

SAMPLE

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What Parents Can Do at Home to Help Students With Science



Apply Scientific Thinking to Everyday Events

You can encourage scientific thinking by helping your child develop skills like these:

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- **Observing.** Encourage your child to notice the small details in the world around us. Ask questions like, “What shapes do you see in that spider web?” “Does this rock feel different from that one? How?”
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- **Classifying.** Help your child put things into groups based on common characteristics. When you’re doing laundry, you might say, “Let’s sort all the socks by color.” When cleaning up, ask, “Why don’t we put away all the toys with wheels first?” Encourage your child’s natural tendency to collect, sort and classify rocks, leaves, shells, insects or other items from nature.
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- **Predicting.** Scientists make predictions about things that *might* happen based on what they know about how things *have* happened. You and your child can do the same thing: “If we leave this ice cube on the counter, what do you think will happen to it? How long will it last as an ice cube? Is there somewhere else we could put it to make it last longer?”
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- **Quantifying.** Science involves counting, measuring and other math skills. Encourage your child to make the connection between science and math by asking questions like these: “How many seeds can we plant in each row?” “Which container will hold the most water?”

Teach Your Child to Be a Good Observer

Most science starts with careful observation. Your child may want to observe:

- **How long it takes** for a dandelion or a rose to come into full bloom.
- **The moon** every night for a month. Keep track of when it rises. Keep a picture chart of how the appearance of the moon changes during the month.
- **How the spin cycle** in the washing machine gets the water out of the clothes.
- **A kitten growing into a cat.** Keep a record of the changes. Or if there is a new baby in the family, watch for changes during the first year of life.
- **How fast people grow.** Ask a group of friends to record their height every day for three or six months. Is it true that kids “shoot up overnight”?



When you walk with your child, make sure you stop to notice the world around you. Talk about what you see. Ask questions: “Why do you think the ants built their house there? Why are those geese flying in a V shape?” See if you can come up with answers together, then look them up when you get home.

Science Should Lead to Explanations

Science is not simply about watching. Science is about learning through careful observation and experimentation. Science is about trying to explain what causes things to happen—and what doesn't.

Try the experiments in this booklet to spark curiosity in your child. Then encourage your child to do further research and experiments.

Do Science-in-the-Sink

While you're in the kitchen, your child can learn many important things about science. Together, you can:

- **Collect a variety of objects:** a sponge, a spoon, a plastic container, a can of soup. Have your child make predictions. Which will sink? Which will float? Fill the sink with water and test and see.
- **Put several inches of water in the sink.** Give your child a glass that's a little shorter than the depth of the water in the sink. What will happen when your child plunges the glass upside-down straight to the bottom of the sink? Try it and find out. Water will try to rush in, but it can't. What keeps it out? (*Air.*)
- **Fill a container with two cups of water.** Put it on a sunny windowsill or a radiator. Measure it daily for the next few weeks until the water is gone. Where did it go? (*It evaporated.*)

Think Like a Scientist

Scientists ask questions and look for pathways to answers. They get their information in four ways:

1. Find out what's already known.
2. Make observations.
3. Conduct experiments.
4. Make calculations.

Try These ‘Egg-Speriments’

An ordinary egg can be the basis for many interesting science experiments. Here are just a few:



- **Fill a jar with water.**

Gently drop an egg in the water. It sinks. Now slowly add salt to the water. The egg floats! Salt increases the density of water, making it easier for objects to float.

- **Hand your child an uncooked egg.** Ask if it's possible to crack the egg using just one hand and applying equal pressure from all sides.

It isn't! Although we think of eggs as very fragile, their special shape makes them able to withstand pressure. (Remember, hens have to *sit* on them.) But if your egg has even a tiny crack, this experiment won't work, so hold it up to a light first to check it.

