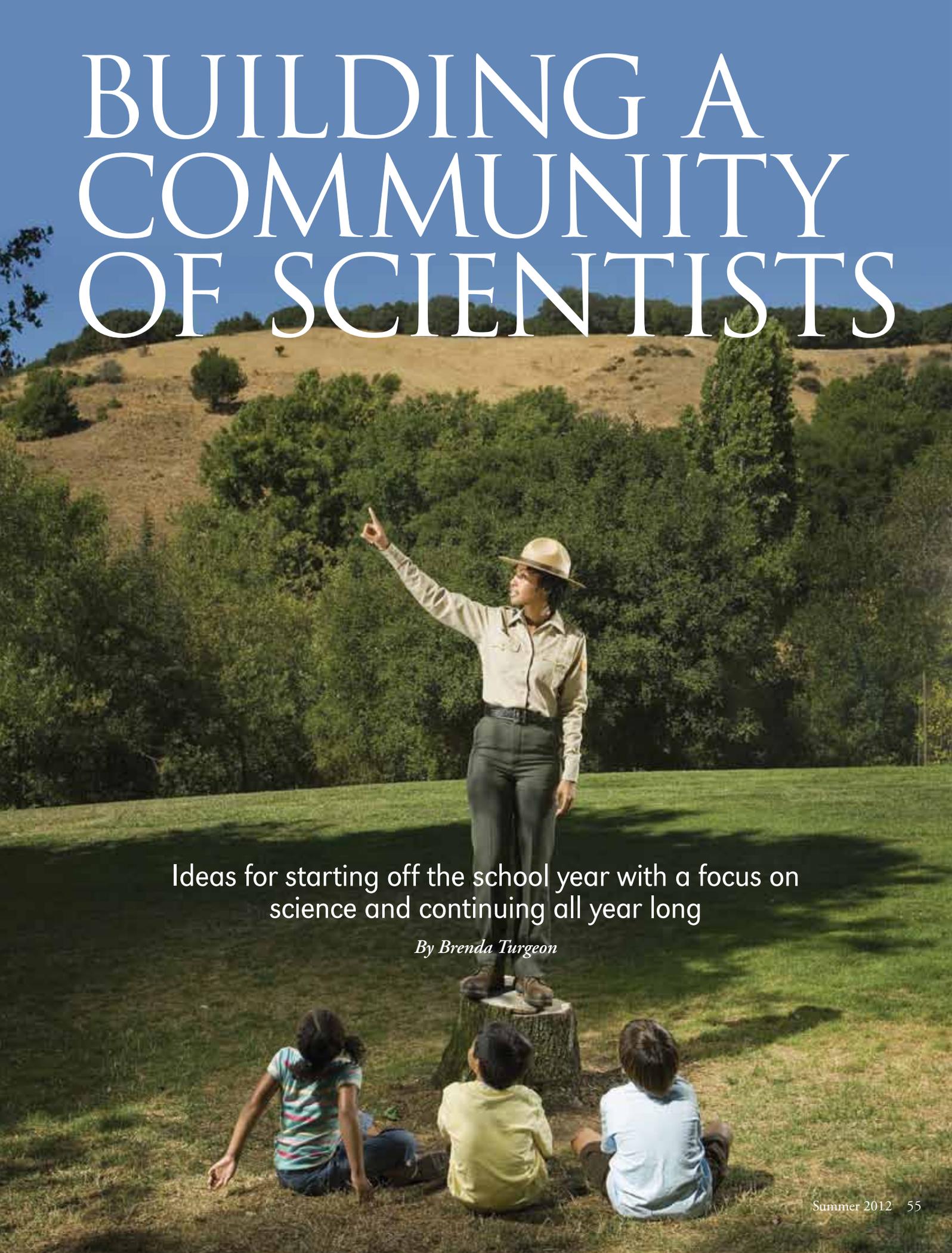


BUILDING A COMMUNITY OF SCIENTISTS

A woman wearing a tan shirt, dark pants, and a hat stands on a tree stump in a grassy field. She is pointing her right hand towards a large green tree in the background. Three children are sitting on the ground in front of her, looking towards her. The background shows a line of trees and a hillside under a clear blue sky.

Ideas for starting off the school year with a focus on
science and continuing all year long

By Brenda Turgeon



here is nothing more exhilarating than opening the classroom door on the first day of school to look upon the freshly scrubbed, smiling faces of your new students. You can feel the excitement in the air as students wonder what is on the other side of the door. Of course, you do not want to disappoint them!

