Lesson: What is a Model?

Concepts:

- A model is a representation of something else.
- There are many different kinds of models.
- Models are not exactly like the real thing but they are good enough for representing some aspects of the real thing.
- All models have strengths and limitations.

Skills:

- Observing and analyzing a variety of models.
- Communicating ideas about models.

Materials: toy truck, globes

Safety: There are no safety considerations for this lesson.

Engage

Begin the lesson by exploring the students' existing ideas about the word 'model'. Students can record their ideas in notebooks or you can create a class chart of their ideas. Encourage students to share their ideas (anticipate students will talk about fashion models, toy models, and role models). Using an example of a toy model such as a toy truck, ask: Is this toy model exactly like the real thing? In what ways does the toy model differ from the real thing? In what ways is the toy model similar to the real thing? Why do people create toy models?

Explore

Have pairs of students identify and list models they see in their classroom. For each model, ask them to answer questions such as: In what ways does the model differ from the real thing? In what ways is the model similar to the real thing? Why do we use this model in the classroom?

Explain

Tell students that scientists use models to help explain ideas and make predictions of future events. For example, scientists draw pictures of life cycles to help us understand more about life cycles and scientists build models for the solar system to help us understand how objects in our system relate to each other. Models help people to think about complicated phenomena (e.g., the water cycle), things that we cannot see (e.g., energy flow, molecules), events that happened a long time ago (e.g., dinosaurs), and processes that are very slow (e.g., mountain building, rock weathering).

In general: A model is a representation of something that is real that helps us to understand more about the real thing.

Elaborate

Distribute globes to small groups of students. Tell the students that when using models in science, it is important to think carefully about the model because no models are perfect. Instead they are 'good enough' for helping to understand certain aspects of the real thing. Every model is a 'good enough' model. Post the following questions:

How is this model like the real thing?
In what ways is the model not like the real thing?
In what ways does the model help you to understand about the real thing?
What incorrect ideas could people have if they believed that this model was the real thing and not a model?

Have student groups analyze the globes and record their answers to the above questions. Children who have a naïve understanding of models will tend to answer that the globe is a copy of the Earth or just a smaller version of the Earth. With time you would want these children to grow towards understanding that a globe differs in a variety of ways from the Earth. Some typical Grade 5 answers to the above questions include:

- How is the model like the real thing: shows locations of water, land masses, some cities, both the globe and the Earth are spherical, tilted, and can turn
- In what ways is the model not like the real thing: different size, made of different materials, really cannot see the equator and lines of latitude and longitude, does not show streets, people, countries are not pink or yellow, the Earth does not have words on it
- In what ways does the model help you to understand about the real thing: shows places and locations, helps to understand spin and tilt, and helps to understand distance
- What incorrect ideas could people have if they believed that this model was the real thing and not a model: that the world is plastic, borders are really there, and that the world is hollow

Children's responses adapted from: Gustafson, B.J., and M.-C. Shanahan. 2010. Children thinking about models: analyzing a globe. *Alberta Journal of Educational Research* 56 (4): 435–457.

Evaluate

Have each group share their globe analysis.

Review children's answers with the whole group. Ask questions such as: Why is it useful to have a classroom globe? How do you have to use your imagination when you use a globe?

Ask additional questions such as: How could a pencil sharpener be a model for eating and digesting food? Tell students it is important to understand that some models look like what they represent (a globe) and some models do not (the pencil sharpener). Both kinds of models are still useful for helping to understand something about the real thing.

Closure: Ask questions such as: How would you describe what a model is to someone who has never even heard the word before? (anticipate a variety of answers such as 'something that represents something else' or 'something that shows something else') Is

it possible to make a perfect model? (No.) Why or why not? (models are human inventions; all models differ in some way from the real thing; some models are designed to highlight just one aspect of the real thing) How can models result in you misunderstanding the real thing? (not everything about the model may be accurate)

Lesson adapted from**:** Gustafson, B.J., M.C. Shanahan, S. Gentilini, P. Mahaffy, and B. Martin. 2008. *Understanding models in science*. Edmonton, AB: Unpublished teaching resource.