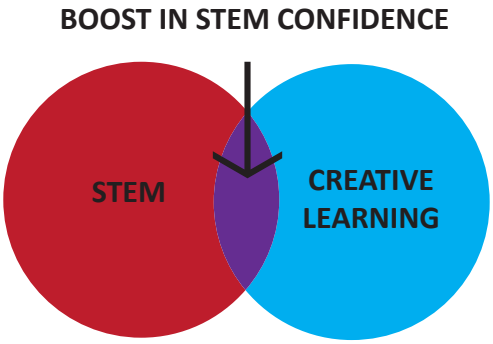
Males are consistently more confident of their STEM abilities than females. This holds:

- Whether they aspire to a STEM career or not.
- Among students with high GPAs who aspire to STEM careers.
- For students in AP STEM classes.

"Reverse engineering" may shed light on what can close the gender gap in confidence and help raise STEM confidence for all STEM students with promise. So what (besides gender) distinguishes students with the highest and lowest STEM confidence? One distinction is creative learning opportunities in their STEM classrooms.

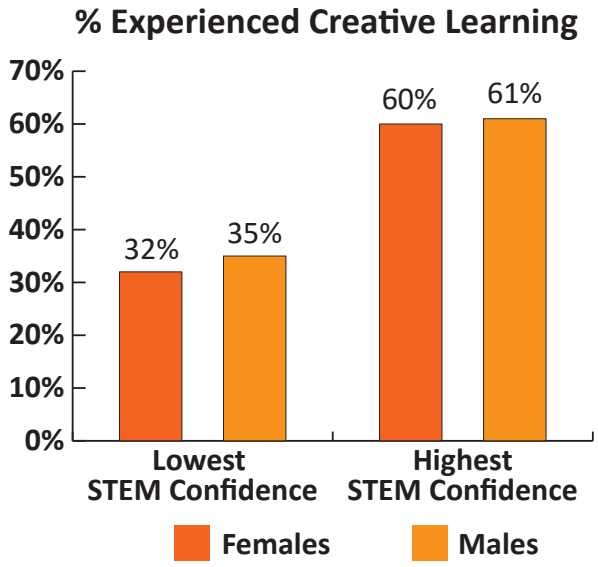


CREATIVE LEARNING & STEM



Creative learning matters. It characterizes the educational environment of confident students, regardless of gender. That suggests that greater access to STEM learning environments which *students themselves see as creative* might boost the STEM confidence of a generation. It might also help close the gender gap.

Majorities of students highly confident of STEM abilities[11] report frequently experiencing creative learning[12] in their STEM classes. Not so among students with the lowest STEM confidence. This pattern holds equally for males and females.



Education about career options is a logical solution. Yet a 38-point gender gap may require overcoming micromessages as well[13].

Micromessages are subtle, often negative, messages that reinforce stereotypes. Over time, micromessages accumulate. Unless countered, micromessages can lower STEM confidence.

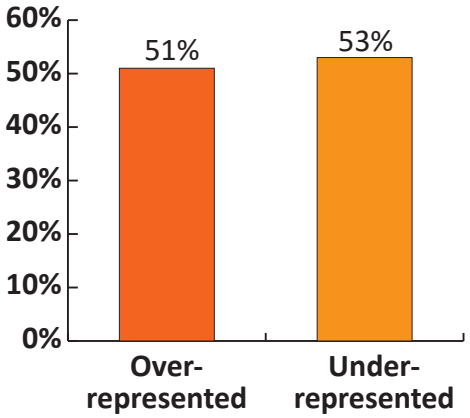
RACE/ETHNICITY & THE STEM PIPELINE

Racial/ethnic groups historically overrepresented and underrepresented in STEM careers agree STEM classes are highly relevant to their future careers.

