Many teachers and students have experienced the classic pet rock experiment in conjunction with a geology unit. A teacher has students bring in a “pet” rock found outside of school, and the students run geologic tests on the rock. The tests include determining relative hardness using Mohs scale, checking for magnetization, and assessing luster. (For an example of such an activity, look under Internet Resources at the end of this article.) While this type of lesson is concise and direct, we have found a new way of targeting the same Earth science benchmarks for upper elementary students. We used an inquiry-based approach for students to learn about geology as they befriended their pet rocks.

From Tradition to Inquiry
One of the most vexing parts of conducting inquiry is making sure that student exploration occurs before the explanation of the content. Many teachers believe that the students will not know what to do without some fundamental base of knowledge prior to an activity. This reasoning is evident in the traditional lessons, which tend to take all of the decision making
On the first day, we gave the students the instruction, “Make observations about your rock.” We provided students with whatever tools they requested to help them make observations (a string, a ruler, crayons, a magnifying glass, a magnet). Our goal was to make sure students’ observations were as detailed as possible, so we made the things they requested available without leading the students or telling them what observations to make. Each student wrote his or her findings in a science journal. We were amazed to see what the students came up with on their own when given the tools and freedom to do so. One of the students wanted to tie a string to her rock and see how long the rock would “stay”—not the most scientific test of weight, but it sure was creative. Another student wanted to see what would happen if he put his rock in water (Would it change color? Would it affect the water?). This was a good evaluation of the students’ observational skills because the students were given a new situation—one without specific instructions—in which to demonstrate their ability to note details.

Once the students completed their observations, we had them share their findings with the class. The students then came up with a list of all the different characteristics the class observed about the rocks, and we made sure each student had written down at least the fundamentals about their rock (where it was found, mass, size, shape, and color). Finally, we told the students to name their rocks, for they would soon become good friends with their rocks during the inquiry-based geology unit!

**Our Take**

Our geology unit was fashioned to fit our textbook’s sequencing, which began with rock basics and progressed through rock types and the rock cycle. We fit our rock inquiry around these parameters to move the unit from a textbook-driven study to a student-driven one. The unit began with the idea that rocks are made out of minerals. The way we broached this topic was simply to ask, “What do you think your rock is made of?” This led us to an investigation of what the “tiny things” in students’ rocks were. We asked the students to play detective to investigate the minerals. The students had to determine how they could identify which minerals were in their rock. They made and recorded observations about the properties of the minerals in their rock. The discussion started on the students’ end; if they came up with those properties, we were happy. However, if they hadn’t come up with the properties by the end of the discussion, we would ask leading questions to try to flesh them out. (e.g., Is it shiny? Luster was
a good example of this, as most students didn’t think of it.). Some students were able to use a chart in their book to identify a mineral by name. If an identification chart is not available to you, David Dillon has put together a website of minerals commonly found in rocks with listings of the minerals’ names and corresponding properties (see Internet Resources at end of article). In our opinion, it was not important that our fourth-grade students were able to identify the minerals by name, but it was important that they could identify the properties of the minerals in their rocks and know what traits to look for when identifying different minerals in other rocks.

Again, the students recorded their findings in their science journal, as they did throughout the unit. An example of what we would expect for a student journal entry would be something like the following simple explanations:

- **Luster:** dull
- **Color:** brown with blue in it
- **Granular size:** small (can’t see different grains)

An informal assessment of the class, consisting simply of walking around and asking questions, was adequate at this point to evaluate students’ progress with the material. We were looking to see if they could properly identify the properties of the rock. For example, we might ask, “Would you say the granular size of the rock is large, medium, or small?” Or we might ask the student to compare the granular size to that of other students’ rocks. Because of the small class size and because we had two teachers, we were able to get around to everyone and elicit discussions with each student.

