

# Science: It's a Family Affair

• A Guide for Parents •



Techbridge

chabot  
space & science center

GORDON AND BETTY  
**MOORE**  
FOUNDATION

San Francisco Bay Area



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# Introduction

Why is the sky blue?

How do birds fly?

What makes leaves change colors in the fall?

Children start out curious and eager to make sense of their world. They make observations and come to you for the answers. This guide is meant to help support your child's sense of wonder and to encourage your family to explore science together.

You don't have to be an expert in science to provide your child with confidence to be successful at science. Making time to support your child's interests and providing a variety of opportunities to explore science can set your child on the path to finding a lifelong passion in marine biology, biotechnology, or chemical engineering.

It is never too early to begin to help children think about and plan for their future. It's okay if they don't know what they want to be or if they change their mind along the way. What is important is to start the conversation now about their futures and expose them to a wide range of careers.



In this guide, we share ideas and science projects for you to try at home. We also profile science and technology museums in the San Francisco Bay Area and provide activities for you to do during your visits to these museums as well as ideas for follow up at home.



# Parents Make a Difference

“Approach the world with curiosity and you will help spark an interest in science.”

Even if you don't have a science or engineering background, you can play an important role in your child's learning. Approach the world with curiosity and you will help spark an interest in science.

Research shows that intelligence can be developed with effort. As

parents, you can teach your child that the brain is like a muscle that gets stronger and works better the more it is exercised. In the face of challenges, children with this type of mindset are more likely to be persistent and successful in math and science. Make sure to highlight the importance of learning from mistakes.



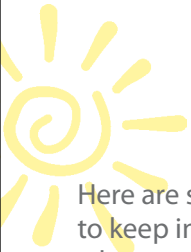
Here are some everyday tips and resources to encourage learning and family fun with science and engineering.

- **Encourage your child to share her discoveries.** Ask your child to share one idea or lesson that she learned in school.
- **Science is all around** and in the media. Movies, television specials, magazines, newspapers, books, and computer programs frequently present science-related topics. Talk with your child about the science she encounters. What interested her? What did she learn?
- **Take advantage of the learning opportunities** in everyday activities. Take an extra five minutes to study how the gears on a bike work and involve your child in repair projects that require measuring and mathematics.
- **Try setting a dinner-time tradition** of asking each family member to share a question she asked herself that day, or something she wondered.
- **Keep a family science journal** or scrapbook of experiments and other activities, including pictures.
- **Turn off the TV and spend a day playing board games and puzzles.** Look for games that promote problem-solving and spatial skills such as jigsaw puzzles, checkers, chess, and tanagrams. Print or create a puzzle for your child at [www.puzzlemaker.discoveryeducation.net](http://www.puzzlemaker.discoveryeducation.net).

- **Collect specimens and scientific data like a real scientist!** “Citizen Science” projects rely on the field work of people like you and your child. Find a project near you at [www.scienceforcitizens.net](http://www.scienceforcitizens.net).
- **Conduct your own science fair project.** Visit [www.sciencebuddies.org](http://www.sciencebuddies.org) for over 1,000 science fair project ideas, answers, and tools for you and your child.
- **Give the most important gift of all—your time.** Make time to talk with your child about her interests and dreams for the future.

“It is one thing to talk about engineering or technology, it is quite another to meet engineers and learn more about what they do. I wish there was more of this available.”





Here are some ideas to keep in mind when working with your child:

- Let your child take the lead in handling materials and giving directions.
- Work as a team. Don't be afraid to have fun. When you get excited about learning something new, your child will too.
- Give your child time to think and explore. Silence often means that your child is thinking about what is going on.

# Try it Out: Science at Home

Did you know that many scientists and engineers knew by eighth grade what they wanted to be? They recall activities they did at home or lessons from school that sparked an interest. Even if your child isn't interested in a career in science or technology, you can support a budding engineer or biologist by encouraging tinkering and creativity. Try out a hands-on activity together at home and you may inspire America's next top inventor or scientist!

## Try it Out: Drip Drop

### The Challenge

Imagine you are an engineer and must find a way to deliver water to a rural village in South America. Design and build a device to safely drop a cup of water from a height of at least 7 feet. The goal is to build a cup that can hold as much water as possible during the drop, without covering the top of the cup.

