# Hot Beaker Challenge

#### Summary

This lesson reviews the storage and transfer of heat and leads students through the scientific method.

#### Time Frame

3 class periods of 45 minutes each

#### Group Size

Small Groups

## Life Skills

Thinking & Reasoning, Systems Thinking

## Materials

One set for each group: beaker flood lamp with clamp ring stand test tube clamp labquest with temperature probe Possible materials that students will choose for the experiment: black paper white paper bubble wrap

aluminum foil plastic wrap cotton balls packing wrap

## Background for Teachers

It is best to gather the materials and test the set up and before having the students do the experiment. The basic set up is a beaker with a lamp shining on it as a source of heat. A temperature probe is suspended in the beaker using the ring stand and test tube clamp.

Temperature is taken before the light is turned on and then every minute after the light is turned on. Test to see how long you need to keep the light on to get significant temperature change. Probably you will need to test for 3-7 minutes. You can also alter the distance the light is from the beaker to alter how quickly the temperature changes. Expect a bit of trial and error to get the best set up.

## Student Prior Knowledge

Students should be familiar with the scientific method and have been introduced to heat and light.

## Intended Learning Outcomes

Students will:

Review the concept of heat. Understand the relationship of heat and temperature. Practice the Scientific method Practice using scientific equipment Review background knowledge about heat Apply this knowledge Reflect on what did or didn't work and why Practice analyzing data

## Instructional Procedures

Day 1:

Introduce the "Challenge": Show students the basic experimental setup and introduce the challenge of which group can increase the temperature inside the beaker the most.

Problem/Question: Through discussion lead the students to the experimental question.

Background Knowledge: Ask the students what they already know about heat. Brainstorm as a group.

Materials: List materials that every group will use and the materials that they will have a choice of using. Each group gets to choose one item that they think will help increase the temperature the most in their beaker.

Controls & Variables: Ask students what each group will need to keep the same (controls) and what will be different for each group (variable).

Groups choose material: Give the groups 2-5 minutes to choose which material they will use. Hypothesis: Once the groups have chosen their material tell them to create a hypothesis explaining why they chose that material.

Procedure: Begin guiding the students through the procedure. Make sure they understand that each group must set up their experiment the same for comparison.

Control: If there is time you can set up a control (no material) and show students how the experiment will be implemented.

Day 2:

Set up data table: Guide students through setting up a data table.

Review LabQuests: Show students how to use the labquests including use of the stopwatch. Set up experiment: Have students begin to set up their stations, but make sure you check to ensure they are set up correctly before they begin taking data.

Design material: Once their setup is checked give students their chosen material and have them design their beaker in a way they think will cause the most heating.

Perform experiement: Have students perform the experiment and complete three total trials. Take data: Make sure students are taking dating as they proceed.

Day 3:

Analyze data: Have students analyze their data by taking averages and comparing to other groups. Who won the challenge? Why did this group do the best?

Try new things: Give students a chance to try new materials or change the way they put the material on the beaker. What have they learned?

Rubrics

Science Lab Report Rubric

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