Learn-Along-Guide

Community Science

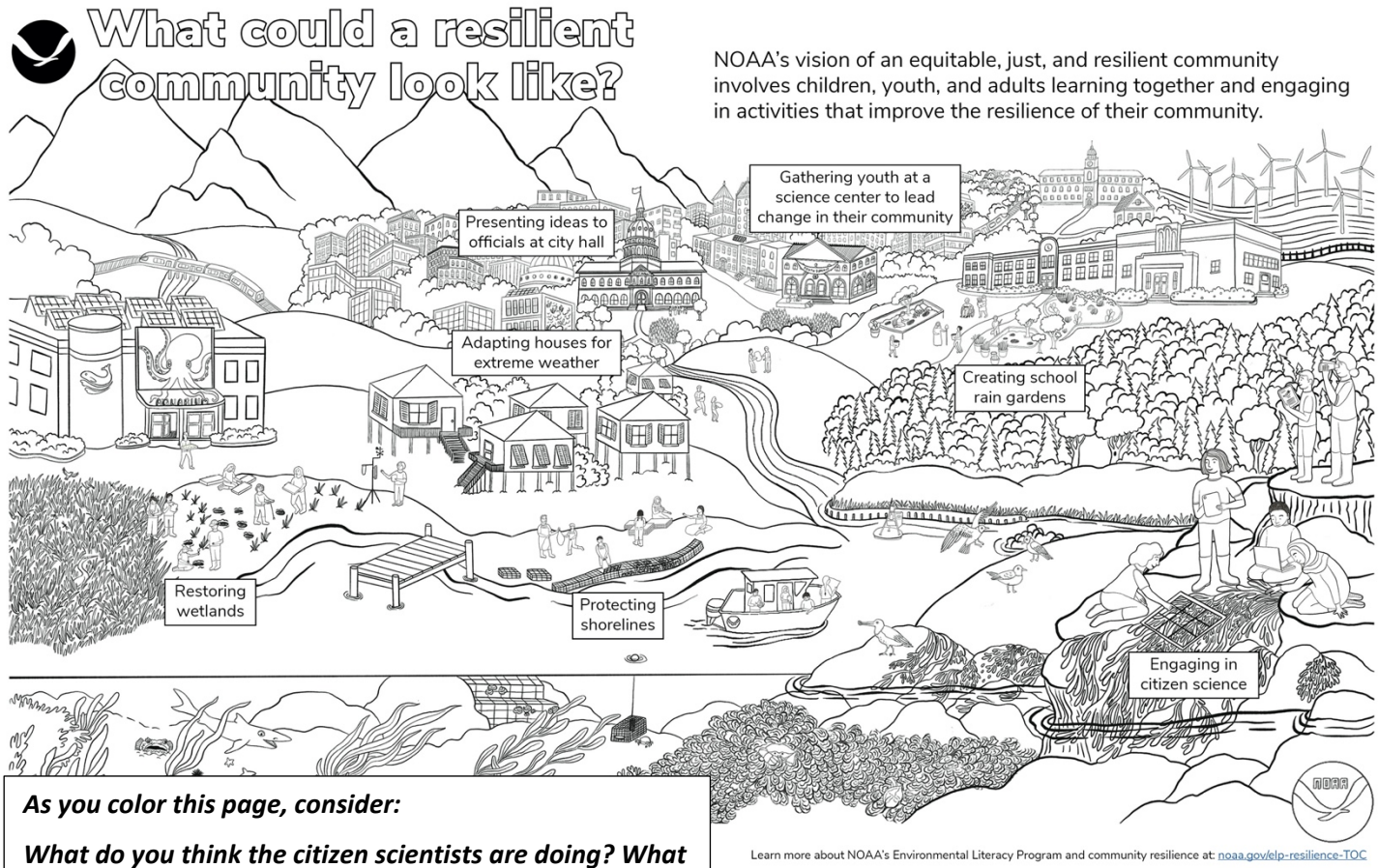
The Children's Hour radio show podcast

https://www.childrenshour.org/community-science/

The Children's Hour
kids public radio

We hope you enjoyed listening to our interview with Zoe Wadkins-Daniels and Annie Montes from Bosque Ecosystem Monitoring Program (BEMP).

This print-ready guide may help you learn more about Community Science and the scientific process. Also, there are links to where you can learn even more online. Connections to core learning standards are shown on page 13.



As you color this page, consider:

What do you think the citizen scientists are doing? What could be the question they are trying to answer?

Which of these activities are going on in your community? Which ones would you like to see happen?

What do you know?

Get set to listen.

Read the statements below. In the "Before Listening" column, write "TRUE" if you think the statement is true. Write "FALSE" if you think the statement is not true. Then listen to the ***Community Science*** episode of The Children's Hour. Based on what the expert says, check if each point is true or false in the "After Listening" column. If the statement is false, explain why it is false.

