Subaru and AAAS invite you to bring science into your daily life with these five resources that offer kids the opportunity to learn fun science concepts by conducting their very own science experiments. The activities are designed to be comfortable for non-scientist adults to supervise, to utilize materials found around the home, and to be flexible for time, space, and number of participants.

The activities included here are adapted from a collection of informal, hands-on afterschool resources developed by AAAS for the Science NetLinks website. Each one includes a facilitator page, as well as online and printable pages for kids. More activities can be found at scienenetlinks.com/afterschool-resources.

This booklet also contains a short guide to citizen science projects in which kids, families, and community groups can participate. These projects are research collaborations between scientists and volunteers that welcome public participation to help collect and sort scientific data for ongoing scientific research projects.

About AAAS
The American Association for the Advancement of Science (AAAS) is the world’s largest general scientific society and publisher of the journals Science (www.sciencemag.org), Science Signaling (www.sciencesignaling.org), Science Translational Medicine (www.sciencetranslationalmedicine.org), Science Immunology (www.immunology.sciencemag.org), Science Robotics (www.robotics.sciencemag.org), and Science Advances (www.advances.sciencemag.org). AAAS was founded in 1848, and serves 262 affiliated societies and academies of science, reaching 10 million individuals. Science has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of 1 million. The non-profit AAAS (www.aaas.org) is open to all and fulfills its mission to “advance science and serve society” through initiatives in science policy, international programs, science education, and more. For the latest research news, log onto EurekAlert!, www.eurekalert.org, the premier science-news Web site, a service of AAAS.
Balancing Points

Have you ever tried to make a mobile? It can be tricky if you don’t pay attention to balance. The best mobiles have parts that are balanced and move freely.

If the parts aren’t balanced, you can end up with a tangled mess, not a mobile! That’s no fun! Want to learn the secrets of making one that balances just “right”?

Let’s make a balanced mobile!

Here’s all you need:
- objects for your mobile*
- string, thread, or fishing line
- hanger
- rulers or sticks

*Use objects that can hang on a thread. Or cut shapes out of cardboard and decorate them.

Here’s what to do:
1. Tie an object on the hanger. If it balances, your object is at the balancing point.

2. Slide the object to one side. Where do you add an object to make the hanger balance again?

3. How can you make a heavy and a light object balance?

4. Make a tier (level). Slide it off-center. Where do you add objects to balance it?

5. Use what you learned to make a well-balanced mobile!

Follow up
Do tiers make the mobile more stable or less stable?

Here’s more about balance:
To be able to seesaw with a sumo wrestler, you must sit at the end of the seesaw. The wrestler must sit near the center. It’s like putting heavy objects near the center of your mobile. (Try it!)

Which plastic bowl is easier to balance? (Try it!) The mass of the first one is at the same height as the balancing point. The mass of the second bowl is mostly below the balancing point. Tiers on a mobile put more mass below the balancing point.
Cool Idea

If you live in a place where there is snow or ice in the winter, you probably see trucks sprinkling salt on the road. Have you ever wondered "Why salt? Why not sugar or flour, or baking soda?"

Let's see how salt affects ice and water!

Try this experiment first:
1. Take two plastic cups and half-fill them with water.
2. Put a tablespoon of salt in one of them, and mark that cup "salt."
3. Put both cups in the freezer overnight.

What do you see the next day? How did the salt affect the freezing of the water?

Now try this:
1. Take an ice cube and lay a piece of string on top of it.

Use a cube of ice for this experiment. Crushed ice will not work.

Here's all you need
- 2 plastic cups
- water
- salt
- ice cube
- thin string or thread

2. Sprinkle about half a teaspoon of salt on top of the ice cube.
3. Watch what happens after the salt is added. After a few minutes, lift the string.

What happens to the ice cube when you sprinkle the salt on it? What do you notice about the ice cube when you lift the string?

Here's more about freezing:

Zero degrees Celsius (32° F) is the "freezing point" of water. At this temperature, water forms ice. It is also the temperature that is warm enough to melt ice.

When you add certain chemicals, like salt, to water, you lower the freezing point. People add "antifreeze," a chemical, to the water in their cars, to lower the "freezing point." That way, the water won't freeze solid in the winter.
Falling for Gravity

Gravity is the force that pulls on every object on earth. Have you ever wondered if the pull is always the same for every single thing? If you drop a penny and a pen from the same height, they'll hit the ground at the same time, too. But if you drop a pen and a piece of paper, the paper may drift and take a lot longer to fall than the pen does. Can you guess why?

Let's test gravity!

Here's what to do:

1. First make a ramp. You can use a binder notebook, or tilt a small desk or table by putting books under two of the legs. Make sure the ramp is tilted just a little bit, so the marbles will roll slowly -- then you'll be able to watch them better. The smoother the surface, the better it is!

2. Take two marbles, a big one and a small one. Line them up evenly at the top of the ramp.

3. Use a ruler or meter stick as a gate. If you don't have a ruler or meter stick, use anything that is straight, like a pencil or a rolled up piece of paper. Hold the starting gate and lift it quickly so that both marbles start to roll at the same time.

4. Watch the finish line closely to see if one marble comes in first or if it's a tie. Keep a sharp eye out to see if there is a winner!

5. Do the race at least 3 or 4 times to check for accuracy. It doesn't hurt to try it even more times than that!

Does one marble win the race, or is it a tie? Are the results the same for every race?

Here's more about gravity:

Have you ever noticed the force of a magnet? If you put two magnets next to each other, they will either push or pull on one another. The push or pull is the force of magnetism. Gravity is a force, too. It makes all things attract each other. The bigger the object, the stronger the force is.

