

Experimental Design: Are Mushrooms the New Styrofoam?

Teacher Answer Key

Students should complete each section of the worksheet below. Suggestions are given as examples for you that match the four uses suggested on the worksheet Are Mushrooms the New Styrofoam worksheet. The objective, hypothesis, variable, and controls will vary depending on student choices.

Complete each section of this worksheet

Objective of the experiment (The objective is what you aim to do or show with your experiment)

Hypothesis (Your hypothesis is an educated guess as to what you think your results will be)

Detailed list of materials needed

This should include how the students will create the mold for their mushroom materials and their details about the polystyrene product they will use for comparison. Below are some examples. You will need to assess what type of test is best as determined by your availability of materials and your students' developmental level.

Thermal insulation - Use a polystyrene coffee cup with lid and mold mushroom materials into a similar shape and size using a plastic cup

Buoyancy - Use a flat piece of polystyrene (perhaps cut the side of a Styrofoam cooler) and mold a flat piece of mushroom materials into a similar size and thickness

Packing insulation - Use packing peanuts or cut up the side of a polystyrene cooler into cubes and either mold the mushroom materials in an ice cube tray or into small squares. Of, if your students are sophisticated, perhaps they would want to find a packing corner (like the one shown in the Eocvative video) and mold their mushroom materials to match its shape and size

Water resistance - Use a flat piece of polystyrene (perhaps cut the side of a Styrofoam cooler) and mold a flat piece of mushroom materials into a similar size and thickness

Independent and dependent variables of the experiment

Experimental controls

Step by Step Procedure (be sure to include at least three trials)

It is important that you carefully check each student's proposed procedure to be sure they have thought it out step by step and that they have identified a method of gathering data that will test the property or use they identified.

For example, if students were testing thermal insulation they might just state a generalization, such as, "put hot water into cup and see if it stays hot" rather than identifying how they will do this. Also, they need to think ahead to the properties of the polystyrene as well as the mushroom materials. For example, polystyrene will melt, so it would not make sense to heat water in the coffee cup. Students would need to identify a detailed list of steps used for coffee cup calorimetry.

Some other examples of testable properties are listed below.

- Which is the best insulator? Test thermal insulation.**
- Which biodegrades fastest? Test biodegradability.**
- Do the samples absorb water? Test water resistance.**
- Which material is better for the egg-drop test? Test impact resistance.**

Data that will be collected

Students need to think ahead to what data will be collected and how it will be analyzed. With the thermal insulation example used above, they would need a consistent volume of water, length of time the water sits in the cup, and temperature before and after the time allotted.

Methods used to analyze data

Students should have a plan as to how they will analyze the data they collected. With the thermal insulation example, students could graph the results over time and compare polystyrene to mushroom materials. More advanced students could calculate the joules of energy lost over the period of time, using the specific heat of water.