Before Listening	TRUE or FALSE?	After Listening
	1. **Bosque** is a forest that grows along a river.	
	2. Data that can be collected by students include **precipitation**, **groundwater**, **litter fall**, and **arthropods**.	
	3. Precipitation is rainfall, snow, and sleet.	
	4. Litter fall is the amount of human-made trash found in nature.	
	5. Arthropods are bees, snails, and earthworms.	
	6. The number of plant species and the density of plants along the Rio Grande is pretty much the same in all the sites being monitored.	
	7. Data collected by BEMP is shared with projects on water policy, climate change analysis, and the health of the native cottonwood trees.	
	8. Anyone can collect **data** like a scientist.	

What did you learn?

After listening to the radio show, answer these questions:

1. What is one new fact you learned about community science?
2. What is one new question you have about the process?
3. What is an important thing about community science (or specifically BEMP) that you think everyone should know?

Find many activities for the Bosque ecosystem, including a guide on how to *Build Your Own Monitoring Site*: https://bemp.org/education-outreach/education-resources/monthly-monitoring/

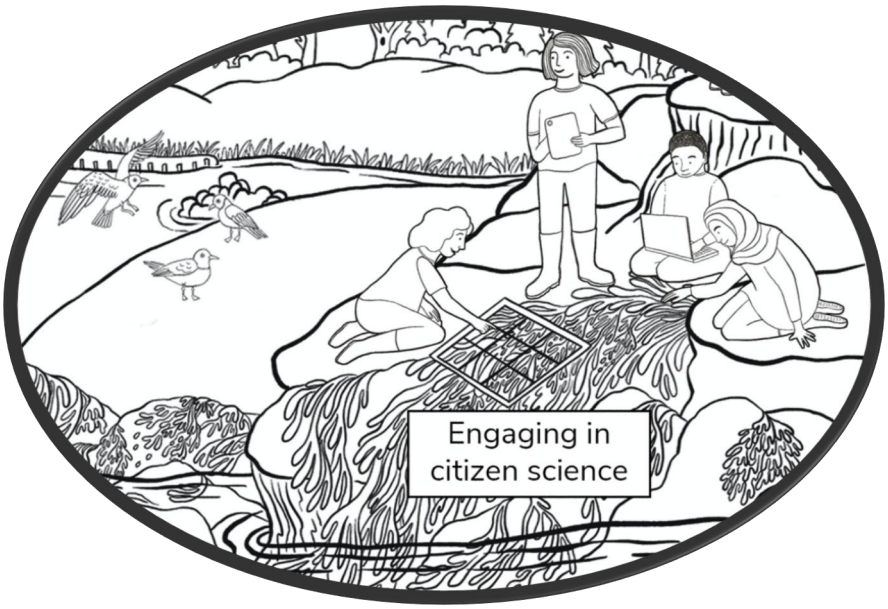
What is community science?

Community Science happens when a community uses science and technology to answer questions specific to that community. The goal of Community Science is to find solutions that will benefit the community and/or it's ecosystem. Those solutions could be recommendations, action plans, or policies that will be used by an organization or a government (local, state, tribal, or national level).

In this situation, a **community** is a group of people who are connected or organized. They share a common geography, jurisdiction, set of characteristics, or interests and goals.

In Community Science, **science** is defined very broadly to include all disciplines of basic and applied science, engineering, technology, and mathematics. Members of the community are involved in the scientific process of gathering data and recording their observations. Analysis of that data can help to answer questions, which may help to advance change in that community.

Sometimes this process is called **Citizen Science**.



Discuss it.

(See group discussion strategies on page 10.)

1. What do you think about everyday people participating in science?
2. What could be a challenge or problem with having the public contribute to scientific research?
3. How do you think it might feel to participate in a global scientific endeavor?
4. What research would you do, if you could?

The National Park Service offers many opportunities to get involved in Citizen Science: https://www.nps.gov/subjects/citizenscience/citizen-science.htm

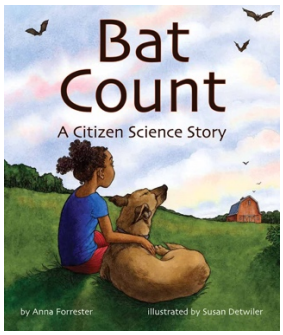
20 Citizen Science projects: https://www.experientiallearningdepot.com/experiential-learning-blog/20-citizen-science-projects-for-students-of-all-ages

More Citizen Science projects: https://education.nationalgeographic.org/resource/citizen-science-projects/

Find a Community Science project at: https://scistarter.org/

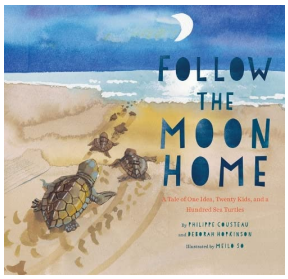
Books About Community Science

Make a trip to your local library to find one or more of these books.