- **Put an uncooked egg**, still in its shell, into a clear glass jar with a mouth wider than the egg. Fill the jar with white vinegar. Cover it and let it sit for about two weeks. Have your child watch to see what happens—little bubbles will form on the shell. This is a sign that the acid in the vinegar is slowly dissolving the egg's alkaline shell.

After about two weeks, the egg will be bigger. Now let your child empty the jar in the sink, rinse it and hold the egg gently. It's rubbery—it may even bounce, if your child is gentle enough. What has happened to the egg? Research it together.

Do Oil and Water Mix?

Here's an activity that can occupy your child for a long time. You'll need a clear plastic container with a screw-on lid. Mix a few drops of food coloring with some water, then add an equal amount of cooking oil. Let your child shake up the container, then watch as the oil and water separate. Oil molecules stick to each other, and water molecules stick to each other—so the two kinds of molecules don't mix.

Let Your Child See How Things Work

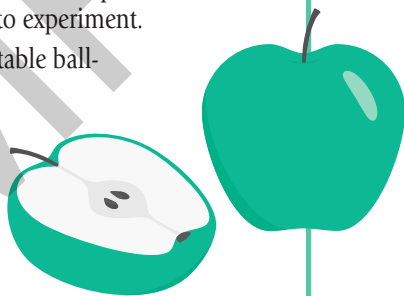
Your home is full of everyday items that can spark scientific curiosity and encourage your child to experiment.

Let your child take apart a retractable ballpoint pen to find out how it works.

When you slice an apple, ask your child to estimate how many seeds it has inside and then count to check. Together, keep a record: Do all apples have the same number of seeds?

When you make repairs around the house, include your child as an observer or, better yet, a helper.

Of course, there are some rules to seeing how things work. First, your child must ask permission. Second, it's vital to be careful—some parts can be sharp. Finally, this kind of exploration can be messy, so it's best to wear old clothes.



Give Your Child a ‘Third Eye’

A magnifying glass will give your child a chance to look at the world in a whole new way. Get an inexpensive magnifying glass with a handle. Now let your child look through it at sugar, hair, rocks and anything else that might look interesting up close (supervise for fire safety).

Take a ‘Micro-Hike’

Sometimes, children seem to pass through the world without really seeing it. You can open your child’s eyes by taking a “micro-hike” together. All you need is a three- to five-foot string, a magnifying glass and some open ground.

Ask your child to lay out a “trail” for the hike with the string. Now hand over the magnifying glass. Say, “I want you to use your imagination to shrink yourself down to the size of an ant. Don’t allow your eyes to get more than one foot above the ground.”

Then let your child observe the natural wonders available in even a tiny spot of earth. Ask questions to stimulate imagination: “What kind of habitat are you traveling through right now? What plants and animals do you see? Is that spider going to eat you?” Later, you may want to challenge your child to write a story or a letter about your micro-hike.

Microscopic worlds are all around us—and a micro-hike is an exciting way to explore them.



Experiment With a Magnet

Magnets are something of a mystery to children and can occupy them for days. First, show your child that many metal objects are attracted to magnets. Try a doorknob, some paper clips, some nails or the silverware. Which ones does the magnet attract?

Now let your child try these experiments that *seem* mysterious but have scientific explanations:

Magnets and Water

Although glass, water and paper aren't attracted to a magnet, the magnetic force will pass *through* them. Have your child drop a paper clip into a glass and move a magnet around on the glass—even if the glass is filled with water, the clip will still follow the magnet. Then tell your child to put a paper clip on a piece of paper and move the magnet underneath the paper. The clip will move. Can your child draw a maze on the paper and use the magnet to guide the clip through the maze?

Play With Poles

Like the Earth, a magnet has a north and a south pole. Let your child hold a magnet near a compass. The needle will move toward the magnet's south pole. Give your child a second magnet. If the magnets are held close together, one magnet's south pole will attract the other's north pole. If two north or two south poles are pointed toward each other, the magnets repel. Challenge your child to make one magnet "chase" the other across the table or floor!

