

## Black Boxes

<b>Lesson Concept</b>	Matter has observable physical properties at both a macro and micro level. Everything is made of something smaller, including matter. Matter is made of elements. The ways elements are put together make different types of matter.
<b>Link</b>	Introductory lesson to structure of matter
<b>Time</b>	1 hour 15 minutes
<b>Materials</b>	<p><u>Whole class</u></p> <p>1 demonstration station with black box and sample materials (see below)</p> <p>1 photograph of the atom</p> <p>1 photograph of the sun</p> <p><u>Per Group (groups of 2)</u></p> <p>Black plastic box with cardboard or sponge shape (rectangle or triangle) taped inside and one marble (taped closed so that students are unable to see inside)</p> <p>Black box (empty and open)</p> <p>Tape (masking tape)</p> <p>One marble</p> <p>Rectangle and triangle cardboard or sponge shapes</p> <p><u>Individual</u></p> <p>pencil</p> <p>Black Box Lab (see attached)</p>
<b>Advance Preparation</b>	<ol style="list-style-type: none"><li>1. Gather supplies (cut cardboard or sponge shapes).</li><li>2. Assemble black boxes (may be any color as long as opaque) by taping a rectangle or square shape made of sponge or cardboard inside the box (placement varies); also place a marble inside the box, and tape box closed. (See the FOSS website for detailed directions: <a href="http://www.fossweb.com/modules3-6/ModelsandDesigns/index.html">www.fossweb.com/modules3-6/ModelsandDesigns/index.html</a>)</li><li>3. Reproduce copies of Black Box Lab</li></ol>

**Procedure:**

**Engage**                    **(10 minutes) Observe physical properties on a macro and micro level.**

1. Display a picture of the atom and the sun.
2. Ask students, “How do scientists know what is inside an atom? How do scientists know what the inside of the sun looks like? How might scientists construct this model?”
3. Discuss how scientists are able to construct a model for something that cannot be seen with the human eye.

**Explore**                    **(30 minutes) Matter has observable physical properties at both a macro and micro level. Everything is made of something smaller, including matter.**

4. Distribute taped black boxes, empty black boxes, masking tape, marbles, cardboard or sponge shapes, and Black Box lab papers.
5. Allow students to observe taped black box and construct black box models.

**Explain**                    **(15 minutes) Matter has observable physical properties at both a macro and micro level. Everything is made of something smaller, including matter.**

6. Discuss/chart student findings. Discuss student methods. Have students describe how they inferred what was in their black box.

**Extend**                    **(10 minutes) Observe physical properties on a macro and micro level.**

7. Students create their own black box for another group to observe and infer what is inside the black box.

**Evaluate**                    **(15 minutes) Apply methods for exploring what cannot be seen with the unaided eye to a new situation.**

8. Have students compare and contrast their methods for constructing black box with a scientist’s method for constructing a model of something that cannot be seen such as the Earth’s layers or the Sun’s layers. \*last question on Black Box lab paper

Name: \_\_\_\_\_



### Black Box Lab Paper

1. How do scientists know about the layers of the Sun/Earth?

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2. Sketch what you think is inside the black box.

<b>Idea #1</b>	<b>Idea #2</b>

3. Test your ideas. Do you think your model is a match with the Black Box?

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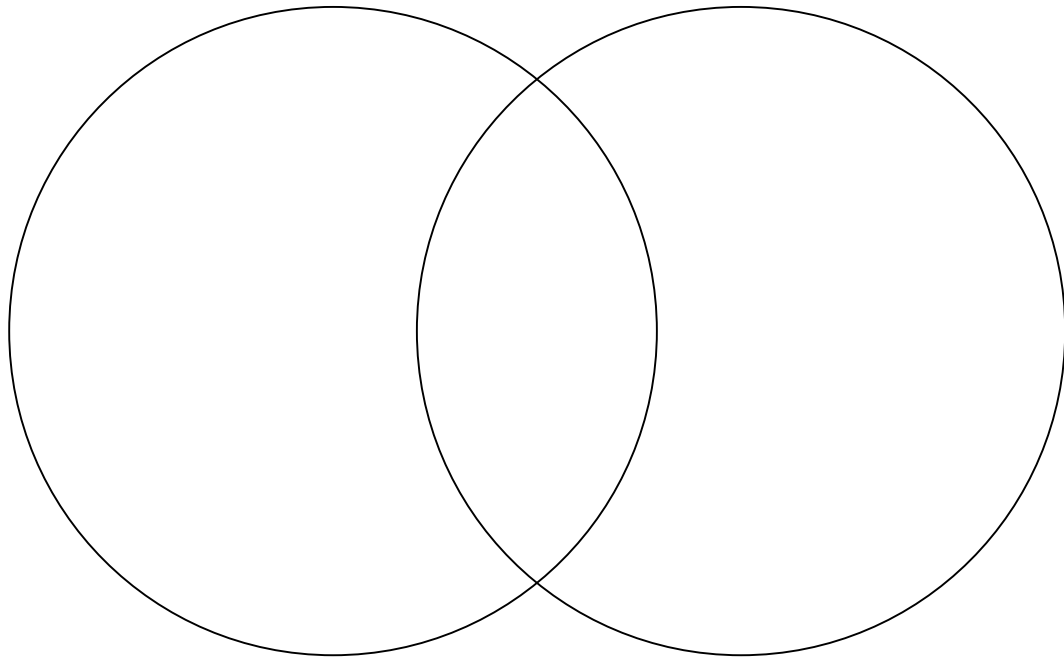
4. How would you alter your model? \_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_

Post Lab Question:

9. Compare and contrast your methods for constructing your black box with a scientist's method for constructing a model of something that cannot be seen such as the Earth's layers or the Sun's layers.

Your Method

Scientist Method



Describe how your method compares with a scientist's method.

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