Bat Count: A Citizen Science Story *by Anna Forrester*

Spend exciting summer evenings with Jojo and her family, counting bats to help scientists studying white-nose syndrome.

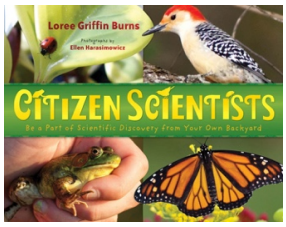


Follow the Moon Home: A Tale of One Idea, Twenty Kids, and A Hundred Sea Turtles *by Phillipe Cousteau*

Discover the incredible difference curious kids can make in the world. A little courage and perseverance and make big-hearted kids unstoppable!

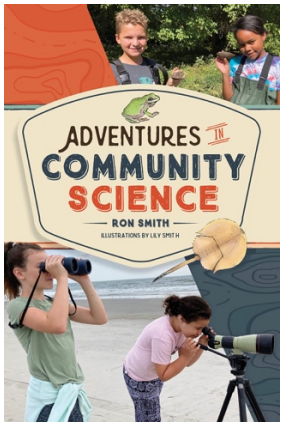
Ruby's Birds *by Mya Thompson*

Join Ruby in discovering the fun of birdwatching, a pastime you can pursue whatever you are! Learn Ruby's tips for taking nature walks, find out how to spot birds in your neck of the woods, and connect with Celebrate Urban Birds, a community-science project at the Cornell Lab.



Citizen Scientists: Be a Part of Scientific Discovery from Your Own Backyard *by Loree Griffin Burns*

Get started with simple, flagship community science projects through Audubon, FrogWatch USA, and more.



Adventures in Community Science: Notes from the Field and a How-To Guide for Saving Species and Protecting Biodiversity *by Ron Smith*

Young readers and educators can explore various community science projects through natural history, journal entries, and sample data sets. One part nature journal and one part call to action, these studies and surveys will inspire readers to engage the natural world through hands-on exploration.

You can do community science.

The Great Sunflower Project

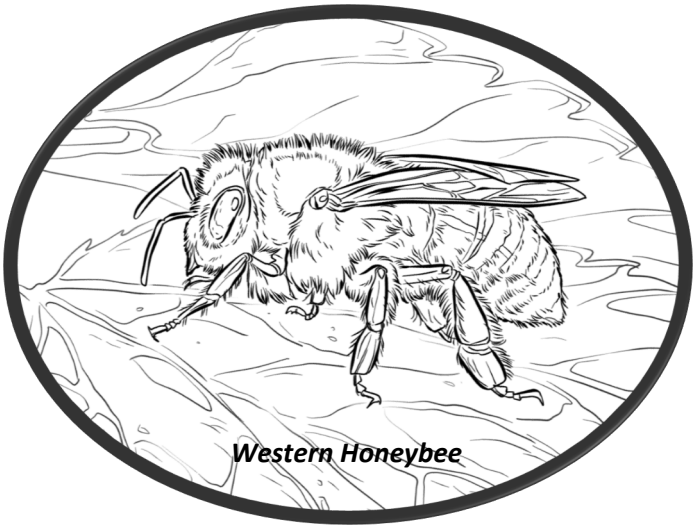
Goal: To identify where pollinators are declining and improve habitat

Task: Observe a plant, record pollinators, report online

Where: Global, anywhere on the planet

The Great Sunflower Project has three programs:

1. The *Safe Gardens for Pollinators* program uses data collected on Lemon Queen sunflowers to examine the effects of pesticides on pollinators.
2. The *Pollinator Friendly Plants* program is designed to identify the key plants to support healthy pollinator communities.
3. The *Great Pollinator Habitat Challenge* allows citizen scientists to evaluate and improve gardens, parks and other green spaces for pollinators.



Western Honeybee

Some bee populations have experienced severe declines that may affect food production. However, nobody has ever measured how much pollination is happening over a region, much less a continent, so there is little information about how a decline in the bee population can influence gardens.

The Great Sunflower Project makes it easy to gather this information. Find a plant you know (or a Lemon Queen sunflower), observe it for five or more minutes, record all **pollinators** that visit it, and contribute that data online. You can make as many observations as you want while your flowers are in bloom. Plant, watch, enter, and repeat.

Try it: https://www.greatsunflower.org

Did you know? Electrostatic forces help grains of pollen "jump" onto bees.

