Creating a Physical Model

Objective – to create a physical model using indirect observation and inferences.

Materials (per 3-4 students)
- Plastic container (approx 12"x6"x4")
- Sand
- Grid paper (2 different resolutions)
- Thin rod (such as a bamboo skewer)
- Legos

Directions
1. Prior to the activity prepare the plastic containers by building shapes out of legos, placing the shapes in the plastic containers and covering them with sand (see suggested design above).
2. Without mentioning anything about modeling, pass out the containers and tell the students their goal is to create an accurate depiction of the object in the container.
3. Pass out 2 copies of the low resolution grid paper, one with holes at the intersection points and one without holes to draw the model on.
4. Instruct students to place the grid paper with holes over the top of the container and use the rod as a probe to determine the shape of the object. As an extension students could use the rod and a ruler to accurately measure the height of the object in order to create a 3-d model. The height could be represented on the 2-d drawing by color or shading.
5. Students should draw the model on the 2nd copy of the grid paper. With the low resolution they will have to make a lot of inferences/guesses as to the exact shape, but that’s the idea.
6. Repeat steps 3, 4, and 5 with the higher resolution graph paper. Students should get a much more accurate picture of the shape of the object.
7. Allow students to remove the object from the container and compare it to their drawings.

Discussion/Post Lab questions
1. How accurate were your representations of the model?
   Students should notice that neither of the models are completely accurate and miss the finer scale structures of the legos and the exact shape and size.
2. Which representation was more accurate? Why?
   Hopefully the representation from the higher resolution grid will be better. Students should say something about the fact that there were more observations which allows for more accuracy.
3. What could you do to make a perfectly accurate representation of the model?
   Make grid paper and a container with an infinite number of locations to test with the rod.
4. What effects does resolution have on creating a model?
   Increased resolution makes the model more accurate but also requires more measurements each of which has to be plotted, therefore greatly increasing the time needed to construct the model.
5. What are some examples of actual models that you know of?
   Depending on the level of student, answers will vary but may include: Earth’s interior, Sun’s interior, Atomic structure models, Human body models, Population growth models, Economic models, Climate and Weather models, Genetic models.
6. Which of these are created through indirect observations and inferences like the ones you used to make this model?
   Anything that we can’t see.