Topic: Creating a Scientific Model

Summary: The goal of this lab is to have students make predictions based on data without ever finding out if their prediction is actually correct. Concepts like iteration, using data from experiments, and prediction make up the core of the lesson.

NGSS Standards: Scientific Practice: Developing and Using Models.

Time Length: 90 minutes

Prerequisite Knowledge: what is a model, different types of scientific models (physical, conceptual, mathematical)

Materials:
- Black box bucket with lid
- Sink and faucet
- Whiteboard for drawing predicted models

- Two 500 or 1000 mL beaker **OR** two water gathering containers and a beaker to measure the water in the container.

Lab Set-up:
1) Bucket should have a hole on the top for water to be put into the black box and a hole in the bottom for water to come out of the hole.
2) Place a beaker or water gathering container below the bottom hole of the bucket. Place bucket so the drain hole is over the sink. It is best if the bucket is actually above the sink, so any spilt water goes down the sink and not the floor.
3) If you can't fit the beaker under the bucket while the bucket is over the sink, put some kind of water gathering container under the bucket. When students pour water into the bucket, they can collect the water leaving the bucket. Students can then measure what they collect using a beaker.
4) Near the bucket should be a dry erase board and marker. When students each a number of trails, they should draw their prediction of what is in the bucket.

Accommodations: Students who are not able to participate pouring or measuring the water can record the data in the data table.

Editable DOCX File and Answer Key:
Available at www.ngsslifescience.com

Creating a Scientific Model

Academic Vocabulary: Write definitions for the following keywords.

Model:

Limitation:

Background: A model is a physical or conceptual representation of an object or event. Models make tiny, large or hard to comprehend things easier to understand and visualize. One major limitation to models is that scientists never know all of the variables involved in a system. There are 3 main characteristics of a model:

  1.

  2.

  3.

Purpose:
Your goal is the figure out what is happening inside the bucket. You are then going to build a visual model on the white board with your lab group.

Limitations:
- You may only pour in water through the top of the bucket.
- You may only capture water from the hole underneath the bucket.
- You may not move the bucket or in any way lift / shake / flip the bucket.
- You may not open the lid of the bucket.
- You may not bang on the bucket.
- You may not look into the bucket.

Procedures:
1. Pour in 200 mL of water, measure the amount that comes out.
2. Record data on next page. Repeat until water comes out.
3. Draw your predicted model on the white board.
4. Repeat experiment again, pouring in different amounts of measured water.
5. Draw your predicted model of what is inside the bucket on the whiteboard after trial 6, trial 12 and trial 18.
6. Draw your final predicted model on the back side on the paper.

Data Table (observations):

Trial	Amount Poured in *(mL)*	Amount that came out *(mL)*
1	200	
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		

Draw Final Predicted Model (*don't draw until finished with all 18 trials*)
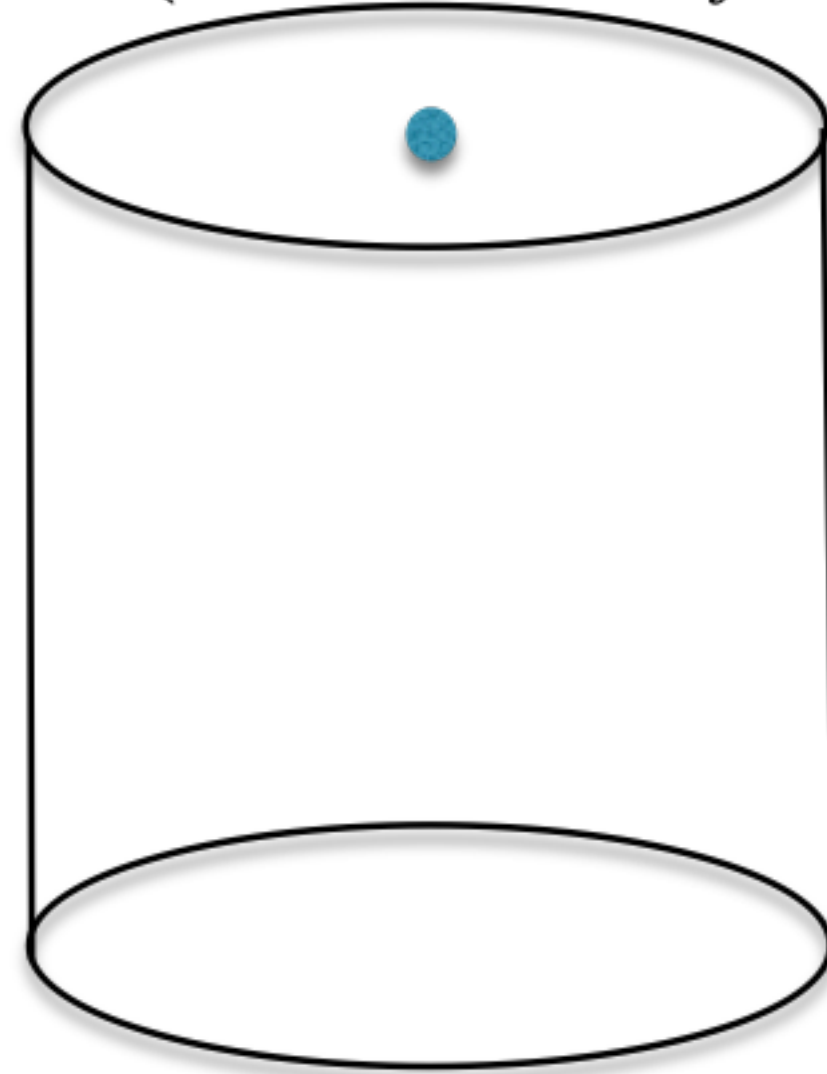
Challenge Question: What is another scientific model *(not the bucket)* you have learned in school. *Either draw or explain it.* You may not use the same model as other students.

Challenge Question: Explain how scientists can make models when they do not know everything.