Pollinator printable coloring page: https://orrery-media.s3.amazonaws.com/library/Pollinator_Printable_04_12.pdf

What is science?

Science is what we do to find out about the **natural world**. It's a **process**. The process of science produces tested facts, scientific laws, and theories. Science also refers to the large amount of knowledge that has been found using this process.

There are many different branches of science. Here are a few of the more common sciences:

- **anthropology** is the study of humans
- **astronomy** is the study of stars, planets, moons, and everything in space
- **biochemistry** is the chemistry of living things
- **biology** is the study of living things (organisms)
- **botany** is the study of plants
- **chemistry** is the study of the elements (like carbon atoms) and their compounds (like carbon dioxide molecules)
- **ecology** is the study of organisms and how they interact with the environment around them
- **geology** is the study of rocks and the Earth
- **meteorology** is the study of the weather
- **physics** is the study of energy - light, sound, heat, electricity, and motion
- **zoology** is the study of animals

The different kinds of scientists are named for what they study. Biologists study biology. Zoologists study animals. So, there are botanists, chemists, geologists, astronomers, and many more.

OLogy is the science website for kids from the American Museum of Natural History:
https://www.amnh.org/explore/ology

All fields of science ask questions, gather data, and draw conclusions about the natural world. The **scientific method** is a way to get knowledge by discarding what is not true.

"The method of science, as stodgy and grumpy as it may seem, is far more important than the findings of science."
— Carl Sagan, American astronomer, planetary scientist, cosmologist, astrophysicist, and astrobiologist

What is the Scientific Method?

The scientific method is a process that scientists use to study the natural world. It goes like this…

1. Observe, Research, and Question

Nature is amazing and complex. To better understand it, a scientist asks a very specific **question**. Some questions are simple, such as "how many legs do flies have?" and some are very deep, such as "why do objects fall to the ground?"

Here are some examples of questions that scientists have asked:

A. Why are people more likely to get sick when it is cold?

B. How can we turn ocean water into renewable energy?

C. What happens when you wring out a wet washcloth in outer space?

2. Make a Hypothesis

Then, the scientist will make a prediction about the answer to the question. "I think that…"

A. We think that the inside of the nose is not as good at stopping viruses when the air is cold.

(To read about how scientists tested this hypothesis, go here: https://www.sciencejournalforkids.org/articles/why-are-people-more-likely-to-get-sick-when-it-is-cold/.)

B. We think that a device that efficiently extracts hydrogen from sea water is possible to make.

(To read about how scientists tested this hypothesis, go here: https://www.sciencejournalforkids.org/articles/how-can-we-turn-ocean-water-into-renewable-energy/.)

C. I think that water wrung from a washcloth will scatter into droplets all over the space station.

(To watch how an astronaut scientist tested this hypothesis, go here: https://youtu.be/o8TssbmY-GM)

This prediction is called a **hypothesis**. Since the scientist has researched the question thoroughly, a hypothesis is an "educated guess" at the answer to the question.

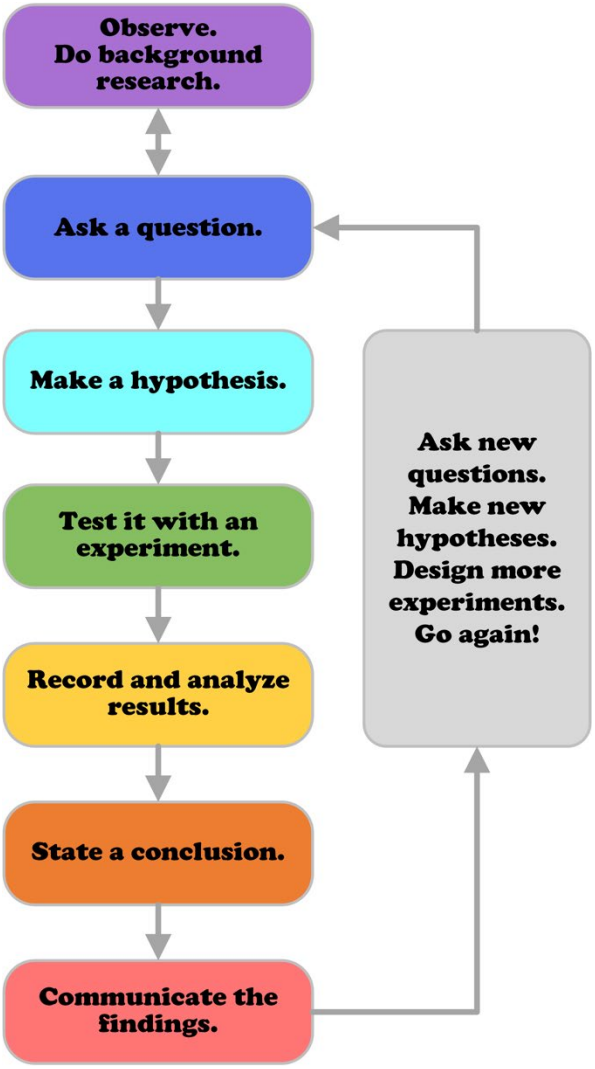
3. Experiment

The way to test the hypothesis is by experimentation. An **experiment** is a specific procedure to see if the hypothesis is true. Usually, there is something that must be measured. **Variables** in the experiment are things that can be changed and controlled, to see if they affect the outcome. It takes creative thinking to design an experiment.