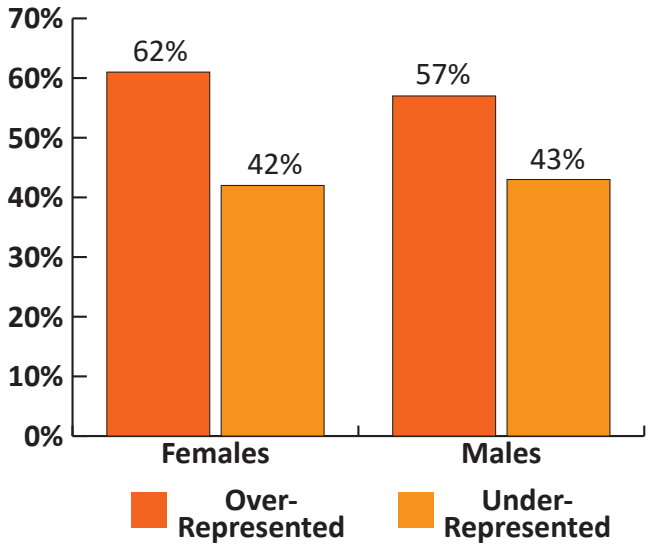
Whites and Asians leave high school with a stronger academic foundation in STEM than African Americans, Hispanics, and Native Americans. Among high school seniors surveyed:

- Whites and Asians more often than African Americans, Hispanics, and Native Americans complete 7+ STEM classes by senior year. This is true regardless of gender.
- More Whites and Asians than students from groups historically underrepresented in STEM fields take AP STEM courses.

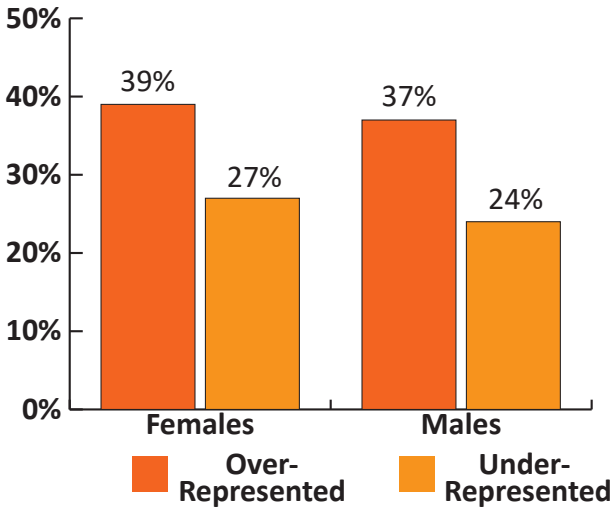
Relevance of STEM Courses



Completed 7+ STEM classes by senior year



Seniors taking an AP STEM class

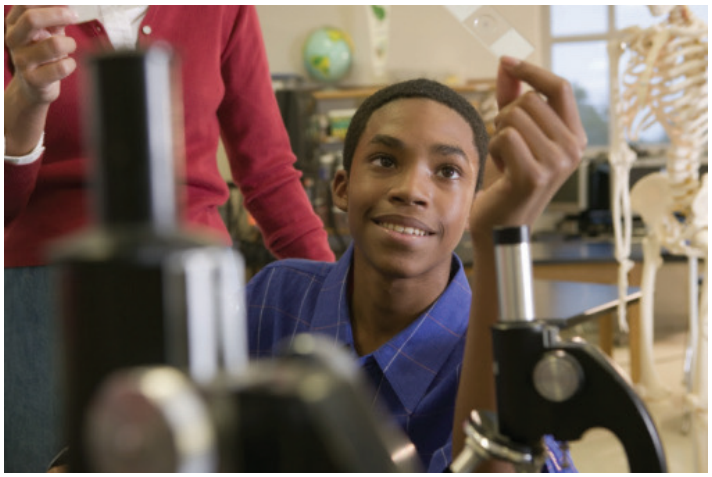


The challenge of boosting supply and diversity in the STEM pipeline are largely due to structural inequalities – not solely results of personal choice. Indeed:

- Nationwide, only 50% of high schools offer calculus, and only 63% offer physics[14].
- Among high schools with the highest percentage of African American and Hispanic students, a quarter do not offer Algebra II and a third do not offer chemistry.
- Fewer than half of Native American and Native-Alaskan high school students have access to the full range of math and science courses in their high school[15].