Be a Weather Watcher

Helping your child become aware of the changes in the weather is an enjoyable way to introduce some of the basics of science. Here are some weather activities you can do together:

- **Keep a temperature graph.** Have your child record the temperature each day for a month. Your child can also note whether the day was sunny, cloudy or rainy. Which was the hottest day? How many rainy days were there?
- **Measure the rain.** You'll need a glass or plastic jar with a wide mouth, straight sides and a flat bottom (like a peanut butter jar), a ruler and a permanent marker. On the outside of the jar, have your child use the ruler to create a "measuring stick" by marking off each quarter inch. Together, keep track of the amount of rainfall.
- **Make a wind gauge** out of a square of cardboard. Label each corner: N (north), S (south), E (east) and W (west). Cut a hole in the center of the cardboard and push it onto a wooden dowel rod.

Then cut out a cardboard arrow and tape on a vertical tail (to catch the wind). Fasten the arrow loosely to the dowel with a thumbtack so it can swivel. Now stick your wind gauge into the ground with the N facing north. (You can use a compass for that.) When the wind blows, have your child keep track of its direction. Remember, part of the fun and educational value is adjusting the weather vane to make it work.

Go on a 'Scavenger Hunt in the Sky'

Take a walk with your child on a clear night. Look for all the things you can see in the sky: the North Star, constellations, visible planets, space stations. With your child, make a record of the things you see and try to come up with your own list of things to find in the night sky.

Plant a Garden

Children of all ages love to watch things grow. Encourage your child to start a small garden in the yard or in a box. An older child may want to learn about organic gardening or experiment with growing various herbs for use in cooking.

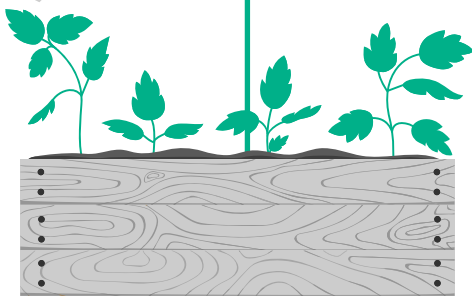
Look in your kitchen for a few things you know will grow. Soak dried beans overnight and plant them. Cut the top off a carrot and set it in the dirt. Ask, "What else do you think might grow?" If your child wants to plant something that you don't think will grow, say, "Let's see what happens." Children learn more by trying out their ideas than by having someone tell them what will happen.

Help your child keep track of what you've planted and water the garden frequently. While you're waiting for plants to sprout, visit the library to look for books about things that grow. (Don't forget about *Jack and the Beanstalk!*)

If your child can't plant a garden outdoors, make a box garden together. You'll need:

- A box with sides that are about four inches high.
- A plastic shopping bag.
- A stapler or tape.
- Dirt or potting soil.
- A teaspoon or spray bottle for watering.

Cut down one side and across the bottom of the plastic bag. Then open the bag up and spread it along the inside of the box. This will keep the water from leaking through the box. Staple or tape the plastic to the edge of the box. Fill the box with moist dirt and plant!



Learn With a Science Fair Project

Working on a school science fair project is a great way to learn about science. Here's a step-by-step method that can help your child plan and carry out a science project.

Step 1: Do some initial observing. All science starts with observation followed by questions. Why did that happen? What caused that? How does that work? Suggest writing down something your child has wondered about. Encourage your student to write as many questions as possible. Then narrow the choices to something of special interest.

Step 2: Gather information. Now your child needs to research the topic by reading library books and going online. It's important to keep track of sources—your child will need the information later.

Step 3: Develop a hypothesis. A hypothesis is a statement of how or why your child thinks something works. "I believe that plants exposed to rock music will grow less than plants exposed to classical music."

Step 4: Make sure you have the materials and equipment. This is a step that often frustrates science fair participants—and their parents. Don't put this off until the last minute. Make a list of the things needed for the experiment and set a time to get them.