### Materials

- paper and pencil for sketching designs
- one paper cup
- paper
- tape
- paper clips
- rubber bands
- plastic bag
- straws
- string

### Directions

1. **Gather as many of the materials** as you can find around the house.
2. **Brainstorm** with your child possible designs for the device using available materials.
3. Have your child **sketch out the design** on a sheet of paper. Talk to your child about ideas on how to make something fall slower, stay balanced, and land upright. Make connections to things your child may already know about like parachutes.
4. Work together to create the device. As your child is building, **ask open-ended questions** about the design.
5. **Encourage your child to predict** what will happen to the device and the water.
6. After the device is ready, find a high place that you can drop the cup from, such as a ladder, deck, or a chair. **Test the device** with your child and see how much water stays inside the cup. Note: If doing this indoors, you may want to place a cover on the floor to absorb any spilled water.
7. **Follow up** the activity with a discussion using the guiding questions.
8. Go back and **make adjustments** to the device and **retest** until your child is satisfied with the results.



## Guiding Questions

How does your design work?

Is there another way to think about this?

What things do you think will affect how your device works?

Why do you think that happened?

What does this activity remind you of?

What forces affected your cup as it fell?

Could you change something in your design to make it hold more water?

What else would you like to try?

## Science Connections

What happened in this activity? What forces acted on the cup as it fell through the air? Here are some simple explanations of the science involved in Drip Drop.

As the cup is released, the **potential energy** (energy stored in an object) is converted into **kinetic energy** (energy in motion). **Gravity** causes the cup to **accelerate** (speed up) as it falls through the air and at the same time **drag** (force exerted by the air) causes the cup to slow down. When the cup hits the floor, the kinetic energy changes back into potential energy.



“I learn best doing hands-on.”





## Want More Activities?

If you liked this activity, we suggest these projects that you can work on at home:

- **Zoom into Engineering** has lots of interesting activities with water to try at home. In its Water: Go with the Flow unit, you can make a soap-powered car with simple household materials. For more ideas check out [www.pbskids.org/zoom/activities/sci](http://www.pbskids.org/zoom/activities/sci).
- **Snap Circuits** makes learning electronics fun and easy. This kit includes everything you need to make AM radios, burglar alarms, and doorbells including speakers, snap wires, LEDs, lamp sockets, and motors. Snap Circuit kits are available from [www.elenco.com](http://www.elenco.com).
- **Design a model green house.** All you need is a shoebox, recycled materials, and the desire to learn how you can make homes more environmentally friendly. Along the way you'll learn about energy conservation and material reuse.

“I had such fun designing and constructing the dollhouse! In the process I learned about green construction and how to solder.”



- **Reverse engineering** (also known as taking stuff apart) is a hit with kids. You can get hairdryers or household appliances at garage sales or thrift stores. Invite your child to spend an afternoon with you taking apart the appliance. Visit [www.howstuffworks.com](http://www.howstuffworks.com) to learn how the appliance works.
- **Make a marble roller coaster.** Use supplies found around your house like cardboard, toilet paper rolls, paper, duct tape, and anything else that can help create a roller coaster ride for a marble.
- **Design and animate with Scratch.** Developed by the MIT Media Lab, Scratch is an easy-to-use programming language that allows kids to create their own stories, animations, music, and art. Scratch software is available for free online at [www.scratch.mit.edu](http://www.scratch.mit.edu).
- **Challenge your child to build** toys, games, art, and other fun stuff. Visit Design Squad at [www.pbskids.org/designsquad/parentseducators/activities.html](http://www.pbskids.org/designsquad/parentseducators/activities.html) to download projects like a hidden alarm or a confetti launcher.

Visit our website at [www.techbridgegirls.org](http://www.techbridgegirls.org) for details on these projects and more ideas.

# “When I grow up...”

## Exploring Careers in Science, Technology, and Engineering

Who is working on a fuel cell powered car? Who is designing a laptop that kids in villages around the world can use? As a mechanical engineer or a computer scientist your child could work on these innovative projects.

Scientists and engineers dream up creative solutions for problems in people’s lives and communities. They ask questions to better understand the world and search for answers to make the world a better place. As a scientist, your child could develop products and systems that save lives, reduce poverty, and prevent diseases. As an engineer, your child could develop ideas like solar powered health clinics in developing countries that provide care for people who cannot walk to a hospital.

“The role models made me see where science can take you—other than a job and white lab coat. A job can be creative, fun, and full of teamwork.”





Not every student will become a scientist or engineer, but children should be exposed to these opportunities as well as understand what they need to do in these fields to follow their dreams.

If they have the chance to work on a hands-on project or visit a science center they will be better prepared to make informed choices.

