

## **Physics & Systems Analysis - High School-Tiered**

**Key Concept:** Understanding how things work and designing solutions to problems of almost any kind can be facilitated by systems analysis

**Generalization:** Principles of physics can help us understand everyday phenomenon.

### **Background:**

Students have studied mechanics and properties of matter. As a comprehensive check for understanding about these principles, students will be placed in groups according to readiness. Their task is to analyze the given phenomenon, demonstrate it, and identify and explain all the physics principles involved. The results must be shared with the class. The presentation style is left to the group but must include both demonstration and explanation.

Many books and materials will give directions for these phenomena. One that is quite comprehensive in both the directions for the demonstration and the explanation of why it works is How Things Work: The Physics of Everyday Life, by Louis Bloomfield (ISBN: 0-471-59473-3).

This lesson is tiered in *content* according to *readiness*.

### **Tier I: *Basic***

**Pulling a Tablecloth from a Table Set with Dishes (Laws of Motion)**

### **Tier II: *Grade Level***

**Swinging Water Overhead in a Bucket without Spilling the Water (Acceleration, Circular motion)**

### **Tier III: *Advanced***

**The Cartesian Diver (Density, Pressure)**

### **Assessment:**

Teacher observation and student interviews during the investigation will serve as formative assessments. Summative assessment includes accuracy of explanation and successful demonstration of the phenomenon. Students' presentation skills may be assessed with a rubric. If possible, you might wish to consider sharing the demonstrations with younger students.

<u>SUBJECT:</u> PHYSICS	<u>KEY CONCEPT:</u> Principles of physics can help us understand everyday phenomenon.	<u>DIFFERENTIATED BY: (CIRCLE )</u> CONTENT * PROCESS * PRODUCT READINESS * LEARNING STYLE INTEREST
<u>LESSON</u>	<u>WHOLE-CLASS COMPONENTS</u>	<u>DIFFERENTIATED COMPONENTS</u>
Lesson 1  <b>INTRODUCTION</b>  <i>Include how much total time in periods this section needs.</i>  <i>Ie., 1 period</i>	Students have studied mechanics and properties of matter. As a comprehensive check for understanding about these principles, students will be placed in groups by readiness. Their task is to analyze the given phenomenon, demonstrate it, and identify and explain the physics involved. The results must be shared with the class. The presentation style is left up to the group, but must include both demonstration and explanation.  <i>Ie., 1 period</i> <i>10-15 minutes</i>	<p>Many books and materials will give directions for these phenomena. One that is quite extensive is <u>How Things Work: The Physics of Everyday Life</u>, by Louis Bloomfield (ISBN: 0-471-59473-3).</p> <p>Make a direction and grading sheet for each tier. Pass out to teacher selected groups. Students work in groups to plan their investigations.</p> <p><b>Tier I Basic</b>          Pulling a table cloth from a table set with dishes (Laws of Motion)</p> <p><b>Tier II Grade Level</b>          Swinging water overhead in a bucket without spilling water (Acceleration, Circular Motion)</p> <p><b>Tier III Advanced</b>          The Cartesian Diver (Density, Pressure)  <i>20-25 minutes</i></p>

<p>Lesson 2</p> <p><b>TITLE OF DAY 2</b> Eg. Planning and executing Physics Investigations</p> <p><i>Include how much total time in periods this section needs.</i></p> <p><i>I.e., 2 periods</i></p>	<p>Mini lecture on rubric used to assess each group's investigation. <i>5 minutes</i></p>	
		<p>Give each group of students a copy of the rubric. Facilitate group interaction, provide directions on finding materials to complete the tasks, and allow students to ask questions. Students work in groups for time allotted and complete any necessary parts for homework. <i>40-45 minutes</i></p>
<p>Lesson 3</p> <p><b>Group demonstrations</b></p>	<p>Whole group introduction on process and expectations during group demonstrations and explanations <i>5 min.</i></p>	
		<p>Group demonstrations and explanations of assigned laws of motion. <i>30-35 min.</i></p>
		<p>Students complete a 4 windows exit card to demonstrate what they learned, questions they still have, what interested them the most, and a connection to something they already knew. <i>5 minutes</i></p>
<p>Assessment</p>	<p><b>Formative:</b> Teacher observation and student interviews during investigation.</p>	<p><b>Summative:</b> Accuracy of explanation and successful demonstration of phenomenon. Rubric to assess students' presentation skills.</p>