When a community member gets involved in community science, they are usually jumping in at this stage of the process. The experiment has already been designed by someone else, and the amateur scientist is serving as a "worker bee" to collect the data.

4. Record and Analyze the Data

The **results** are the **data** collected from the experiment. A scientist may record the results on paper (a notebook or ledger) or in a device (a tablet or laptop computer). The results may be tallies, measurements, calculations, photos, videos, diagrams, or graphs. The scientist decides the best way to display the results. Thinking about the data and using it to make visual displays is called the **analysis**.



5. Conclude

At the end of the process, the scientist arrives at a **conclusion**. What new thing have we learned about the natural world? Do the data support the hypothesis? Has the initial question been answered? Do the results suggest even more questions, that could be pursued with more science?

6. Share

Eventually a scientist wants to tell people about their findings.

Professional scientists will write an article about their work, and a team of peers then reviews it. If the reviewers think the scientific method was valid, then the article is accepted and published in a **scientific journal**. Then the rest of the scientific community (as well as the public) can read discuss it. From there the media and educational organizations can communicate the findings to communities.

Here are some ways that you, the student-scientist, can share your science:

- Have a conversation with another person about your science project.
- Demonstrate your experiment for one or more people. See if they can do it themselves and get similar results.
- Write up all the stages of your process. Make a display and post it up on a bulletin board (or refrigerator) where other people can see it.

7. Do More Science

After sharing, a scientist decides if the question needs more work. Scientists often change their minds. Anything in science may be revised if the previous results were not good enough. An experiment can be refined, or a new hypothesis can be proposed and tested. Science leads to more questions, which calls for more science.

Do Science

Video: Grover demonstrates five experiments that you can do at home: https://youtu.be/BeLT-O8Mz2M

More ideas for the young ones to "do Science": https://sesamestreetincommunities.org/topics/science/

A classic at-home experiment is "***What conditions make the biggest bubbles?***" https://kids.niehs.nih.gov/activities/science-experiments/blow-the-biggest-bubbles

Read About Science

Learn the scientific method by reading scientific articles at: ***Science Journal for Kids and Teens*** https://sciencejournalforkids.org/

Here you can find Hundreds of scientific articles. Written for kids. Approved by scientists. Searchable by reading level, with comprehension questions, answer keys, and lesson plan ideas with NGSS standards identified. Amazing resource!

Let's talk about science.

1. How does a person start "doing science"?
2. What are some of the benefits of science that we live with every day?
3. What does it mean to be a scientist?
4. How can you tell if something is science, or not science?
5. Do scientific facts ever change?

Group Discussion Strategies

Think Pair Share:

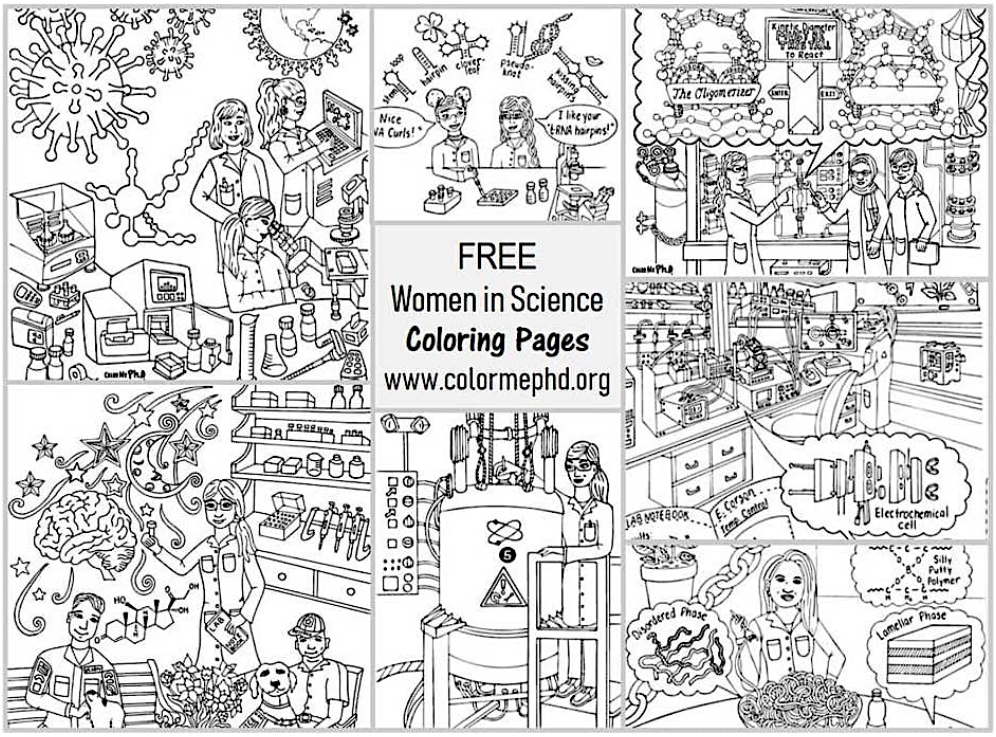
1. Individually, student writes down their answer to a question.
2. Students pair up and tell each other their answers.
3. Teacher calls for volunteers to share with the whole class their answer (and/or their partner's answer). Teacher notes key words/phrases on board.