This is consistent with government statistics showing African American and Hispanic students are:

- 37% of students in high schools
- Only 27% of students enrolled in at least one Advanced Placement (AP) course, and
- Merely 18% of students receiving a qualifying score of 3 or above on an AP exam[16].



Bearing in mind these powerful structural inequalities across US public education, historically overrepresented and historically underrepresented racial/ethnic groups are still: 1) Equally likely to see STEM coursework as career-relevant, 2) Equally confident in their STEM abilities and 3) Largely similar in STEM career interest (with a mere 6-point gap compared to the 38-point gender gap).

Females from groups historically underrepresented in the STEM pipeline are faced with unique challenges. They face the structural challenges their male peers face: acquiring a solid academic foundation in STEM when they on average have access to fewer critical courses. And they face the challenges White and Asian females face: a gender gap in STEM confidence and STEM career aspirations.

These women and girls need strategies tailored for the more complex challenges that young women from historically underrepresented racial/ethnic groups face.

CALL TO ACTION

The nation faces an urgent challenge: how to offer all students secondary education options that equip all interested students – regardless of race/ethnicity – to pursue STEM dreams. Doing this: 1) Increases US potential to compete successfully in the global STEM market and 2) Provides students with the foundation required to achieve their dreams.

SOLUTIONS & STRATEGIES

Data from students suggest two strategies:

1. Support creative learning in all STEM classrooms. Students with the highest and the lowest STEM confidence diverge dramatically in at least one thing: frequent exposure to creative learning in STEM classes. This is true for females as well as males.

2. Address structural inequalities so that fewer African Americans, Hispanics, and Native Americans leave high school unprepared for post-secondary STEM education and careers.

The Research Consortium on STEM Career Pathways recommends approaches and tools to help every student, regardless of race or gender, achieve their STEM potential – and to position the US for success in the technology-driven global economy:

- Identifying and overcoming micro-messaging that threatens STEM confidence[17].
- Building resilient students who persist despite adversity[18].
- Cultivating desire to pursue STEM careers[19].

After-school clubs, teams, maker spaces, and camps can allow students to experiment with STEM concepts and explore the limits of their understanding. This builds confidence and is carried back to the classroom[20].

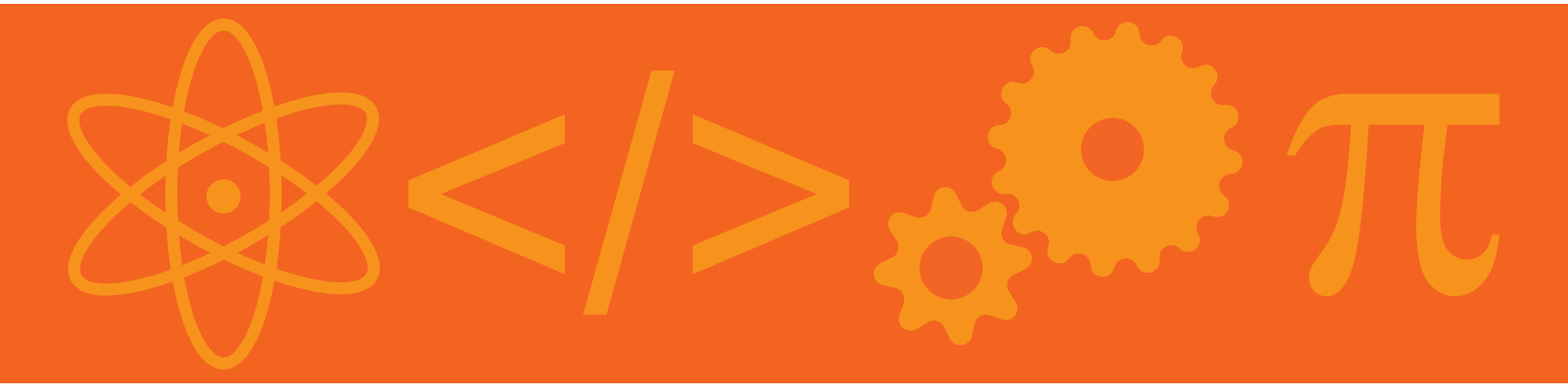
METHODOLOGY

This report is based on data from 7,325 students who responded to in-class surveys administered between March 2015 and May 2015[21]. Surveys were mailed to STEM teachers across the nation. Students generally reflect a cross-section of high school students nationally:

