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K-2 Methods

Method 1: Answering Science Questions Using Models.

To study a natural geoscience process, students might find it useful to build and test a model. Scientists use models to study processes and phenomena that are too big, too small, too dangerous, too complicated, too far away or take too long to study directly. For example, meteorologists and climatologists use computer models to study and predict weather and climate patterns. Other geoscientists might use stream table set ups as models to study erosion patterns. Your students might choose to use models to study the Solar System, weathering and erosion, the Earth's interior, volcanoes, glacier movement, icebergs or many other geoscientific phenomena.

Younger students, with guidance, can use existing models in their science projects, but older students may be capable of designing and building their own models. Consider having older students work in groups to design and build their models, so that they can draw upon the expertise of other group members.

Questions for students to consider in using model-based science projects are:

1. How is my model similar to the real thing? (For example, a stream table model can use actual soil, sand and water.)
2. How is my model different from the real thing? (The same stream table model mentioned above might be much smaller than the phenomenon the students are investigating.)
3. What can I do to improve my model? (Students can have you or their peers critique their models and offer suggestions for improvement.)
4. What did I learn from using my model? (Students should discuss their observations as they use their models as well as afterwards.)

If it is practical, students should consider including their models with their science project displays. That way, they can demonstrate exactly what they did and explain what they discovered from using their models.

Method 2: Answering Science Questions by Conducting a Survey.

Older students might choose to use a survey method to test a science question that has social, environmental or economic aspects to it. For example, they might want to survey classmates and/or community members about their water use, energy use, preparedness for natural hazards or products used to enrich the soil in their gardens.

Survey projects may appear to be easy options, but it takes a great deal of thought and skill to design a survey and select a sample of participants that will provide useful and valid data.

Students doing survey projects need to ask themselves:

1. What do I really want to find out from my survey? (For example, what percent of people in my class use oil to heat their homes with oil and what percent with electric heat? How does this compare with the national average?)
2. Who should be in my sample of people to take the survey? Why those people? (Students could use their classmates and their parents or guardians, or a wider sample. The sample should be as representative as possible of the community.)
3. How will I protect their privacy? (Students should let survey participants know that no names will be reported out in the study. All data will be anonymous.)
4. How long should my survey be? (Students will find that they get greater participation with shorter surveys than with longer ones.)
5. Should the questions be open-ended (fill in the blank) or should I give people answers to choose from (closed-ended)? (Closed-ended responses are easier and quicker to score. Open-ended questions take longer to score and the data are more difficult to pull together. However, open-ended questions also provide more information.)

6. How will I distribute my survey? How will I get it back? (Students can distribute their surveys and have a box or envelope to collect them. They can also ask the participants the questions themselves and write in the responses.)
7. How will I organize and analyze the data I get from my survey? (Students can organize data in tables or charts. They can analyze by adding up the numbers of responses for each item and dividing the number of each response by the total number of responses for that item. For example, if the student asked 20 classmates how they heated their homes and 5 said with oil and the other 15 with electric heat, the student would report 25% heated with oil and 75% heated with electricity.)
8. How will I report out what I find from the data? (Students can report out in a number of ways, but large graphs or histograms are easy to see and understand.)

Method 3: Answering Science Questions Using a Field Study.

Both younger and older students can ask science questions and answer those questions by making observations outdoors. Environmental studies are particularly good for this, but students can also find examples of erosion, study rock layers and types, collect fossils, test soil, monitor the weather and do many other geoscience projects outdoors.

As with all science projects, the student must first be clear about what his or her science questions are. Some examples might be:

1. What types of rocks are common in my area? Why is that?
2. What type of soil is common in my area? What grows in this soil?
3. What fossils are in my area, if any? Why is that?
4. What effects does erosion by water have in my area? How do people prevent that erosion?
5. What is the average rainfall for my area for this month? How does this compare to the annual average for this same time?
6. What birds live in my local area during the winter? Why do these birds choose this area?
7. What is the water quality in my local stream/pond/lake? What affects the water quality?
8. What effect is ozone having on plants in my area? How can I tell?

Field studies usually involve a set method (protocol) for collecting the data. For example, if a student decides to measure precipitation in his area during the summer, he will need a rain gauge. The rain gauge is a graduated container used to collect and measure precipitation. A protocol for measuring precipitation will direct the student how to set up the rain gauge, when and how to make measurements, and what information to record in a notebook. The student will collect the observations over time, and then calculate the daily average precipitation over that time. He might also report the range of the amount of precipitation (most to least).

There are a number of field studies run on a national level in which students can participate as "citizen scientists." Following protocols is particularly important if students are participating in national studies. Some of the national programs in Citizen Science include the U.S. Geological Survey's Did You Feel It? Earthquake, Breeding Bird and Invasive Species Monitoring projects and NASA's Ozone Monitoring Gardens.