Round Robin:

1. Teacher poses one question (written on top of a large page) to students, who are assembled into small groups of 3 or 4.
2. Students take turns brainstorming the answers. The recorder of the group writes down all answers.
3. The leader reads the groups ideas to the entire class. Teacher moderates.

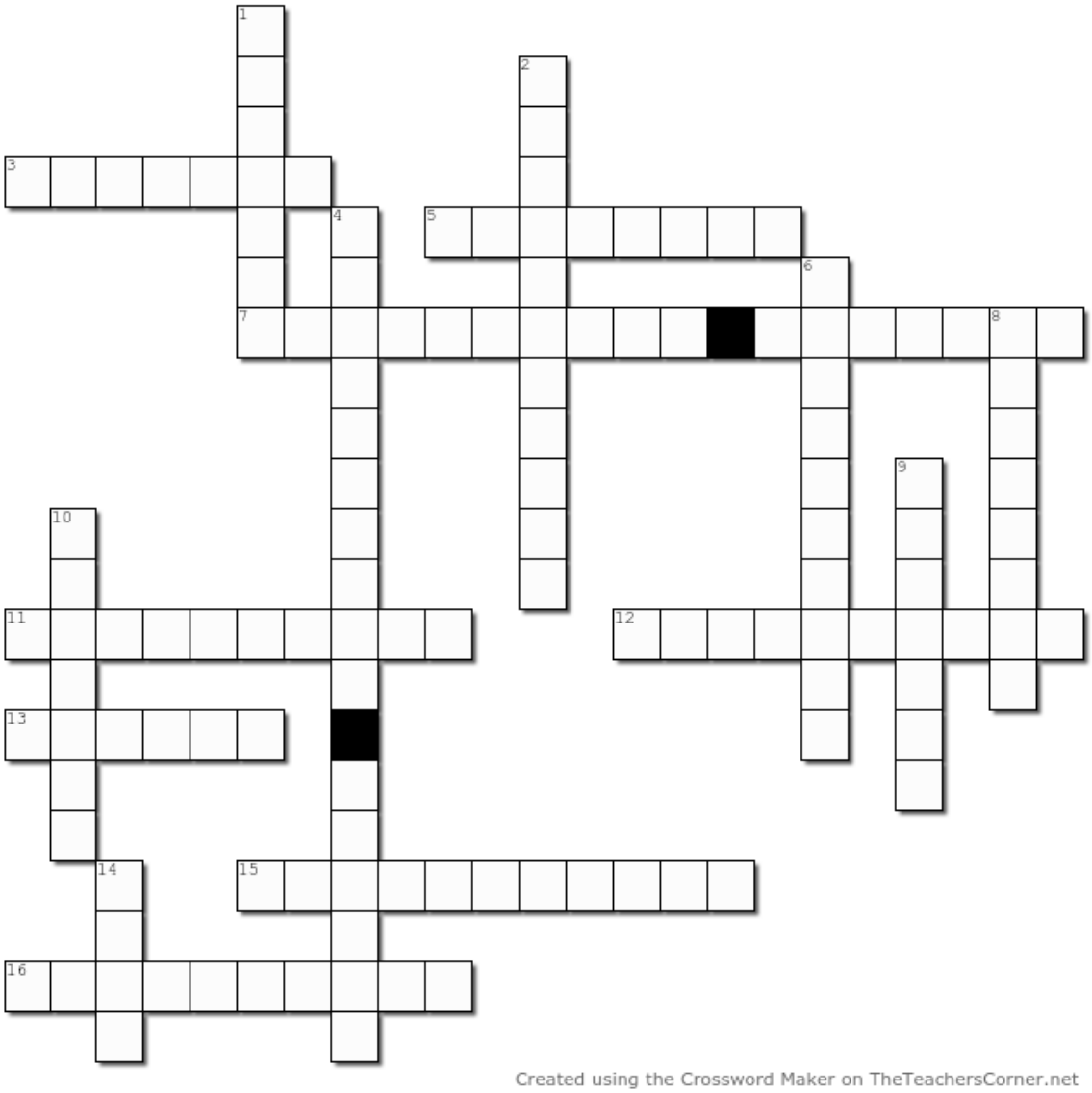
Both *Think Pair Share* and *Round Robin* discussion strategies encourage equal participation by all students, and they provide a collaborative group learning environment.

