

Winter Break STEM Guide

Science, Technology, Engineering, and Math Opportunities

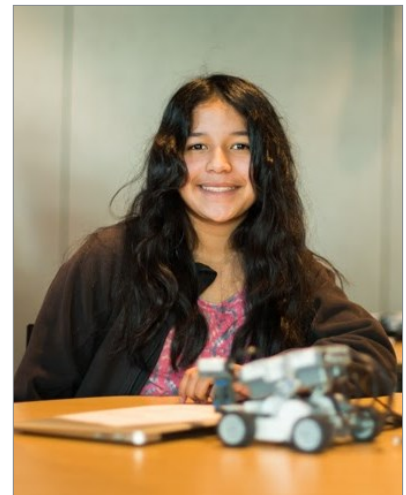
About Techbridge Girls

Techbridge Girls pictures a world where all girls lead, contribute, and thrive in science technology, engineering, and math (STEM). Based in the San Francisco Bay Area, Greater Seattle, and Washington, D.C., Techbridge Girls serves girls in grades 4 to 12 through high-quality STEM afterschool and summer programs that include hands-on projects and career exploration.

Dear Parents and Guardians,

Do you want your daughters to have a stable, well-paying, and rewarding career that helps them make a difference in their communities? STEM careers, like engineering and computer science, can be the answer! To get to a STEM career, your daughters need more support than just Techbridge Girls programs. They need **you** to encourage them!

You do not have to be an expert in science and engineering to support your girls. This guide shares events, activities, websites, and gift ideas that can help you encourage their STEM learning. Here are other ideas for simple things you can do at home to help your daughters develop an interest and skills in STEM:



- **Encourage girls to fix things around the house.** Teach them how to use tools and solve problems. If something is broken and can't be fixed, have girls take the object apart to explore how it works.
- **Connect everyday activities to STEM careers.** For example, while cooking together, ask girls about jobs that might involve mixing things together to create something new (like chemical engineering!). If the electricity goes out, ask girls what type of people work to keep the lights on (like electrical engineers). You don't have to have all the answers--just asking questions get girls thinking.
- **Talk about their futures in STEM.** Ask girls what kinds of problems they want to solve in their communities and how STEM could solve those problems. Talk to your girls about their college goals and dreams. Encourage them to take middle school and high school elective classes that support their STEM learning.

Below are local opportunities and websites to support the budding scientists and inner engineers in your family. Need access to the Internet? Check out your local library!

Holiday Trains and Planes at the College Park Aviation Museum



www.mncppc.org/calendar.aspx?eid=1836

Miniature trains, villages, tunnels, and depots spark the imagination as they bring history to life. The National Capital Trackers bring a fascinating, constantly moving, holiday-themed display of model railroads to the museum.

Free with Museum admission (\$0-\$5).



Season's Greenings at the US Botanical Garden on the National Mall



www.usbg.gov/plan-your-holiday-visit

Season's Greenings is an annual delight for all ages. The conservatory exhibit features Washington landmarks constructed from plant materials and one of the city's largest Christmas trees. But the highlight, hands-down, is the garden railway, which never fails to impress and enchant with intricate, imaginative designs. FREE.



Hands on Science at the Koshland Museum



www.koshland-science-museum.org/explore-the-science/handson

Experience hands-on science activities and engage with issues that affect you and your community and at the Koshland Museum. Hands-on science offerings may vary and are included free with regular admission (\$3-\$5).

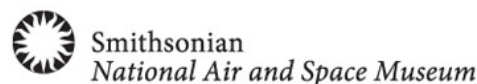


National Air and Space Museum



www.washington.org/DC-guide-to/smithsonian-national-air-and-space-museum

The National Air and Space Museum boasts the world's largest collection of historic aircraft and spacecraft, including Charles Lindbergh's *Spirit of St. Louis*, the Wright brothers' original 1903 flyer, astronaut space suits and a lunar rock sample. FREE.



Engineer Girl



www.engineergirl.com

Designed specifically for girls, this website highlights all the exciting opportunities that engineering has to offer. Learn about different engineering fields, hear from women solving exciting real-world problems, and ask women engineers your personal questions on this highly interactive website!

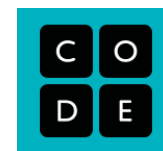


Hour of Code



www.studio.code.org/courses

Code.org has a wide variety of lessons on coding for kids in grades K-12. Looking for someplace to start with your daughter? Try one of the Hour of Code activities, which include activities with themes like Star Wars and Frozen.



Design Squad



www.pbskids.org/designsquad

This website connected to the PBS show Design Squad has online games, video clips, and activity ideas that are related to design and engineering. They also have resources for parents and educators.



Science Buddies



www.sciencebuddies.org

Science Buddies has a variety of STEM activity ideas that girls can try, as well as information about careers, and an "Ask an Expert" forum. Although the website is focused on science fair activities, you can try out the activities anytime with your daughters!



