Instructional Scenario for Benchmark 11B (6-8)#3

Instructional Scenario A

Mr. Short's 7th-grade class spent Tuesday at Woodland Center, the school system's own deciduous forest preserve.

On Wednesday, back in their classroom, the group constructed a list of all the organisms they had observed in the wooded area. Mr. Short added some organisms that lived there but had not been observed by the group, such as owls. He wrote the names of the organisms in random places all over the chalkboard.

"Let's think about how all these organisms are related by their feeding habits," said Mr. Short. "We could show what organisms are food for what other organisms by connecting them with lines. For example, what would the mice be food for?"

"Owls," Clarissa said. "Remember how we found mice bones in the owl pellets we dissected?"

Mr. Short drew an arrow from the word mice to the word owl. Sarah suggested that nectar from flowers provides food for bees, and Mr. Short indicated that relationship with another arrow. Soon the entire board was covered with lines connecting organisms with other organisms. Many times an organism served as food for several other organisms so that the lines crossed each other to show many linkages.

"We call this a food web," said Mr. Short, "for obvious reasons. All these organisms are connected in complex ways by their feeding relationships."

"We could model this food web in another way, too," continued Mr. Short. He gave each student a sign on which was written the name of a woodland organism. He had the students stand and hold up their signs. This time he used string to connect organisms to other organisms for which they provided food. By the time the class had named all the feeding relationships they could, they were entwined in a large tangle of string, and, in fact, Mr. Short's ball of string had been used up.

Laughing, the students untangled themselves and sat down.

Mr. Short returned to the chalkboard. "Here's another way we could represent feeding relationships among the woodland organisms," he said. He drew a pyramid and divided it into three levels. The bottom level was largest, with each higher level being smaller than the one below it. "This bottom level," said Mr. Short, "represents the energy of the producers in the woodland food web. Above it is the energy of the primary consumers, those organisms which eat the green plants or their products. For example, the squirrels would be primary consumers because they eat nuts produced by trees. Next, above that, is the energy of the secondary consumers, such as owls which might eat the squirrels. You see that less energy is available at each level."

"Now let's think about the models we have just used," said Mr. Short. "We have represented the feeding relationships among woodland organisms in three ways: with the food web on the chalkboard, modeling it with our own bodies and string, and drawing an energy pyramid. What would happen in a food web if one organism were removed? Suppose, for example, all the rabbits died of a disease. How would the other organisms be affected?"

“Some would be hungry,” replied Jim. “Owls, for example, and maybe the foxes.”

“Which of our food web models would best show what happens when one animal is removed?” asked Mr. Short.

“Well,” said Craig, “the food pyramid wouldn’t be good for showing that at all, because it doesn’t show single kinds of organisms, just groups, like primary consumers. I think the food web diagram on the board would be best because you would erase the animal’s name and it would be clear that the rabbits weren’t going to be food for anybody anymore.”

“I think the model we made with our bodies and string would be better,” said Alicia. “The person representing rabbits could just leave the group, and the strings would be hanging there.”

“Both of you give good reasons for your answers,” commented Mr. Short. “We use models often in science. It’s important to remember that different models can represent the same thing. You have to choose the model that best serves your purpose.”

Instructional Scenario B

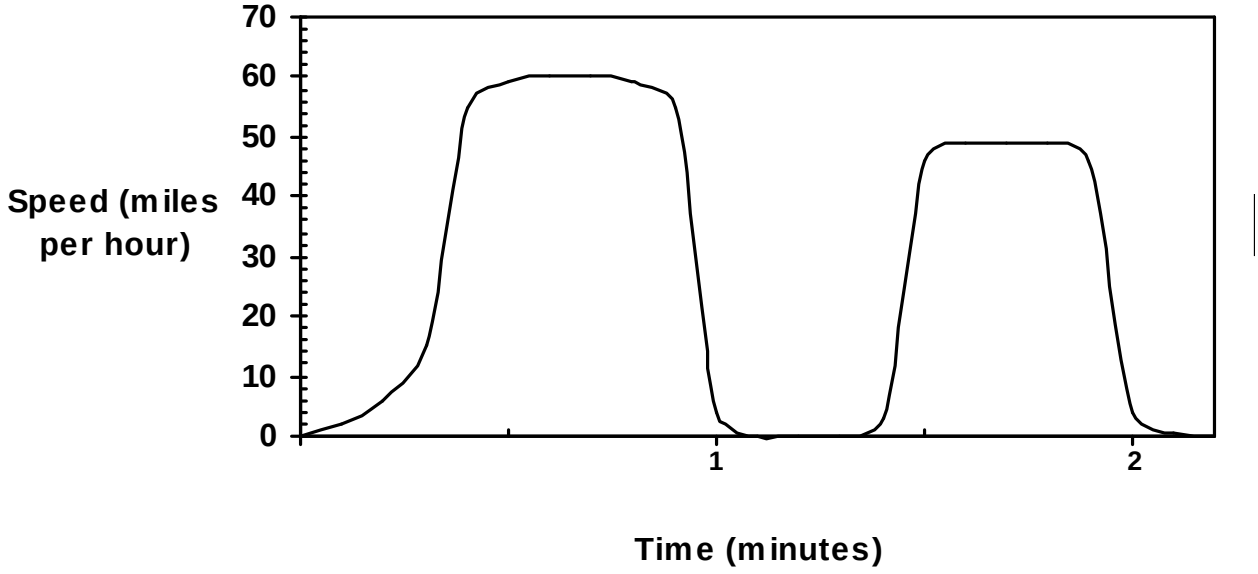
Mrs. D'Adamo's 8th-grade class was studying speed.