Women in STEM coloring pages: https://www.colormephd.org/coloring-pages/free-pdf-vol-2



Crossword Puzzle: Community Science

Hint: Words used in this puzzle appear in **boldface** in this learning guide.



Created using the Crossword Maker on TheTeachersCorner.net

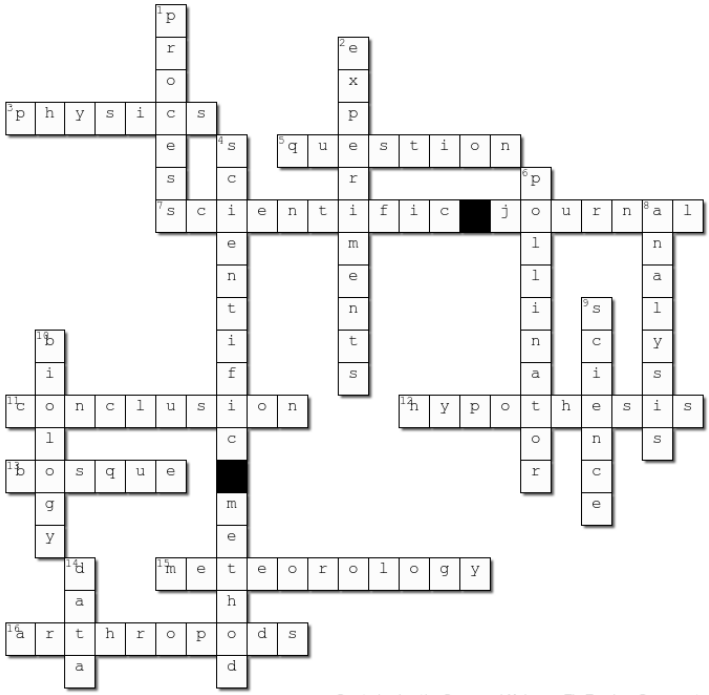
Across

3. the study of energy
5. Science begins with a _____.
7. A scientist publishes their findings in a _____.
11. If the data confirms the hypothesis, the scientist reaches a _____.
12. a prediction or an educated guess
13. a forest ecosystem by a river
15. the study of weather
16. animals like spiders and insects

Down

1. Science is a _____.
2. Scientists design _____.
4. a way to get at the truth about the natural world
6. an animal that carries pollen from flower to flower
8. Thinking about the data and using it to make visual displays is called the _____.
9. Anyone can do _____.
10. the study of living things
14. what scientists collect during an experiment

Crossword: Answer Key



Created using the Crossword Maker on TheTeachersCorner.net

Across

3. the study of energy (**physics**)
5. Science begins with a _____. (**question**)
7. A scientist publishes their findings in a _____. (**scientific journal**)
11. If the data confirms the hypothesis, the scientist reaches a _____. (**conclusion**)
12. a prediction or an educated guess (**hypothesis**)
13. a forest ecosystem by a river (**bosque**)
15. the study of weather (**meteorology**)
16. animals like spiders and insects (**arthropods**)

Down

1. Science is a _____. (**process**)
2. Scientists design _____. (**experiments**)
4. a way to get at the truth about the natural world (**scientific method**)
6. an animal that carries pollen from flower to flower (**pollinator**)
8. Thinking about the data and using it to make visual displays is called the _____. (**analysis**)
9. Anyone can do _____. (**science**)
10. the study of living things (**biology**)
14. what scientists collect during an experiment (**data**)

Get Set to Listen: Answer Key

4. Litter fall is the amount of human-made trash found in nature. = FALSE […is the amount of fallen leaves…]

5. Arthropods are bees, snails, and earthworms. = FALSE […are spiders, insects, and ants]

6. The number of plant species and the density of plants along the Rio Grande is pretty much the same in all the sites being monitored. = FALSE [There is a lot of variation in plant type and density.]

All other statements are true.