After students completed their observations, they shared their mineral discoveries with the entire class, again giving us time to reflect on what they had learned. A trend began to pop up at this point: Most of the students were eager to share their findings and would jump at any opportunity to discuss their rock.

We used a recurring method throughout the unit. Every time we came to a topic that the students could explore about their rock, we let them investigate. For example, before coming to the topic of Mohs hardness scale, we asked the students, “How hard do you think your rock is?” and “How would you figure out how hard your rock is?” We gave them different things (for example, a nail, a penny, and a scratch plate) to test for different levels of hardness, asking them if their rock is harder or less hard than each thing and how they could tell. Asking, “How hard is your rock compared to each other’s rock?” led to small “battles” between their rocks to see which one was the hardest. Eventually the students realized that they needed to make a standardized scale to be able to measure how hard something is. Thus the students discovered the need for Mohs hardness scale. When we were done discussing the scale, we tested the students to see if they could estimate the Mohs hardness number for their rocks. We also made sure that students realized that hardness is an important characteristic for rock and mineral identification.

Again, each time the unit came to something that students could test or examine about their rocks, we let them explore. The enthusiasm generated by this method was unparalleled. Our students were comparing rocks, asking each other what minerals were in their rocks, how hard were their rocks, and anything about which they were curious. Any time an investigation came up it became a fun class discussion about the properties of each other’s rocks and how each rock was unique. The students’ written observations in their science journals provided a good way for us to track student progress and understanding over the course of the unit.
of the unit. Their observations were also useful as a device for mid-unit evaluation.

Assessment
By the end of the unit, the students had a full list in their journals of new observations and discoveries about the properties of rocks in general. They had also compiled a storehouse of knowledge about their own rocks. Instead of a traditional multiple-choice, vocabulary-driven evaluation, we kept the evaluation in line with what the students had been doing during the unit. We had students write an essay with the directions, “Make observations about your rock.” The students used the rubric (see Figure 1) to guide their essay. We found, through a bit of trial and error, that without a suitable guide, the students did not have a clear idea of what was expected of them on the assessment. Making the rubric available to the students ahead of time was the most appropriate way of enlightening the students and giving them the opportunity to share their discoveries about their rock.

To extend and apply the students’ newfound knowledge, we had the students switch rocks and complete the same evaluation. Students used their observations about their own rocks to help them make sure they looked for the essential characteristics of the unfamiliar rock. This method gave the students a chance to apply geologic concepts to a new situation.

This type of evaluation may seem inherently difficult. Writing an essay is trying at best for fourth graders. We did not hesitate to return the essay to students with comments on how to make improvements. Our students went through at least two revisions of their essay (first without the rubric, second with it) before we felt the essay fully showed what the students knew. An example of a student’s final essay appears in Figure 2. It was amazing to see the students not only succeed, but also enjoy a task as challenging as this assessment.

The students’ relationships with their pet rocks helped forge geologic ideas through fun investigative activities. Their ownership of the material helped them remember the information and gave them the idea that learning about science can be rooted in the real world and even fun. Using inquiry as the structure for the unit and the investigation of a pet rock as the shell can help your third- through fifth-grade students succeed in any unit involving rocks and their properties.

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Acknowledgments
This article was funded in part by the National Science Foundation Graduate Teaching Fellows in K–12 Education program, grant number NSF DGE-0231853, and Dr. Steven J. Van Hook, director of the PRISM program at Bowling Green State University.

References

Internet
The Society for Mining, Metallurgy, and Exploration Rock Critters/Pet Rock Activity
www.coaleducation.org/lessons/sme/elem/11.htm
Mineral Identification Chart
www.ontariogeoscience.net/lessonplans/mineral-id-chart.html

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

Content Standards
Grades K–8
Standard A: Science as Inquiry
• Abilities necessary to do scientific inquiry
• Understanding about scientific inquiry
Standard D: Earth and Space Science
• Properties of Earth materials (K–4)
• Structure of the Earth system (5–8)