Mrs. D'Adamo showed the class a transparency of the graph below. "What does this graph tell us?" she asked.

After thinking for a few minutes, Rene replied, "It shows how the speed of some vehicle keeps changing."

"Can you use the graph to make up a story about the trip this vehicle is taking?" Mrs. D'Adamo asked. "I'd like you to write down your story. Tell what kind of vehicle it might be and why it might go slower or faster at certain points in the trip."

The students studied the graph and then wrote their stories.



Instructional Scenario C

As the 7th-graders entered the room, they noticed that the supply table was covered with interesting materials: clay of various colors; plaster of Paris next to a container of water; newspaper, flour, and a bucket of water; large cubes of styrofoam; paint, brushes, and markers; sponges and paper towels.

"Looks like we might do papier-mâché again," Lois whispered to Myesha as they went to their table.

"Now that we've learned about the structure of our earth," Ms. Broom said to the class, "I'd like you to work in pairs to make a model of the earth. You may use any of the materials on the table. If you need other materials, I'll try to find them for you. Look back at our classwork or at references if you wish to do so. Just be sure you have clean hands when you pick up a reference book, please."

The students worked on their models for the whole period.

When they entered class the next day, they found the models displayed around the room.

"Look at the variety of models you have created!" said Ms. Broom. "I'd like each pair to tell briefly how they decided to make their model as they did."

"We made ours to scale," Everett said proudly. "We decided it was important to people to realize how thin the earth's crust is compared to the other sections inside the earth."

"We reread the story about the discovery of the Moho," Myesha said. "So we put a little label on our cross-section to show the Moho."

"Ours has brighter colors to show how the temperature increases toward the core," Andrea commented.

After all the students had explained their model development, Ms. Broom brought out the globe.

"Here's another model of the earth," she said. She placed it on a table.

"Now I'd like you to think about how different models are useful for different things. Please select one of the models we made yesterday (not your own), and compare the ways it is useful with the ways the globe is useful. You may work with a partner if you wish."

"That's simple," Myesha whispered to Lois. "They each have different uses."

Instructional Scenario D

"I'd like everybody to look at this," said Dr. Haselden.

Each 6th grader examined the fossil carefully, turning it over and over and looking with intense interest at the imprint of an ancient fern.

"Today we'll make models of this kind of fossil," Dr. Haselden said. He distributed to each group a leaf, a paint brush, a small cup of salad oil, a paper bowl, a cup of plaster of Paris, water, a Popsicle stick, and a bowl for mixing.

Following Dr. Haselden's directions, the students first "painted" their leaves with salad oil. They then placed them in the paper bowls. Next they mixed water and plaster of Paris and poured this substance over the leaves. Dr. Haselden worked with Maria, whose vision was impaired, making sure she felt all the items used. The students then set the bowls aside.

The next day the students found that the plaster of Paris had hardened. Dr. Haselden showed them how to peel off the paper bowl and to gently remove the leaf. They were delighted.

"Oh!" cried Maria as she rubbed her fingers over the leaf imprint. "I feel where the leaf shape made a mark!"

"Look at mine!" called James. In his hurry to show his model to Malcolm, James dropped it. It broke into several pieces.

"Never mind, James," said Dr. Haselden. "You can make another one. But let's all think about something. I told you we would make a model of a fossil. How is your group's model like a real fossil and how is it different? I want you all to think about that, then share your ideas with a partner and write down your responses. You may refer to reference books if you wish."

"We've got a lot more differences than likenesses," said Malcolm after about ten minutes.

"So do we," agreed Graciela.

As students shared their responses, Dr. Haselden wrote them on the chalkboard:

- Imprint fossils are formed naturally, not made by people.
- Imprint fossils are usually formed at the bottoms of seas or lakes in sand or mud that has hardened into rock, not in plaster of Paris. Fossils take a lot longer to form than our leaf imprints took.
- Most things just decay rather than becoming fossils. We made imprints from ALL our leaves.

The main similarity the students listed was that both their leaves and the ancient leaves had left imprints.

"So you see," concluded Dr. Haselden, "models are often very different from the things they represent. Your home assignment is to write a paragraph telling why it's always important to identify just how a model is different from the thing it is modeling. Be sure to give examples to support your ideas."