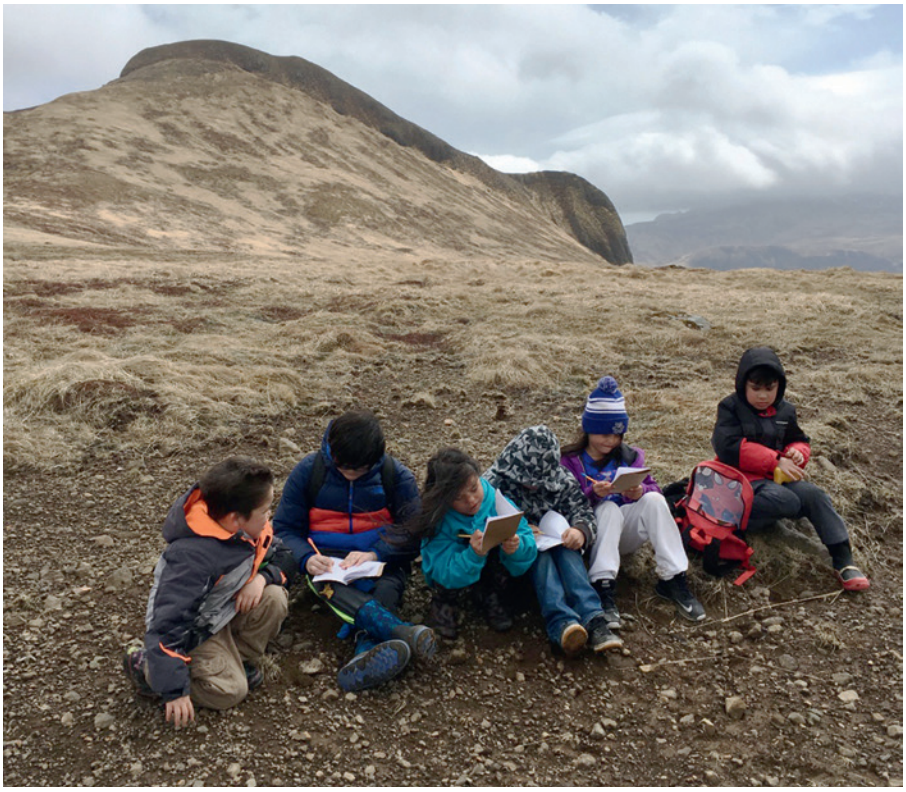
TEAM OBSERVATION

Students observe the same subject and work together to discover as much as possible. As they do, they see the variety and depth of the observations that can be made.

Science is a team sport. Rarely does a lone scientist, working in isolation, contribute much to our understanding of the world. Scientists work together to solve complex problems. They share ideas, read one another's work, replicate one another's studies, and build on what is already understood. Everyone has different strengths, and having more eyes on any problem means there will be more ways of thinking about potential solutions. We can see examples with NASA (it takes a village to get to the moon—and back) or any group engineering effort that has produced many of the modern products we take for granted. Any lab at a university comprises a cohort of graduate students at various levels, and just about any scientific paper was written by a team of authors. Your students will go further in their understanding of science if it is a collaborative effort, not a competition to see who gets the best grade. Use this activity to set the tone of teamwork and enable your students to see how much they can learn when they work together.

NATURAL PHENOMENA

Find a natural object, organism, or species that all students can simultaneously observe. The possibilities are limitless. Students could focus on an abundant species of flower in a field; a colony of ants; a tide pool; a large, spreading tree; a small pond; or a stream. A tall, narrow tree (such as a pine) is more challenging for a large group. Even though everyone would be able to see the tree, it might be difficult for everyone to get up close and examine the bark or lower branches. Choose the phenomenon, or set it up so that the group of students can decide what they want to explore. If you want to use this activity to help students build understanding of specific science concepts, then choose the phenomenon and suggest a couple of categories for observations that meet your learning goals.