- 49% were female, 51% were male
- 45% were White, 6% Asian, 24% African American, 23% Hispanic, 7% Native American, and 9% preferred not to say. (Students could choose up to two responses.)
- They were distributed across four graduating classes: 2015 (19%); 2016 (29%); 2017 (23%); and 2018 (29%).
- They were from the South (53%), Midwest (18%), Northeast (9%), and West (20%) – roughly equal to the population of US high schools.

ACKNOWLEDGEMENTS

We are deeply grateful to all the high school STEM educators across the nation who administered the surveys, and especially to the students who voiced their points of view on this very important topic. We hope this report contributes to the dialogue about students' career and educational paths. For more information about the work of the Research Consortium on STEM Career Pathways, or to have your students participate in this project in the future, please contact: info@studentresearch.org. We also welcome inquiries from organizations that want to become involved in, or support, this work.



ABOUT THE PARTNERS

Destination Imagination

Destination Imagination (DI) is a cause-driven, 501 (c)(3) nonprofit focused on readying students worldwide for college, career, and life beyond school through opportunities that promote and support creativity, imagination, contextual learning, arts appreciation, STEM-based skills development, and entrepreneurship leading to an engaged and future-ready student population. To learn more, see: www.destinationimagination.org - Twitter: @IDODI

National Girls Collaborative Project

The National Girls Collaborative (NGC) facilitates collaboration, resource sharing, and professional development to strengthen the capacity of organizations to effectively engage girls in STEM, and leverages a network of girl-serving STEM programs and advocates to create the tipping point for gender equity in STEM. For more on the National Girls Collaborative see: www.ngcproject.org Twitter: @ngcproject

National Alliance for Partnerships in Equity

The National Alliance for Partnerships in Equity (NAPE) builds educators' capacity to implement effective solutions for increasing student access, educational equity, and workforce diversity in high-skill, high-wage, and high-demand STEM and career and technical education programs. For more on NAPE, see: www.napequity.org - Twitter: @NAPEquity

Educational Research Center of America

The Educational Research Center of America (ERCA) pursues a mission of helping high school students and their families to identify college- and career-ready pathways relevant to their interests, education, and passions. For more information, visit www.studentresearch.org - Twitter: @ERCAResearch

FOOTNOTES:

[1] See http://www.bls.gov/careeroutlook/2014/spring/art01.pdf

[2] Source: http://www.azquotes.com/author/19498-Carol_S_Dweck

[3] Even agencies across the federal government define STEM differently. The National Science Foundation defines STEM broadly, including social sciences. The Bureau of Labor Statistics defines it more narrowly, but includes accounting, for example. This study is ultimately about the challenges of fueling the STEM pipeline to meet demand now and in the future. Therefore, the definition of STEM used in this study attempts to align with the definition of Immigration and Customs Enforcement (ICE) – which designates certain job categories/ university majors as needing the talents of foreign students and workers. See http://www.ice.gov/sevis/stemlist.htm. Thus, social sciences, health careers, and accounting are excluded from the definition of STEM fields in this report.

[4] Student interests are classified using a two-step process. First, students indicated interest in up to two possible careers interests or goals from a list of 100 choices on the survey. Second, researchers then coded each option as STEM or not STEM careers, Health Science Careers or not, and neither Health Science nor STEM careers.

[5] See: https://www.census.gov/prod/2013pubs/acs-24.pdf

[6] (NSF, Science & Engineering Indicators, 2014) cited in https://ngcproject.org/statistics.

[7] For U.S. Children, Minorities Will Be The Majority By 2020, Census Says in http://www.npr.org/sections/thetwo-way/2015/03/04/390672196/for-u-s-children-minorities-will-be-the-majority-by-2020-census-says.

