AAAS ScienceNetLinks

Sampling Rocks

MATERIALS

- *Everybody Needs a Rock* by Byrd Baylor

PURPOSE

Students will learn about sampling through an investigation of rocks found in the schoolyard.

CONTEXT

In grades K-2, learning can begin that will eventually lead to students' having a good grasp of everyday statistics.

In this lesson, students will collect and analyze a sample of rocks from the schoolyard. Students will array the collected rocks by characteristics such as size, weight, and color, to see if any generalizations can be made about the types of rocks that can be found in the schoolyard.

This lesson will introduce students to the notion of a sample, and how the size and method of collection of a sample can bias findings.

MOTIVATION

Show students a rock that you have collected from the schoolyard. Ask students to describe it in words (big, small, smooth, bumpy, light, dark, spotted, heavy, round, flat, etc.)

Then have students measure and weigh the rock, recording information about the sample rock for future use.

Note: If necessary, use this time to review any developmentally appropriate measuring techniques that students will be expected to use in the course of the lesson, such as using a ruler or string for measuring length and using a balance and cubes to weigh an object.

Tell students that they will create a "rock guide" for the schoolyard. In order to create the guide, they must collect and observe rocks from the schoolyard and record their findings. Their goal is to gather information about the characteristics of the rocks that are most commonly found on the schoolyard.

Ask students:

If we are going to create a guide to the types of rocks that can be found on the schoolyard, how should we go about collecting the rocks?

Do we have enough information from this one rock to create the rock guide? Why or why not?

How many should we collect? Will one or two be enough? Why or why not? Introduce the notion of a sample and the importance of sample size and the manner in which the sample is collected.

Could we possibly collect all of the rocks from the schoolyard? If not, will we still have enough information to create a rock guide? Why or why not?

How can we use some of the rocks to give us a good idea about the rest?

Where might you find rocks on the schoolyard? Should we collect rocks from some or all of these places? Why?

What kinds of rocks do you expect to see? What will they look like? Feel like?

Should we look for only certain kinds of rocks?

DEVELOPMENT

Once the class has created a plan for gathering the rocks, allow students to collect their sample of rocks from the schoolyard. When students have collected the rocks and returned to the classroom, break into small groups. Allow time for students to share and compare their rocks. Have them classify the rocks into groups according to size, shape, color, and texture.

Students can take turns grouping the rocks according to the properties of their choice, while their team members guess the rule that they are using. Have groups share some of their sorting rules with the class.

In this part of the lesson, students will arrange the collection of rocks from smallest to biggest on the floor or along the ledge of the blackboard.

Begin with the rock used in the Motivation of the lesson, and ask students:

> Is your rock smaller or bigger than this rock?

Continue using the strategy of comparing two rocks at a time, asking "Is it smaller or bigger?" each time. Have each student place his/her rock in the appropriate place along the distribution.

When students have created an array of rocks (ordered from smallest to biggest), ask them:

> How many rocks are there altogether?
>
> Which is the biggest rock? The smallest?
>
> Which rock is in the middle?
>
> Are there places along the line where there are lots of rocks that look about the same size? Where? How many rocks seem to be that size? What size are most of the rocks?
>
> How could we decide whether or not these rocks are actually the same size?

After asking the last question above, model the use of a ruler, tape measure, string, or cubes to measure and compare the size of the rocks. Allow student volunteers to measure the rocks to determine the actual size.

Have students weigh their rocks using a balance and unifix cubes, if available. Then have students create a cube train using the appropriate number of cubes to represent the weight of the rock. Have them arrange the cube trains so that they are standing vertically along the floor or chalk ledge, going from smallest cube train to tallest.

You could have students answer the questions above again, using this graphical representation to determine the extreme and middle values.

You could repeat the procedure and questioning strategies above, arranging the rocks from lightest to heaviest. If desired, allow students to arrange the rocks according to other characteristics such as smoothest to bumpiest, lightest to darkest, etc.

Finally, ask this question:

> What can we learn about the rocks on the playground by looking at this collection of rocks? Do we need more information? Why or why not?

Read *Everybody Needs a Rock* by Byrd Baylor. In this book, Baylor gives students ten rules for finding the “perfect” rock. Discuss what Baylor would define as the perfect rock. Could you find that kind of a rock in the schoolyard?

Ask students:

> If each one of us were to follow the author’s rules for finding the perfect rock, what would happen?
>
> What do you think the collection of rocks would look like? Why?
>
> Would this be a good sample of rocks to study? Why or why not?
>
> How might following these rules affect our sample?

Allow students to search for their own "just right" rock, either in the schoolyard or at home. Have students complete a journal entry using words and or pictures to describe the rock that they have chosen.

Ask students:

- Where did you find the rock?
- Were there others around that were like it?
- Describe your rock.
- How big is it?
- How much does it weigh?
- Is it like the rocks that are usually found on the playground? In what way?

ASSESSMENT

Ask students:

- Do you think that we have enough information to create a guide to the rocks found in the schoolyard? Why or why not?
- How did studying a small group of rocks help us learn about the large number of rocks that are on the playground?
- Can you think of other objects that we could study by looking at a sample?
- If we were going to study that object, how many should we look at?
- How should we choose which objects to look at?

Create a class book showing the results. Include information about the sample that students looked at and how they got that sample. Some of the pages might show the information that students learned about the most common rocks found on the schoolyard. For instance, most of the rocks on the playground are __ cm long and weigh __ cubes. Other pages could include information about the darkest, lightest, smoothest, bumpiest, biggest, and smallest rocks that students found.

EXTENSIONS

For more ideas on how to incorporate data analysis into science, mathematics, and literature lessons, go to **Exploring Data (http://mathforum.org/workshops/usi/dataproject/usi.elemlessons.html)** on the Math Forum website. See Carol Hurst's Guide to Teaching Mathematics through Literature.

For information on how to set up a **Rock Swap (http://www.fi.edu/fellows/fellow1/oct98/collab.htm)** for comparing data in different schools, visit Rock Hounds, sponsored by the Franklin Institute.

For other ideas on how to use *Everybody Needs a Rock* by Byrd Baylor in the classroom, see the **Everybody Needs a Rock (http://www.educationoasis.com/curriculum/LP/SCI/everybody_needs_rock.htm)** lesson plan

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