Time

Introduction: 5 minutes
Activity: 30–40 minutes
Discussion: 10–15 minutes

Materials

- ☐ Journals and pencils

optional

- ☐ Loupes, hand lenses, or magnifying glasses

Teaching Notes

Some students go into class wanting to "win" the observation competition. Students will cooperate more with each other if it is clear that there is room for more than one person (and, in fact, everyone) to be successful. Weave this activity in with community building or social emotional learning in your class or group, and reflect afterward on what they could do next time to be a more effective team.

Many sets of eyes observing will lead to a rich experience. Give plenty of time for groups to share what they learned. This information your students worked hard to collect can be a rich source of data, but only if you use it beyond this activity to further the whole group's understanding of the phenomenon. Use subsequent experiences to deepen students' learning.

PROCEDURE SUMMARY

1. Collect interesting observations for your category with your assigned team.
2. Make your own journal entry of observations, but talk to your teammates and work together as coexplorers.
3. Before you begin, discuss with the team what should be observed, and make a plan for how the work will be shared.

Note: There is no demonstration for this activity because different groups of students will focus on collecting data on different parts of this phenomenon.

PROCEDURE STEP-BY-STEP

Note: In this example, we use a tree as the focal object of the study. The procedure would be modified slightly for other subjects. Here we imagine a group of twenty-four students who will be working in groups of four (or six groups). Adjust accordingly for your needs.

1. **Explain that science is a team effort, and scientists think through problems and ideas together, helping one another solve problems and try to come up with the best possible explanations based on the available evidence.**
   a. "In movies and TV, scientists are often shown as loners who work in isolation. In reality, most of science is a team effort."
   b. "Groups of collaborators share their observations and talk about different possible ways to approach a problem or answer a question."
   c. "When they have trouble understanding something, they ask someone who knows more than they do, or they talk with peers about things they have read."
   d. "They work together to come up with the best possible explanation based on all the available evidence. In working together, they come to a deeper understanding than any of them could have done on their own."
2. **Tell students that they will work together like a team of scientists to study a nearby tree [or ecosystem, stream, etc.], emphasizing that the goal is collaboration, not competition, and that each person has a role to play.**
   a. "We are going to explore how working in teams helps us learn as we try to discover as much about this tree as we can, collaborating like a team of scientists would."
   b. "Our goal is to collaborate, not to compete. When we all observe and work together, we learn more than any of us could by ourselves."
   c. "There can be a role for everyone. Some people might be more drawn to counting and working with numbers; others of us might be thinking big picture and connecting what we see to science ideas. Another person might be great at keeping track of the needs of the group, making sure we all have what we need to stay focused. All of these are important roles that will help us learn."
3. **Explain the procedure: The group will come up with categories for the types of observations they think are important to make, then divide into teams of study.**
   a. "First, we need to come up with categories of the types of observations we think would be important to make about this tree."
   b. "One category could be studying the tree's leaves."
   c. "What other interesting structures or categories can you think of?"
4. **If students have trouble starting a list, prompt them toward other categories.**
   a. "Try looking at the shape and color of the trunk, branches, and leaves or looking for evidence of animals or plants living on the tree; another group could study the soil around the tree, or anything else you think might be important."
5. **Divide the group into teams (counting off is a useful strategy for this) and assign categories.**

Note: Older students or those with more experience in the field could be set loose to create their own study groups and categories for observation. Offering this autonomy will increase student buy-in.

6. **Tell students that each team of four will be responsible for collecting interesting observations about their category, recording what they find in words, pictures, and numbers.**
   a. "Your research team is tasked with collecting the most interesting and relevant observations about your category. You will have seven minutes to collect information relevant to your category. Although you will work as a team, you will each record notes separately in your journals, using words, pictures, and numbers."
7. **Suggest that teams take a minute to make a plan for what will be important to observe and focus on, and encourage teams to continue to talk to each other about observations and questions as they work.**
   a. "Before you begin, take a minute to plan what will be important to record."
   b. "As you all work, talk to the members of your team, sharing questions or exciting observations. Are there any questions? Go!"
8. **As students work, take time to circulate, talk to teams about what they are observing, and support any students who are struggling.**

9. **When the time for observation is up, call the group back together and tell teams to meet and share observations, questions, and ideas.**

   a. "Take a couple of minutes to meet with your team and share observations. Talk about the things that you learned, and any questions you came up with."