They just might want to follow up and take advanced math and science classes and explore new interests in summer programs, which could help set them on the path to a rewarding career in science, technology, or engineering.

Parents, you are the most important and influential persons in shaping your child's future. As a parent, you can spark, sustain, and renew your child's sense of discovery in science and engineering. Here are some ideas to help your child explore the possibilities for the future.

“I met a lot of people and all of them inspired me to think about my future. This made me think...that I can do anything if I put my mind to it.”

- **Make summer a time to explore new interests and careers.** Find summer science and engineering programs in your community for your child to participate in. Job shadows and office tours give children a chance to “test the waters” and discover new careers.
- **Role models matter!** Find someone whom your child can talk with to learn more about colleges and careers. Speak with a teacher or school counselor if you need help finding one. Check out the Sally Ride Science series of cool careers in science and engineering at [www.sallyridescience.com](http://www.sallyridescience.com).
- **Find out about science enrichment programs and events in your community.** Look for those that incorporate career exploration and be sure to follow up with conversations with your child. Check out after-school programs or weekend events.





- **During vacations, include visits to college campuses** in your travel plans. College tours can help your child begin to think about the future. Many Bay Area colleges have community outreach days offering tours and workshops for families.
- **Introduce your child to stimulating environments.** Visiting beaches, wetlands, parks, and airports; designing a garden; or planning a household repair offer opportunities for discussing science careers.
- **Broaden your selection of family outings.** The San Francisco Bay Area is filled with science museums. Include discussions about careers on these outings.

For more information on careers in science, engineering, and technology visit **TryScience** at [www.tryscience.org/parents/se\\_6.html](http://www.tryscience.org/parents/se_6.html).

## Did You Know?

- The demand for scientists and engineers is expected to grow by 44% in 10 years. (U.S. Bureau of Statistics)
- As a group, engineers earn some of the highest salaries. For example, the starting salary for those holding a bachelor's degree in chemical engineering is \$66,000. (National Association of Colleges and Employers, 2009)
- Information technology jobs will be among the fastest growing and highest paying over the next decade. (U.S. Department of Labor)
- A study showed that 43% of kids said that role models would increase their interest in learning about science, technology, and engineering. (2010 Lemelson-MIT Invention Index)





# Discover the Science Near You!

The San Francisco Bay Area abounds with science museums. With their hands-on activities and expert staff, science and technology centers are a great resource for family fun.

“With their hands-on activities and expert staff, science and technology centers are a great resource for family fun.”

Science centers make discovery fun and can lead to a lifelong interest. An afternoon at a science center may set your child on the path to becoming a rocket scientist or electrical engineer. Interactive science exhibits provide environments where children can explore and discover.

A visit to a science museum can also make for quality time for a family. Without the distraction of computers and TV, you can focus on one another and create shared experiences and memories.

Looking for a gift idea that you can use all year long? Buy a family membership to your favorite museum. In just a few visits, the membership will pay for itself.



## Tips for Visits to Science Museums

Have you ever visited a museum and felt that everyone was running in different directions? Here are some tips to make your family's visit fun and meaningful from start to finish.

- **Try a scavenger hunt.** To aid in your visit, we have developed scavenger hunts for the museums listed in this guide to provide a fun, interactive way for your family to experience the exhibits. Visit our website to print up a scavenger hunt for your next visit.
  - **Plan ahead.** Let each family member take the lead in planning the visit to his favorite museum. In advance, find activities that are likely to interest your kids and make them want to visit—interactive exhibits, take-home projects, or movies in the large-domed theater.
  - **Find unique opportunities.** When you arrive, find out if there are special events or shows by visiting the museum's information desk.
  - **Spend time investigating.** Encourage your child to spend time at the exhibits and read the information provided on the signs of his favorite exhibits. Ask open-ended questions like "Why do you think this is happening?" or "What would happen if...?" to help slow him down and encourage an exchange.
  - **Talk it over.** Relate what you're seeing with your child's interests or experiences in his life.
- **Set an example and ask questions.** Ask your child, "What could we do to find out?" Asking questions and seeking answers is a powerful way to model how new discoveries are made. By looking online or enlisting help from a relative, teacher, or museum staff, try and find the answer as a family.
  - **Make the connection.** Is your child studying earth science, physical science, or life science in school? Let your child be the expert and explain to you the most fascinating concept he learned in class and how it relates to the exhibit.
  - **Follow up on interests.** After a fun day at a museum, explore some of the topics that your child enjoyed the most.
  - **Look for books** about a topic that caught your child's interest and have science experiments to do at home.
  - **Get out the popcorn and watch a movie or TV show** related to science. Be sure to check out QUEST, a KQED series that explores Northern California science, environment, and nature. The PBS series, DragonFly, offers fun experiments and games to play. Learn more at [www.pbskids.org/dragonflytv](http://www.pbskids.org/dragonflytv).