On the other hand, we all know that one of the biggest challenges in the early weeks of the new school year is to keep learning interesting and the students engaged as routines and procedures are established and reinforced. How can a classroom teacher make the routines and procedures engaging and educational, while building a community of learners? The answer is simple...build a community of scientists in your classroom with science, science, and more science. The first two weeks of school provide the perfect opportunity to set the stage for a sound academic program with science as its foundation.

This article describes a 5E learning cycle and follow-up activities designed to turn your third-grade students into scientists at the beginning of the school year. The first two weeks of the school year are the perfect time to introduce students to the importance of posing questions, making observations, using tools in investigations, collecting data, implementing notebooks, and communicating with peers. When students are engaged in scientific inquiry, they develop important skills and understanding that promote critical thinking and problem solving (NRC 1996). These skills and understanding can be integrated into all aspects of the classroom and curriculum during the school year.

Engaging With a Guest

Our third-grade curriculum revolves around our changing world. In order to observe the changes in our rural environment throughout the year, we take nature walks around our school yard, our neighborhood, and our local park. To help my students learn to make good observations about what is found in our changing environment, I invite a ranger from our local state park system to discuss the plants and animals found in our area. Ranger Mary is a scientist who brings in animals, both live and preserved ones, along with samples and pictures of plants from our area to share with my students. The ranger talk is engaging and informative for the students. She provides a wonderful opportunity to expose and to connect children to the real world, while discussing what she does as a scientist. Not only does our invited scientist get my students excited for science, but they begin to see the link between science and future occupations. She helps students see the connection between studying science and its use in the real world. After our ranger talk, my students take their nature walks very seriously because they want to be a scientist just like Ranger Mary.

In addition to Ranger Mary, I have been fortunate to have some of my students' parents visit our classroom to share what they do as scientists. Who better than a scientist to reinforce what science is and what scientists do? I have had a dentist visit our class to discuss dental health. A dietician has discussed eating healthfully and staying active. An engineer from our local water district has shared his knowledge and expertise about keeping our drinking water safe and the importance of using water wisely. Science is all around us, and it makes sense to help our students see the connection between studying science and its use in the real world.

Exploring Our World

Introducing my students to the practices associated with scientific inquiry at the beginning of the year sets the stage for future learning. While my students are doing science, they learn to conduct investigations, to use tools appropriately, to work in groups, to record information in their notebooks, and to develop important communication skills. These newfound skills develop scientific thinking and understanding.

Now that my students have met a scientist, it is time for them to be scientists. At the beginning of the year, I provide premade science notebooks (Zike 2002) for my students. While they are dusting off the summer cobwebs, I provide some structure in their notebooks by supplying data recording sheets and blank sheets of paper. By structuring the first couple assignments in their notebooks, students get examples of how to organize information. In addition, the format provides a reminder about the directions to follow to complete their task. Before we head outside, and as a follow-up activity to Ranger Mary's visit, the students make the notebooks their own by adding their name to the cover and creating a drawing depicting one interesting bit of science they learned from our guest scientist. With new notebooks in hand, we head outside to observe nature, record data in our notebooks, and collect samples for future study.

The good weather in August and September provides an opportunity for a nature walk. In her book, *Science Is...*, Susan Bosak provides many different versions of a nature walk that can meet the needs of all classrooms (Bosak 1992). For our purposes, I prompt students to use their senses to observe plants and animals in the school yard as they take their walk. Of course, I prohibit the sense of taste. The first page of their notebook is arranged into five rows. Each of the first four rows contains one of the senses: sight, hearing, smell, and touch. The fifth row is a place for students to write down any questions they have as they go on their nature walk (see NSTA Connection). As they walk and observe the plants and animals in their environment, they record

their observations in their science notebook. Using notebooks was introduced in second grade, but it is still very much a developing skill at the beginning of third grade. In order to support the students' use of notebooks, I prompt them to include at least three plant or animal observations in each section and at least two things they wonder about from their walk. I tell the students that we will be observing the plants and animals in our environment over time. Since we live in a forest at high elevation, we will observe many changes in the plant and animal life during the school year. As our year unfolds and we continue our nature walks and our studies of plants and animals, the students begin to understand that adaptations in structures and behaviors improve an organism's chance for survival.

After 10 minutes, they share their observations and question(s) with a partner. I move from pair to pair listening to what they are sharing. Most of the students' observations are generally basic and lacking in details. They share that they saw trees, squirrels, and chipmunks. They smelled pine trees. They heard birds. And, although trash is not a plant or animal, almost all the students comment on how much trash has blown into the forest. They always make the suggestion to discuss a trash patrol with the principal to keep the school cleaner.