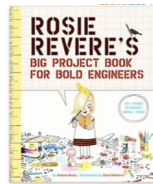
Below are gift ideas that develop critical thinking, creativity, and perseverance — skills that are essential for careers in STEM!

Rosie Revere's Big Project Book for Bold Engineers

www.amazon.com, bookstores

Price: \$10.00

Ages: 5+



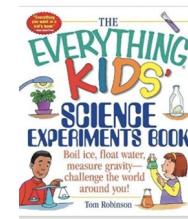
This activity book teaches problem-solving and creative-thinking skills crucial to STEM fields. Girls will be able to design a better bicycle, build a catapult, and more.

The Everything Kid's Science Experiments Book

www.amazon.com, bookstores

Price: \$10.00

Ages: 7+



This book contains ideas for dozens of science experiments that use household items.

My First Mind-Blowing Science Kit

www.amazon.com

Price: \$15.00

Ages: 6+



This kit contains several introductory science experiments such as growing crystals and creating color-changing liquids.

Qwirkle Board Game

www.amazon.com

Price: \$20.00

Ages: 6+



This pattern-matching board game can be played by the whole family and builds spatial recognition, planning, and problem-solving skills.

Snap Circuits, Jr.

www.amazon.com

Price: \$19.99

Ages: 7+



A snap-together kit for designing circuits that includes materials such as a motor, a light, and an alarm.

Nancy B's Science Club Microscope

www.amazon.com

Price: \$27.00

Ages: 8+



A real working microscope, with a journal that includes activity ideas as well as space for drawing.

4M Crystal Growing Experimental Kit

www.amazon.com

Price: \$16.00

Ages: 10+



This kit contains materials for seven different crystal growth experiments.

Science Academy Bath Bomb Lab

www.amazon.com

Price: \$25.00

Ages: 8+



This kit teaches principles of chemistry through the creation of bath bombs.

STEM Activities

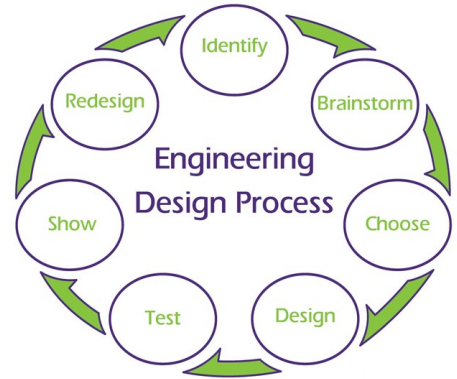
Doing STEM activities together as a family is a fun way for the whole family to learn! Below are simple challenges that you can try with materials around the house. While doing these activities, ask girls questions about their design and building process to push their thinking.

Bridge Design Challenge

Goal: Build a bridge that can reach across a 1 foot gap and support as much weight as possible.

Materials: Use materials you can find around the house, such as:

- Recycled paper, plastic, cardboard
- Tape
- Wooden sticks (popsicle, dowels, etc)
- Straws
- Rope or string



Directions: Place two tables 1 foot apart. Design your bridge using the steps in the Engineering Design Process above and place your bridge across the gap. Test your bridge by placing weight on top or hanging weight from below. Can you redesign your bridge so that it holds more weight?

Ask: What are different parts you see in bridges around the city? What shapes could you use to make a bridge strong? What materials could you use to make a bridge strong? What step of the Engineering Design Process is your favorite?

Career: Structural engineers design buildings, bridges, and structures that are safe and stable. The average starting salaries of structural engineers are about \$56,000, and average salaries after 5 years are about \$88,000.

Bubble Design Challenge

Goal: Design a bubble solution that creates long lasting bubbles.

Materials: Use materials you can find around the house, such as:

- Cups or bowls
- Ingredients to add to make bubbles, such as: soap, shampoo, cornstarch, oil, corn syrup, or any other ingredients you want to test out!
- Water
- Bubble wand (can be made out of twisted wire, pipe cleaners, or plastic)
- Measuring cups or spoons (optional)

Directions: Put a half cup of water into a cup or bowl. Using the steps in the Engineering Design Process, make a bubble solution by adding ingredients that you think will form strong, long-lasting bubbles. Use your bubble wand to test your solution. What do you notice? What kinds of bubbles are created? Redesign by adding more ingredients or starting a new recipe. Write down your recipes so you can compare which solution makes the best bubbles!

Ask: Where do you see bubbles form in everyday life? What liquids do you know form bubbles? What ingredients can we combine to make long-lasting bubbles? What step of the Engineering Design Process is most challenging for you?

Career: Chemical engineers use chemistry to solve everyday problems, like making gasoline for your cars, cleaning products like soap and detergent, or even chap stick and make-up. Average starting salaries of chemical engineers are about \$67,000, and average salaries after 5 years are about \$104,000.