[8] For U.S. Children, Minorities Will Be The Majority By 2020, Census Says in http://www.npr.org/sections/thetwo-way/2015/03/04/390672196/for-u-s-children-minorities-will-be-the-majority-by-2020-census-says

[9] http://www.usnews.com/news/stem-solutions/articles/2015/02/24/stem-workforce-no-more-diverse-than-14-years-ago. Also see https://www.census.gov/prod/2013pubs/acs-24.pdf. Disparities in STEM Employment by Sex, Race, and Hispanic Origin.

[10] Based on our definition of STEM, careers were assigned to STEM, health, or other categories.

[11] Highest confidence students report being “extremely” or “very” confident of their STEM abilities.

[12] Frequent exposure is defined based on self-reports of “always” or “often” experiencing creative learning opportunities in STEM courses.

[13] Morrell, C. and C. Parker. 2013 (Spring). Adjusting micromessages to improve equity in STEM. Diversity & Democracy 16(2). Available at http://www.aacu.org/publications-research/periodicals/adjusting-micromessages-improve-equity-stem

[14] http://www2.ed.gov/about/offices/list/ocr/docs/crdc-college-and-career-readiness-snapshot.pdf

[15] http://www2.ed.gov/about/offices/list/ocr/docs/crdc-college-and-career-readiness-snapshot.pdf

[16] http://www2.ed.gov/about/offices/list/ocr/docs/crdc-college-and-career-readiness-snapshot.pdf

[17] NAPE Micromessaging to Reach and Teach Every Student Social Learning Theories Unit

[18] Hall, C., Dickerson, J., Batts, D., Kauffmann, P., and Bosse, M., “Are We Missing Opportunities to Encourage Interest in STEM Fields?” Journal of Technology Education, URL: http://scholar.lib.vt.edu/ejournals/JTE/v23n1/hall.html

[19] http://www.engr.psu.edu/awe/misc/arps/arp_selfefficacy_overview_122208.pdf

[20] See www.theconnectory.org to find opportunities by zip code.

[21] A sample from one of several consortia projects.

Afterschool Programs Build STEM Strength

2012, No. 2 (Updated 2013)

Afterschool Programs

The best learning often takes place when it is presented as a form of play – which is why afterschool programs are the ideal venue for engaging young minds in science, technology, engineering, and mathematics (STEM).

Nationally, many efforts are underway to encourage and support STEM programming afterschool. These efforts are being championed by organizations such as the Afterschool Alliance (www.afterschoolalliance.org) and the Coalition for Science After School (www.afterschoolscience.org) because they recognize the vital role afterschool programs can play in building STEM strength.

Afterschool programs serve more than 8.4 million K-12 students nationwide. These programs offer a unique opportunity to incorporate STEM learning because they foster fun, flexible environments and use a variety of learning methods such as hands-on activities as well as including non-traditional learning venues like museums. In addition, afterschool programs often serve underrepresented youth who benefit from additional opportunities to participate in STEM learning.

Although afterschool programs are an ideal venue for incorporating STEM learning, challenges can exist in incorporating STEM principles. Youth workers are known for their expertise in working with youth which is critical for engagement and relationship building; however, infusing academic content into afterschool programs may not fall within their area of expertise.

This challenge can be overcome with help from the National Girls Collaborative Project.

Afterschool Matters

The Spring 2013 edition of the *Afterschool Matters* journal focused on STEM learning in afterschool. Download the special STEM-focused edition here: http://niost.org/Afterschool-Matters/afterschool-matters-spring-2013

National Girls Collaborative Project

Afterschool Programs

Partners in STEM Learning

The National Girls Collaborative Project (NGCP), a National Science Foundation funded initiative, brings together organizations throughout the United States that are committed to informing and encouraging girls to pursue careers in STEM.

The NGCP increases the quality of STEM programming and strengthens the capacity of STEM practitioners by leveraging existing resources, sharing exemplary practices, and facilitating collaboration among its constituents.

NGCP has gained traction and become more effective as it has been replicated in 40 states.

A highly-effective model, NGCP uses in-person and online professional development events, mini-grants as an incentive to build collaboration among projects and organizations, and sharing of exemplary practices to build STEM capacity nationwide.