“I love being curious and finding out how things work.”

## Chabot Space & Science Center

Stay Close and Go Far! Spark your child's imagination by experiencing what it feels like to be an astronaut in outer space with a visit to Chabot Space & Science Center. From hands-on interactive exhibitions to immersive digital full-dome planetarium and large screen theater shows, this center is full of experiences that families will remember long past the weekend. Don't miss your opportunity to see the night skies up close with the center's giant historic telescopes, open to the public for free viewings on Friday and Saturday evenings (weather permitting).

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[www.chabotspace.org](http://www.chabotspace.org)  
510.336.7373

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## California Academy of Sciences

Count the number of teeth on the albino alligator, soar through the galaxy, take a walk on the living roof deck and identify the native plants and flowers, explore the 4-story rainforest enclosed in a glass dome, or take a stroll beneath the surface of the flooded Amazon basin. Home to an aquarium, planetarium and natural history museum, the California Academy of Sciences offers endless opportunities to explore with your child. Make sure to stop by the *Naturalist Center* before leaving to find resources to continue learning at home.

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[www.calacademy.org](http://www.calacademy.org)  
415.379.8000

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## The Exploratorium

The Exploratorium is an experimental, hands-on museum designed to spark curiosity—regardless of age or familiarity with science. It attracts the old, the young, the artist, the scientist, the family, and everyone in-between. It's like a mad scientist's penny arcade, a scientific funhouse, an art studio, and an experimental laboratory all rolled into one. You can touch, play, and tinker with hundreds of exhibits. Listen with a deer's ears, view glowing roundworms that have phosphorescence genes, harvest your own cheek cells, and take a sensory journey in total darkness in the *Tactile Dome*.

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[www.exploratorium.edu](http://www.exploratorium.edu)  
415.561.0360

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## The Tech Museum

Many kids express interest in careers that make the world a better place but may not realize how technology is compatible with such an interest. Help your child see the connection by visiting *The Tech Awards Gallery: Technology Benefiting Humanity* exhibition and be inspired by the incredible people who are committed to using science and technology to benefit humanity all over the globe. Learn how you and your child can take action in your community to make a difference. The Tech Museum offers visitors of all ages the Silicon Valley experience with hands-on, interactive experiences in genetics, earth sciences, alternative energy, virtual design, microchips and lots more.

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[www.thetech.org](http://www.thetech.org)  
408.294.8324

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## Lawrence Hall of Science

At Lawrence Hall of Science you can do science activities, explore exhibits, ask questions and learn new things while having fun! UC Berkeley staff and students will help engage you in unique experiences that show how wondrous the world of science can be. View the Earth from space without leaving the ground at *Science On a Sphere* and explore space in the planetarium. Get an eye opening panoramic view of the Bay Area from the outdoor exhibit, *Forces that Shape the Bay*, hold and touch friendly animals in the Animal Discovery Room, and design, build and test your own creations at *Ingenuity in Action*.

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[www.lawrencehallofscience.org](http://www.lawrencehallofscience.org)  
510.642.5132

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## Girls Can!

Today's challenges in the environment are calling for creative solutions and diverse perspectives. Unfortunately, women are underrepresented in engineering and technology fields.

It's not that girls can't do science or don't like math, but starting in middle school some may lack the confidence and interest to study these fields or consider a career in them. While we aren't intentionally trying to limit girls' options, we may be by the experiences we provide them.

“These are the experiences that build interest and give our girls the confidence to pursue careers in engineering in the future.”



As a parent, you can make a difference in a girl's future. Here are some ideas that may help spark a girl's interest in science and engineering.

- **Make sure girls get enough time tinkering.** Some girls may not have the same opportunities as boys to play with games and toys that develop spatial skills. Research shows that young women arrive at college with less hands-on experience than males, which may make advanced math and science classes more challenging.
- Some girls respond better to collaborative projects rather than to competitive games. Be alert to boys dominating in group situations. You know your daughter best to **help create a learning environment that suits her needs and interests.**
- Studies have shown that parents are more likely to explain to boys than to girls during informal science activities. **Make it a point to explain your next gardening project or car repair to your daughter.**
- Research has demonstrated that parental beliefs and attitudes influence children's development and interests. **Ask your daughter about her daily science and math lessons** to show your interest in her science learning and your confidence in her math ability.