Once they conclude their discussion with their partner, I lead a short whole-group discussion to share what I heard about their observations. I focus on the observations that were more detailed. I say, "I like how Lauren said she saw tall pine trees, instead of just saying she saw a tree." I mention how Miles compared the differences in pine cones. Some pine cones were

eaten and some were not. He thought the squirrels were fattening up for winter. We discuss how important it is for scientists to be as descriptive as possible. We discuss ways students can add detail to their observations. Students came up with questions like, how could they tell if they are observing a chipmunk or a squirrel? Do all the trees look the same? How can we tell? Some students remember that Ranger Mary discussed the bark on different trees as a way to identify them. Once we discuss adding details to their observations, they continue their walk together to observe what they missed. They may add to their notebook entry.

When we come back together after 10 minutes, the students are excited to share their new observations. They have added color descriptors for plants and animals. They have described the texture of tree bark and pine needles. They describe "smelling water in the air" because of our proximity to a lake. What is most exciting is their connection to what Ranger Mary taught them. They were more aware of how plants were beginning "to dry up and die" because we were getting close to the fall, which happens earlier in the mountains. Their evidence was that flowers and leaves were turning brown. As a result of our discussion and second nature walk, students were able to see the importance of repeat observations to improve descriptions and accuracy during investigations. They enjoyed having the opportunity to do science again, just like a real scientist. Again, this came from what they learned with Ranger Mary. She discussed doing multiple investigations over time to be sure the information gathered was accurate and useful.

Explaining Our World

It is important to discuss students' observations before the elaboration phase. While posing good questions to get the discussion started is important, it is just as important to provide wait time to give students the opportunity to think about the question, to formulate their answer, and to be ready to share. Some basic opening questions might be:

- What observations did you make during our nature walk?
- How were your observations the same (or different) from what you learned from Ranger Mary?
- Can you explain that more?
- Why do you think that?
- What is your evidence?
- What are some of the questions you came up with as you did your nature walk?

By the time we get to this second discussion, the students do a better job because their observations are more descriptive. When one student shared that she saw a stream,



she didn't stop there. She shared that she used her senses to try to smell the water and to feel the water. She couldn't describe how the water smelled, but she said it was cold and wet. Another student said he saw shiny flakes in some rocks and wondered if it was gold. One of his classmates asked why he thought it might be gold. He explained that the color was yellow-gold.

As our discussion continues, I attempt to engage more student-student interaction with follow-up questions that get the students talking to each other. For example:

- Will you explain that more to your classmates?
- Who has a question about (student's name) observations?
- What do you think about what (student's name) has shared?

Trying to get students to talk to each other is an interesting process. Even when one of their classmates asks them a question, they turn and respond to me. I prompt them to talk to their classmates, not just to me. As we wrap up, I ask if anyone has any other questions. Oftentimes they do. When the question is directed at me, I re-direct the question to the class. I don't want to be the one who has all the answers. I want the students to learn from each other, too.

While we listen to each other share our observations, I reinforce what my students are doing correctly, and I remind them about what they may be missing or doing incorrectly. My responses tend to focus on using their notebooks correctly, recording descriptive observations, and using evidence in their explanations. In addition, I am ensuring that my students are creating meaning and conceptual understanding, while addressing any misconceptions they have. For example, the student who noticed the yellow-gold flakes in some rocks thought he found gold. He couldn't wait to tell his friends in another class. We discussed what we could do to find out, instead of making the statement without evidence. We discussed what Ranger Mary might do to find out if we had discovered gold. Bringing up Ranger Mary again was a wonderful way to reinforce what scientists do, how we use evidence, and what we do with our evidence. Most important, my students are developing good listening skills, learning how to share what they are learning, and coming together as a community of learners with the goal to succeed in our academic endeavors.

Elaborating With Tools

For their elaboration, my students take another nature walk, but this time with a specific task. I provide magnifying glasses for the students to get a closer look at their surroundings. In addition, I provide each student with a baggie labeled with their name so they can collect three items that are

on the ground, would fit in a baggie, and could be prepared for further study in the classroom or under a microscope. Of course, they cannot include a living creature or pick leaves and flowers from live plants. Students end up with a wonderful assortment of rocks, leaves, twigs, pine needles, bits of pine cones, tree bark, soil, sand, and feathers. Once the students have finished their walk and discussion, they return to the classroom, put their baggies in the science center, wash their hands, and begin to illustrate and label their favorite observation from our nature walk (see NSTA Connection).