NGCP Makes it Easy to Get STEM Afterschool

Making STEM accessible to youth workers.
Afterschool program staff often do not have the time or opportunity to find the latest research on STEM learning or to participate in targeted professional development. NCGP bridges this gap by:

- **Providing professional development opportunities both in-person and online.** NGCP Collaboratives host events throughout the country and NGCP hosts national webinars that are free and open to the public. These events highlight youth-serving STEM programs and initiatives, offering the opportunity for practitioners to share successes, challenges, and programming tips. They also present training for practitioners on a variety of topics, including effective strategies for engaging youth in STEM activities, collaboration, how to utilize mentors and role models, and how to appropriately evaluate efforts.

"The National Girls Collaborative Project has given our board confidence and enhanced our credibility in our community. We have formed new collaborations and we continue to improve the quality of our STEAM (STEM + Art) afterschool program for elementary schoolgirls by following the examples of other NGCP members. Any small, grassroots program can feel strong as part of the NGCP."

— Mary Golden, Director,
Cool Girls Science and Art Club

- **Facilitating collaboration to leverage resources and expertise.** Afterschool programs benefit significantly from collaboration by drawing on other organizations' resources and knowledge to complement what they do best. For example, an afterschool program partnered with a local group of women STEM professionals to provide their girls with role models. Afterschool program staff provided the activities and the STEM professionals led the activities with the girls and provided a unique perspective on pursuing a STEM career. Afterschool programs can utilize the NGCP Program Directory to find professional organizations to facilitate this type of collaboration.

- **Creating community to enhance support.** NGCP also provides a community – both online and in-person – for practitioners who may feel isolated in their efforts to provide science enrichment or who are part of a small staff and benefit from networking and sharing ideas with others who are involved with similar efforts, whether it is across town or across the country.

Building STEM confidence.

A significant hurdle for afterschool programs delivering science content is the level of comfort staff feel with STEM material. NGCP is able to enhance confidence in working with STEM programming by:

- **Leveraging expertise from outside afterschool programs.** By leveraging the content expertise of another organization/individual (such as classroom teachers, science museum staff, and STEM professionals) along with the youth development expertise of afterschool staff, students are exposed to exciting science, engineering, and technology content with the guidance of trusted adults with whom they have relationships.

- **Sharing effective strategies and models through webinars.** NGCP webinars highlight program examples that are relevant to afterschool staff and that are evidence-based with a track record of success thereby eliminating the need for staff to "reinvent the wheel" and helping them gain confidence in the strategies they are implementing. For afterschool staff, participation in these webinars is also a valuable form of professional development they may not have access to otherwise.

Collaboration benefits afterschool program.

An afterschool program partnered with a local museum to expose their students to the museum resources, rich in science content, but not easily available at the afterschool program site. The collaboration also involved museum staff working with the students at the exhibits so the students benefitted from not only the museum experience, but having a guide with deep science knowledge discuss the material with them and answer their questions.

National Girls Collaborative Project

Afterschool Programs

Helping STEM programs thrive.

Sufficient resources are critical to maintaining STEM learning in afterschool programs. NCGP assists with program sustainability by:

- **Enabling programs and organizations to find partners.** NGCP provides opportunity for programs and organizations to find potential collaborators at in-person events as well as through the NGCP Program Directory, a powerful on-line resource featuring over 3,100 programs and organizations. The Program Directory allows organizations to describe their offerings as well as enter their needs and resources thereby allowing others to search for those who can meet their needs or utilize their existing resources.

- **Providing mini-grant funding.** NGCP incentivizes collaboration by giving mini-grants to organizations that partner with at least one other organization on a STEM-focused project. Funded projects leverage the resources and expertise of partner organizations to provide opportunities each organization would not be able to provide if working alone. An overwhelming majority of partners receiving mini-grants report continuing their collaborations post-funding, whether it is to continue the project they initially started together or to develop a new project. For many mini-grant recipients, working collaboratively allows each partner to accomplish more with fewer resources.

"NGCP has assembled a treasure trove of research-based articles as well as highly accessible webinars that help us anchor and modify our program model in practical ways, and develop better grant proposals."