10. **Give each team the opportunity to share some of the questions and observations they made.**

   a. "Let's hear a bit from each team about the observations you made. What did you find out? What did you notice? What was interesting, surprising, or unexpected?"

   b. "Which observations are important to share as a group, so that we can better understand this tree as a whole?"

   c. "What questions did you come up with?"

11. **(Optional) Lead a group discussion about an interesting question a team came up with, asking for differing ideas, possible explanations, and perspectives from members of different teams.**

12. **Send students back out to individually collect one specific and special observation, a detail they think no one else has noticed.**

   a. "We learned a lot as a group, but it is also fun to explore on your own. You will have five more minutes to explore, with this challenge: Make one observation that is so specific, particular, and detailed that you are sure no one else in the group has the same information."

   b. (After exploration time is up) "Does anyone want to share their discovery?"

13. **Give students a moment to record metadata for their journal entry, including the names of the members of their team.**

DISCUSSION

Lead a discussion using the general discussion questions and questions from one of the Crosscutting Concept categories. Intersperse pair talk with group discussion.

General Discussion

Use the general discussion questions to prompt students to discuss and reflect on their process of working together as a team.

   a. "Why do you think scientists work together in teams?"

   b. "What are some advantages of working in teams?"

   c. "What are skills that scientists need to have to make them effective team members?"

   d. "What are other fields where you see teams or people organizing to solve problems together?"

   e. "How did your small group do at working as a team? What about our whole class? What could we do to work better together next time?"

Patterns

   a. "What patterns did you find? These might be patterns in structures or growth formations, in the location of different parts of the organism [or phenomenon], in features like holes or scars, or in the general location of the organism [or phenomenon]."

   b. "What are some possible explanations for those patterns?"

Cause and Effect

   a. "What were some of the features or patterns you observed? What are some possible explanations for them?"

   b. "Did you find any evidence that the [observed organism or phenomenon] may be affected by living or nonliving things in the environment?"

   c. "How do you think the [observed organism or phenomenon] might affect the living or nonliving things in the environment?"

   d. "How might the interactions you observed be affected by the time of day, year, weather, or location?"

   e. "Did you see any interactions between the organism and the environment? What effect might they have had on each other?"

Energy and Matter

Note: These questions are appropriate for students fifth grade and above.

   a. "Let's construct a partial food chain based on your observations. What did you see eating what? Now expand your food chain to a web based on what you have seen in this area, your prior knowledge, and your best guesses about other relationships between animals."

   b. "Now trace the cycling of matter through the parts of the food chain you just described."

Systems and System Models

   a. "You can think of this tree as an ecosystem in itself. Within these branches are many species. How many different kinds of organisms or their evidence did you find?"

   b. "Let's create a diagram to show some of the relationships between these species. Start with two that you think may affect each other—for example, predator and prey. Draw and label a small box for each species."

   c. "Draw a line between them and write the relationship between them on or around the line. Now add another

organism to the chart and connect it too. If you suspect a strong relationship, draw a heaver line."

d. "What connections between the [observed organism] and other parts of the ecosystem did we observe? How many others can you think of?"

In the case of a landscape feature or physical phenomenon:

e. "What are the parts of this landscape feature? How do the different parts affect and interact with each other?"

f. "How can we explain what is happening here?"

Structure and Function

a. "Look back at the structures you observed. Pick one to describe to a partner in detail."

b. "Let's think about how this structure helps the organism survive [or, Let's think about what we know about how this phenomenon works]. What are some possible explanations for how the structure works? How might the specific shape or texture of the structure help this organism survive?"

c. "Were there any structures you were confused by, or were there any whose function you are not yet sure about? Let's discuss this and see what we can figure out together."

FOLLOW-UP ACTIVITIES

Working toward Effective Collaboration

Look up resources on effective teamwork and work together with your students to improve group cooperation and management. Or, read accounts of how scientists have worked together in teams, and use this information to lead a discussion about how students can improve their group cooperation.

Engaging in Further Research

Make a class list of questions about the organism or phenomenon, then work in the same teams (or new ones) to look at other sources of information to deepen understanding.