Let's Talk About Science: Possible Answers

How does a person start "doing science"? Science starts when a person is curious about the world around them and asks questions about how it works. They think of ways to learn about the world by doing investigations, keep track of their data as evidence, and tell other people what they have found.

What are some of the benefits of science that we live with every day? Predicting weather. Combating infectious diseases with medicine and vaccines. Inventing ways to harness renewable energy. Etc.

What does it mean to be a scientist? To study the natural world around us using observation and experimentation. Scientists use the scientific method which is a standard process. They always "show all work" anyone can see how they got their results. Scientists are critical thinkers and are willing to change their minds.

How can you tell if something is science, or not science? Something is science if there is evidence that supports the claims that people make, and if the evidence is collected using the scientific method. If claims do not have evidence to support them, it is not science.

Do scientific facts ever change? Yes. Scientific answers change when new evidence is discovered that disproves what we thought was fact. For example, people once thought that the sun orbited the earth. Then Nicolaus Copernicus in the sixteenth century used data collected using the telescope and mathematical analysis to show the heliocentric model — that the earth and other planets orbited the sun. This new discovery revamped humankind's understanding of the heavens and set off other significant changes throughout the Scientific Revolution of the sixteenth and seventeenth centuries. Another example is germ theory. Before the discovery of germs, most pre-modern scientists believed pandemics, epidemics, and even common ailments came from miasma (a bad air or mist). Some scientists' experiments showed that microorganisms cause disease. In the mid-19th century Louis Pasteur showed that fermentation and putrefaction are caused by organisms in the air; in the 1860s Joseph Lister revolutionized surgical practice by utilizing carbolic acid (phenol) to knock out germs; and in the 1880s Robert Koch identified the microorganisms that cause tuberculosis and cholera. Once it became widely understood and accepted that "germs" cause disease, doctors could develop effective treatments and we got better at containing the spread of infectious diseases.

Connect to Curriculum

http://www.corestandards.org

https://artinaction.org/standards/

https://www.nextgenscience.org/

https://www.positiveaction.net/blog/sel-competencies

https://www.learningforjustice.org/frameworks/social-justice-standards

https://www.socialstudies.org/system/files/2022/c3-framework-for-social-studies-rev0617.2.pdf

Information/Activity	Core Idea	Learning Standards
p.2 Get set to listen; What did you learn?	Recount or describe key ideas or details from (a text read aloud or) information presented orally or through other media.	Common Core ELA: SL 2
p.3, 5, 6, 7, 8	Read and comprehend informational texts, including history/social studies, science, and technical texts...	Common Core ELA: RI 10
p.1, 3, 5, 10 Coloring	Create art that represents natural and constructed environments. Describe what an image represents.	NCAS Creating #2 K Responding #7 K
p.5 Great Sunflower Project	Make observations (firsthand or from media) to collect data that can be used to make comparisons. Plants depend on animals for pollination…	NGSS: K-PS3-1, 1-ESS1-2, 2-LS4-1 2-LS2-2
p.9 Experiment: What conditions make the biggest bubbles?	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.	NGSS: MS-PS2-1, MS-PS2-2, MS-PS2-5 Common Core ELA: RST.6-8.3 NGSS: 2-PS1-1
p.9 Read About Science	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	Common Core ELS: RST 8 (6-8) RST (9-10)
p.10 Focus Questions: Let's talk about science	Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.	Common Core ELS: SL 1 (4,5)
p.11 Crossword Puzzle	Use precise language and domain-specific vocabulary to inform about or explain the topic.	Common Core ELA: WHST 2 (6-8)

About Us

The Children's Hour Inc is a New Mexico-based non-profit organization that produces an award-winning children's radio program that is educational, entertaining, and engaging, and includes kids who participate in its creation. The program is internationally syndicated broadcasting on more than 120 public radio stations worldwide. Program themes focus on civics, STEM, culture, and music education, featuring New Mexico children as co-hosts and lead interviewers. Katie Stone has been the executive producer of *The Children's Hour* for more than two decades.

For more information, contact: Katie Stone | (505) 850-3751 | katie@childrenshour.org

Tell us about you!

We at the Children's Hour would like to know:

1. How old are you?
2. Was this your first time listening to a radio show or podcast for kids?
3. Was this radio show less fun or more fun compared to other things you do for fun, like playing video games or watching TV?

   ☐ Less fun ☐ More fun
4. Would you listen to a radio show again if you could?
5. Of everything you heard in the radio show, what will you remember most?

_____

_____

_____

If you would like to draw a picture about anything you learned on the radio show, we would like to see it. Scan and email it to us, and we may display it on our online space.

If you would like to tell the creators of this radio show something in your own voice, you can send a voice message to *The Children's Hour* here: https://www.childrenshour.org/contact-us/.

Look for the orange button and click to record.