— Connie Chow, Executive Director, Science Club for Girls

Sharing STEM success stories.

Significant work is being done by many afterschool organizations to share how STEM learning is being incorporated in afterschool programs. NGCP lends its voice to support these efforts by leveraging its resources and national network to publicize afterschool STEM learning by:

- **Publishing a monthly e-newsletter.** The monthly e-newsletter highlights NGCP-related programs, many of which involve afterschool activities, and publicizes afterschool efforts and events. With a distribution list of over 24,000, the e-newsletter increases awareness of afterschool activities across the country and the afterschool community's commitment to STEM learning.

- **Using its national presence to advocate for afterschool STEM programs.** As a national organization, NGCP is in a position to represent afterschool programs and other informal learning projects on a national stage and with STEM-related organizations and events that may not always specifically include afterschool representatives.

Conclusion

NGCP harnesses the power of national as well as local collaboration to help strengthen the capacity of youth-serving organizations to provide high-quality programming in STEM. The NGCP model represents an innovative method for developing collaborative relationships between youth-serving organizations, K-12 and higher education, professional organizations, and industry, leveraging resources to benefit afterschool programs and the youth they serve.

Enter your program or organization in the NGCP Program Directory and search for potential collaborators: www.ngcproject.org/directory.

Find connections and resources for afterschool programs at www.ngcproject.org.

- Find a Collaborative event happening near you.
- Participate in an upcoming webinar and view archived webinars.
- Sign up for the NGCP e-newsletter to receive a monthly listing of resources, events, and NGCP Collaborative news.
- Check out mini-grant project descriptions to spark an idea for a collaborative STEM-related project for your program or organization.

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Equitable Practices for Engaging Youth in STEM BOOST 2017 Additional Resources

- **NGCP Resources on Access and Equity: http://ngcproject.org/access-and-equity**
  A content-rich webpage providing links out to exemplary practices in access and equity.

- **FabFems: http://www.fabfems.org/**
  A free online portal connecting women STEM mentors and role models with girls.

- **National Alliance for Partnerships in Equity (NAPE): http://www.napequity.org**
  We build educators' capacity to implement effective solutions for increasing student access, educational equity and workforce diversity.

- **Student Research Foundation: http://www.studentresearchfoundation.org/**
  The Student Research Foundation serves as the voice for young people's career aspirations. By defining career pathways and helping students reach those paths, the Foundation strengthens the nation, its economy, and its citizens.

- **Destination Imagination: https://www.destinationimagination.org/**
  To teach students the creative process and empower them with the skills needed to succeed in an ever-changing world.

- **National Center for Women & Information Technology (NCWIT): https://www.ncwit.org/**
  NCWIT is a "collective impact" effort, a community of more than 700 prominent corporations, academic institutions, government agencies, and non-profits working to increase girls' and women's participation in technology and computing.

- **Harvard Implicit Bias Test: https://implicit.harvard.edu/implicit/takeatest.html**
  Project Implicit is a non-profit organization and international collaboration between researchers who are interested in implicit social cognition - thoughts and feelings outside of conscious awareness and control. The goal of the organization is to educate the public about hidden biases and to provide a "virtual laboratory" for collecting data on the Internet.

- **Understanding Prejudice: http://www.understandingprejudice.org/**
  A web site for students, teachers, and others interested in the causes and consequences of prejudice. On this site you will find more than 2,000 links to prejudice-related resources, as well as searchable databases with hundreds of prejudice researchers and social justice organizations.

- **Racial Equity Resource Guide: http://www.racialequityresourceguide.org/**
  The directory of materials found on this site have been prepared as a shared tool for building a community of connected, informed and engaged practitioners. With the ability to generate a Resource Guide tailored to their own goals, these materials are practical resources that will assist organizations working within the racial healing and racial equity field.

- **TED Talk on Overcoming Bias**
  'Vernā Myers: How to overcome our biases? Walk boldly toward them':
  https://www.ted.com/talks/verna_myers_how_to_overcome_our_biases_walk_boldly_toward_them