Evaluating Their First Science Experience

When my students have completed their nature walk illustration, they complete an "exit ticket" in their science notebook. An exit ticket is a quick and easy way to formatively assess student learning. In their notebooks, students write about two things they learned about being a scientist and two things they learned about science. This final assessment, along with their observations, questions, illustrations, and notebook, serve as a guide to plan future science lessons.

Since it is the start of the year and the students are still learning how to use notebooks, many of my early lessons revolve around accurate notebook entries. For example, when my students illustrated their favorite observation, some students added colorful flowers to their illustrations that were not present on the school grounds. They did not shade in the bark of the trees in the correct color. We discuss, I model, and then we practice how to provide accurate representations of data and evidence.

By using formative assessment activities embedded within each phase of the learning cycle, I collect valuable information about my students with respect to their understanding, abilities, needs, and interests. As the students are observing nature and collecting samples, I use a checklist to record their participation, note-taking, interactions with peers, and tool use (see NSTA Connection). Because we are in the first two weeks of school, I do not expect mastery. My goal is to introduce my students to the processes of science within the context of the disciplinary core ideas they are studying. I want my students to develop good science skills that they can build upon as the school year progresses.

Establishing a Science Center

Now that my students have had some introductory science experiences, it is time to create a science center in the classroom. The students will keep their baggies in the science center where they can observe and record information about the contents in their classmates' baggies or from the slides I prepare and display for further

study. It is a place they can go when their other work is completed. In addition to their baggies and microscopes, there is a science word wall. Our first words are *science*, *scientist*, *observe*, and *senses*.

In addition to our science word wall, I use an interactive bulletin board for questions that arise during inquiry. If we have a question without an answer, it goes up on the science bulletin board. Some of our first questions come from our nature walk. In this case, the first thing students wanted to know is whether we found gold. “How can we find out?” “What are the tests for gold?” and “Who can we ask?” are a few questions that we put on the bulletin board. Any questions the students wrote in their notebooks that we cannot answer also go up on the interactive bulletin board. Sometimes the students find the answers. Other times, the answers come from follow-up science activities that were designed around student interest and questions. Fortunately, with respect to finding gold, the students study rocks and minerals. They are able to conduct some investigations to answer their own questions. Of course, they are very disappointed when they learn they have discovered pyrite or Fool’s Gold instead of real gold. Disappointing discoveries aside, it is motivating and challenging for students to find the answers to their questions. The science center grows over time as students have new science experiences. Vocabulary, questions, books, tools, specimens, and simple investigations are added.

Since all the students collect rocks during our first nature walk, the first center allows students to investigate rocks and minerals. They measure and weigh their rocks. They conduct Mohs Scratch Test to determine the rock’s hardness. They test for minerals by using vinegar. They determine if their rock will sink or float. Using their observations and investigation data, they can compare their results to a classification key to see if they can identify the rock type. In addition to the science tools, there are books about rocks, minerals, and geology. And last, but not least, there is a sample of rocks and minerals.

Wrapping It Up

Writing activities can be used to teach the writing process and to extend science into other content areas. After the nature walk is completed and the science center is established, it is time to write thank-you letters to Ranger Mary. Thank-you letters to guests build community relationships. By building those connections, I am ensuring that my guests will come back to my classroom to share their expertise and love of science. The students thank Ranger Mary for teaching them. They share what they learned during their nature walk. If there were any questions we could not answer that we think Ranger Mary may be able to answer, the students include it in

their letters. It is exciting to collect evidence of student learning in the letter. Our science experience has come full circle back to our guest scientist.

Science All Year Long

The start of the school year is a wonderful opportunity to establish a science routine that includes time for quality science. By starting your school year with science, you can assess your students’ skills and understanding of important science concepts. Assessing prior knowledge and skills allows you to design developmentally appropriate and integrated science units that will engage and delight your students and you for the entire year. The important thing is to do science with your students every day. ■

Brenda Turgeon (brenda.turgeon@purdue-cal.edu) is an assistant professor of elementary science education at Purdue University–Calumet in Hammond, Indiana.

References

- Bosak, S. 1992. *Science is...* New York: Scholastic/Firefly Books.
- Zike, D. 2002. *Teaching science with foldables*. Columbus, OH: Glencoe/McGraw Hill.

Connecting to the Standards

This article relates to the following National Science Education Standards (NRC 1996):

Content Standards Grades K–4

Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Standard B: Physical Science

- Properties of objects and materials

Standard C: Life Science

- Characteristics of organisms

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.

NSTA Connection

For the nature walk observation worksheets and checklist and the science notebook rubric, visit www.nsta.org/SC1207.



Copyright of Science & Children is the property of National Science Teachers Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.