- Girls often express interest in how technology will be used and how it can make the world a better place. Remember to **relate technology products to how people use them.**
- Girl Scouts, YWCA and Girls Inc. have experience and resources to support girls. **Check out the science programs they offer in your community.**
- **SciGirls** is a PBS TV series that features real girls ages 11-14 as scientists and engineers. You can find out more at [www.pbskids.org/scigirls](http://www.pbskids.org/scigirls).
- **Explore careers with your daughter** at [www.engineergirl.org](http://www.engineergirl.org) or [www.engineeryourlife.org](http://www.engineeryourlife.org).

For more ideas to support girls' interest in science, visit our website at [www.techbridgegirls.org](http://www.techbridgegirls.org).

## Did You Know?

- Only 11% of engineers are women.
- 19% of AP computer science test-takers in 2009 were female.
- 28% of computer scientists in 2008 were female.
- 25% of professional astronomers are female.



# Meet the Gutierrez Family

Meet Carmen and Luis Gutierrez, parents of 18 year old Luis Jr. and 15 year old Milagros. This family immigrated to the United States from Michoacán, Mexico in search of a better life and future for their children.

Carmen and Luis Gutierrez are proof that parents can succeed in helping their children find a passion for science and succeed in school even without college experience. Neither parent made it beyond high school. While helping their children with homework can be difficult at times, they know that what is most important is being a source of encouragement and motivation.

Carmen recalls that as her children grew, she did not let anything get in her way of being involved in their education. This has helped to ensure that Milagros and Luis Jr. succeed at science and stay on the path to college. Carmen recounts their many days at the library, science museums, and zoo. “It’s a fun learning process for parents too,” says Carmen as she described how much she learned from the hands-on experiences at science museums.

Both Milagros and Luis Jr. have taken advantage of science after-school and summer programs offered in their communities. Milagros has participated in Techbridge, a program of Chabot Space and Science Center, and Eureka, a program of Girls Inc. Luis Jr.

participated in a summer research program at Stanford University and volunteered at a local hospital. These opportunities have helped Milagros and Luis Jr. succeed in math and science and introduced them to a wide range of careers.

All parents can find a way to help their children succeed. Carmen’s advice to parents is to:

- **Ask.** There are people eager to assist—at school, at your church, or in your community—who can answer your questions or direct you to the right place for resources.
- **Listen.** Open communication is what has kept the Gutierrez family strong. Be open with your children and listen to what they want to explore to follow their career dreams.
- **Encourage.** Challenges will come and go but as a parent it’s important that you motivate your children to persevere and work through whatever comes their way. Support them in all they do and help them find resources to succeed.

# Go Experience and Explore!

We hope you have been inspired to explore the science all around—at home, in the community, and at school. Share the excitement of wonder and discovery with your children and you'll be amazed at the difference you can make.

We would like to hear about your experiences using this resource guide and welcome your comments and questions. Please contact us at [www.techbridgegirls.org](http://www.techbridgegirls.org) or call 510.777.9170.



## About Techbridge

Launched by Chabot Space & Science Center in 2000, Techbridge is helping address the shortage of women and underrepresented minority groups in science, technology, and engineering. Techbridge serves girls in California and nationwide each year through programs that offer hands-on projects and career exploration to expand girls' options. Techbridge offers after-school and summer programs to girls in grades 5-12 in the San Francisco Bay Area, and reaches thousands more girls across the U.S. through programs

with Girl Scout councils and other partners. Recognizing the importance of building a strong network of adult support for girls, Techbridge provides trainings to teachers, parents, and role models.

Seeing the exciting results of Techbridge we hope that many more families can benefit from the lessons we learned. While the mission of Techbridge focuses on girls, the ideas and resources in this guide have been used by our partners in their programs for girls and boys.

## About the Gordon and Betty Moore Foundation

Established in September 2000, the Gordon and Betty Moore Foundation seeks to improve the quality of life for future generations. The Foundation operates proactively in three areas of focus—environmental conservation, science, and the San Francisco Bay

Area—where a significant and measurable impact can be achieved. The San Francisco Bay Area Program supports a number of Bay Area science-rich education institutions to increase scientific awareness and critical inquiry.



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