Step 5: Test the hypothesis. Have your child use these guidelines for experiments:

- **Use** a *variable* to test the hypothesis. For example, expose two plants to rock music, two to classical music and two to country music. Note that it's smart to have more than one plant in each group in case one dies for a reason unrelated to the experiment.
- **Change** only one thing in each experiment. To test how plants react to music, change only the music. The soil, type of plant, pots, watering times, location and anything else should be the same for each plant.
- **Be sure** to have a *control* for comparison. In this example, your child should also grow two plants that are exposed to no music at all.

Step 6: Record the data. The data may be the amount of chemicals used, how long something took to grow, changes in size and so on. In addition to recording data, your child may make other notations about observations and any problems that arise. It's important to keep careful notes about everything that happens. Observations are important when drawing conclusions.

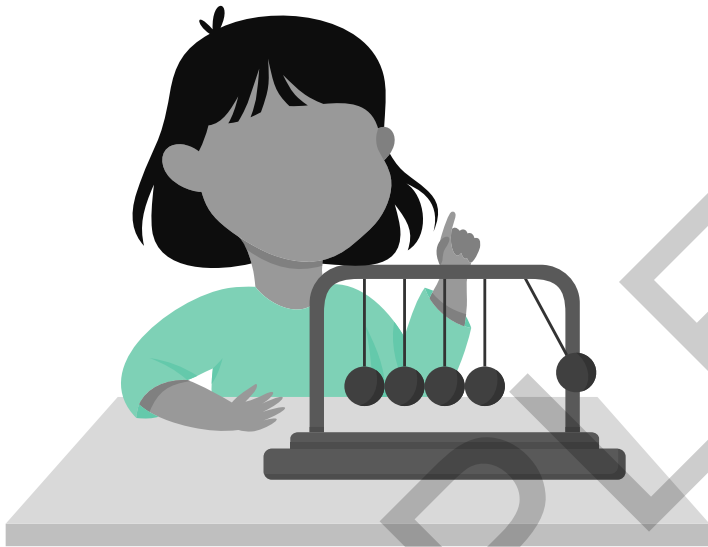
Step 7: Summarize results and draw conclusions. Your child may create tables or graphs to show the data and make a written statement of what occurred during the experiments. Finally, it's time to answer the original question. Was the hypothesis correct?

And what if the science project doesn't work? Your child will have learned something anyway. Thomas Edison tried hundreds of different materials for his light bulb. Each time one didn't work, he didn't give up. He just figured he was one step closer to finding a material that *would* work. That's an attitude that scientists need!

Support Efforts With Higher-Level Assignments

Your child might be taking advanced biology, chemistry, physics or earth science. Perhaps you never took those courses, or perhaps you've forgotten most of what you did learn. There are still things you can do to support your student's effort. Here are some suggestions:

- **Be sure your child keeps up.** Students who mastered challenging science courses usually say it's because they did their studying *every day*. "Once you get behind, it's just too hard to catch up," says a high school senior. "Believe me—it's easier just to keep up." Make it clear you expect your child to study every day.
- **Encourage your child** to keep everything organized in a lab notebook. Many teachers grade their students' lab notebooks. Even if your child's teacher doesn't, it's helpful to get into the habit of keeping all lab assignments together. Learning comes not just from textbooks, but from lab work as well. It's important to be able to study and use lab information easily.
- **Make connections.** Talk about tying new information to prior knowledge. Your child already knows that hands get warmer when they're rubbed together. That can lead to an understanding of how friction produces heat. Science knowledge builds on earlier work.
- **Do the math.** Science courses at the middle and high school levels often include a heavy dose of math. While studying, your child should rewrite symbols, equations and notations until they are familiar. That way, your student won't get to the test and wonder, "Does the exponent go here or there?"



Children have a lively curiosity about the world around them. As a parent, you can help ignite the sparks of interest to keep that sense of wonder alive. Most importantly, you can help your child learn – and that’s what science is all about!