The gravity of earth has a really strong pull, because earth is such a big planet. That's why things fall to the ground instead of floating around. It might seem strange, but objects that weigh a lot fall at the same speed as objects that weigh just a little.
Fun with Forces

Who says science can't be fun? An amusement park uses the principles of science to make exciting and sometimes terrifying rides.

Rides that move in circles and steep curves make you feel like you're being pushed outward. That's centrifugal force. Do you think that's the same force that keeps you from falling out of a roller coaster when it goes upside down? Find out with this experiment!

Test "the force" with your own mini-bucket!

Try this experiment first:

1. Make your own mini-bucket. With the pen, poke a hole near the rim of the cup. Poke another hole directly across from the first hole, on the other side of the cup.

2. Cut two pieces of string about 2 feet (60 cm) long each. Attach each string to a side of the cup by looping it through the hole and tying a knot.

3. Take the ends of the strings, and whip the bucket around in a circle over your head. Be sure to stand far away from your friends and other objects. You may have to sway the bucket back and forth before you can make a full circle.

Here's all you need

- string
- a paper cup (7-ounce or 8-ounce works best)
- a ballpoint pen or pencil
- a penny
- water

When you whipped the cup over your head, did the penny fall out? How is this like a roller coaster that goes upside down?

Now try this:

Do the same experiment again, outside, with water instead of a penny.

Here's more about forces:

Sir Isaac Newton, a scientist who lived 300 years ago, said "a body in motion will move in a straight line unless acted upon by an outside force." When a roller coaster launches into a loop, you might wonder why you don't fall out. What you should wonder is why you don't go shooting into the sky!

What is the "outside force" that stops you?
Geyser Riser

A geyser is a spring that ejects a column of hot water and steam into the air. Here's how it works:

Below ground hot rock boils water into steam. The steam builds up, but not much seeps out. (Note the tiny opening at the top.)

Here's all you need:
- water
- liquid soap
- small bottle with a narrow neck
- Alka-Seltzer™ tablets (broken into pieces)
- large tub or sink
- sponge for clean-up

Then...POW! The geyser "blows its lid."

Let's Make a Geyser!

Here's what to do:

Note: The gas in a geyser is super-hot steam that could burn you. Instead of heat, the Geyser Riser uses a chemical reaction to make safer gas.

1. Fill a bottle almost to the top with very warm tap water. Add a few drops of liquid soap.
2. Set the bottle in a large tub or sink to catch any spills.
3. Drop a broken-up Alka-Seltzer™ tablet into the bottle. Immediately put your palm firmly over the top. If you are doing this in a group, you may want to repeat the experiment so that each person has a chance to do this part of the experiment.

Do you feel the pressure? Does it increase or decrease? What do you hear?

4. Lift your hand and listen again. Do you hear a "pop" sound as the gas rushes out? What makes the soap jet out like that?
5. If you repeat the experiment, try adding more soap and another Alka-Seltzer™ tablet. Is the pressure different? What about the "pop"? Does the soap jet out the same way?

Here's more about geysers:

Gas expands, especially when it's hot. Squeeze a balloon that's half full. It pushes back! It is really the air inside pushing out against the balloon walls. Squeeze a full balloon. It really pushes back! Like a balloon, geysers fill with gas, but the walls don't stretch. So the pressure (pushing) inside gets harder and harder until, whoosh! The gas shoots out a hole, taking underground water with it. Some geysers shoot water up to 400 feet in the air! And some erupt all the time. Old Faithful, a famous geyser in Yellowstone Park, erupts on an average of every 75 minutes!
Citizen Science

Citizen science projects are research collaborations between scientists and volunteers that welcome public participation to help collect and sort scientific data for ongoing scientific research projects. To get started, first check out SciStarter at scistarter.com, where you can get a basic overview about citizen science and find, join, and contribute to science through more than 1,600 formal and informal research projects and events.

Here are just a few of the citizen science projects you might find there that are looking for volunteers:

**NASA GLOBE** [www.globe.gov](http://www.globe.gov)

The Global Learning and Observations to Benefit the Environment (GLOBE) Program is an international science and education program that provides students and the public with the opportunity to participate in data collection and make a meaningful and contribution to the understanding of the Earth system and global environment. GLOBE connects students, teachers, scientists, and citizens from different parts of the world to conduct real, hands-on science about their local environment and put in a global perspective.

**The Great Backyard Bird Count** [scistarter.com/project/42-The-Great-Backyard-Bird-Count](http://scistarter.com/project/42-The-Great-Backyard-Bird-Count)

Launched in 1998 by the Cornell Lab of Ornithology and National Audubon Society, the Great Backyard Bird Count was the first online citizen-science project to collect data on wild birds and to display results in near real-time. Usually held in February each year, this is an annual four-day event during which bird watchers count birds to create a real-time snapshot of where birds are located around the world.

**AirVisual: The Air Pollution Monitoring Project** [airvisual.com](http://airvisual.com)

AirVisual provides the tools and information people need to thrive in polluted environments. By employing big data, artificial intelligence and Internet of Things technologies, AirVisual delivers user-friendly, simple solutions to optimize health and well-being, both indoors and out. Participants in AirVisual can monitor air quality to discover sources of air pollution.

**Project Budburst** [budburst.org/gomobile](http://budburst.org/gomobile)

Project BudBurst monitors plants as the seasons change. These observations are used by scientists to help better understand how plants are responding to changing climates. You can view photos of local or regional plants, with accompanying information about each plant, or search for invasive, poisonous, or endangered plants. The primary function, however, is to let people report the developmental stages of plants in their community. The data are used to develop plant distribution maps, calendars of when plants are blooming, announcements of where to view fall colors, etc.

*Learn more about citizen science by checking out the Ten Principles of Citizen Science from the European Citizen Science Association at [http://bit.ly/2s300pb](http://bit.ly/2s300pb).*