

Exploring Density, Volume, & Weight
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Grades 8th

Goal: The purpose of this lesson is to provide an experience that connects volume, density, and weight.

8th Grade SCIENCE OBJECTIVES:

- (C) I.1 Constructing New Scientific Knowledge
- (C) I.11 Generate scientific questions about the world based on observation.
- (C) I.12 Design and conduct scientific investigations.
- (C) I.13 Use tools and equipment appropriate to scientific investigations.
- (PME) IV.11 Describe and compare objects in terms of mass, volume, and density.
- (PME) IV.12 Explain when length, mass, weight, density, area, volume or temperature are appropriate to describe the properties of an object or substance.

1. The student will apply current knowledge of density and volume.
2. The student will conduct a scientific investigation.
3. The student will use tools and equipment that are appropriate for investigating and conducting scientific experiments.
4. The student will formulate questions by evaluating the strengths and weaknesses of her/his observations and of the given data.
5. The student will compare the density, mass, and volume of different objects.
6. The student will explain what temperature, volume, and mass have to do with the density of snow.

Content Background: The student will need to know what mass is, how to find volume, how to measure temperature and weight, and how to use all listed materials.

Risk Management: Student should dress warm, be healthy enough to be outdoors, and have a place to warm up as needed.

*All marked and new questions, concerns, and ideas formulated by student will be recorded on a note pad.

STEP 1:

Experiment -1

Materials: A shovel three thermometers, ruler, warm gloves, note pad, and pencil.

The student will shovel out a section of snow that leaves a vertical exposed plane surface remaining.

SETP 2: *Questions to student.*

*Does snow have density?

*Is all snow equal in density?

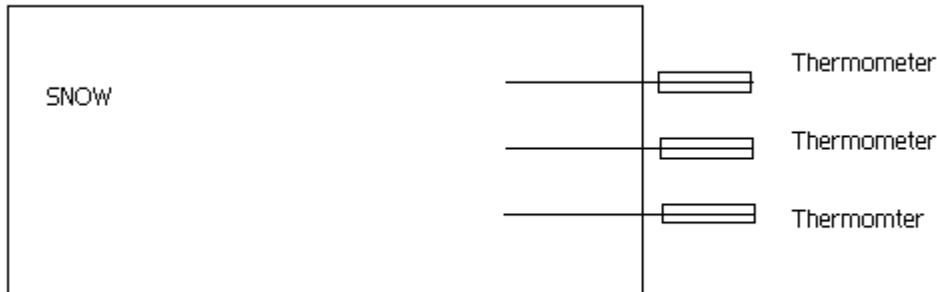
*If we measured the temperature of the snow, would it be equal at all points of measurement? Why or Why not?

The student will have an opportunity to pose questions for guidance of the class discussion.*Student's responses.

STEP 3:

Continue **Experiment -1**

The student will test the temperature of the snow at three horizontal levels by placing a thermometer equally apart but vertically in a row.



The student will record the temperatures of the snow on the note pad as Test 1; top level A., middle B., bottom C.

STEP 4: *Questions to student.*

*Are the temperatures the same? Why or Why not?

*Do you think the thermometers are correct in their measurement?

*How can we test whether the thermometers work?

The student will have an opportunity to pose questions for guidance of the class discussion.*Student's responses.

STEP 5:

Continue Experiment – 1

The student will Repeat STEP 4, but switch thermometers and record temperatures. The students will record the temperatures the same as before but label as Test 2.

STEP 6: *Questions to student.*

- *Why do you think the temperatures are different at all three levels?
- *Do you think it has to do with the sun, earth, amount of snow, what? Why or why not?
- *Because these temperature readings are different, can we say that snow retains heat? Why or why not?
- *Do you think the retention of heat in snow has anything to do with people being able to find shelter from the cold in an igloo or snow cave? Why or why not?

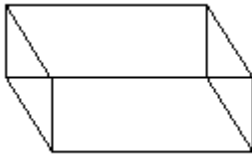
The student will have an opportunity to pose questions for guidance of the class discussion.*Student's responses.

STEP 7:

Experiment - 2

Materials: flat cookie sheet with no edges, ruler, three large deep containers (big enough to hold 1ft. x 1ft. x 4 in. of snow), note pad, pencil, warm gloves.

The student will test the density of snow by dividing the snow into three 1ft. x 1ft. x 4inch levels. The student will slide the cookie sheet horizontally through the snow to lift prism. The student will label the top level 2A, middle level 2B, and the bottom level 2C.



The student will place each rectangular prism of snow in a container. The containers will be taken inside of classroom to melt. Care should be taken as to not spill the water.

The student will measure the amount of water in each container as soon as possible to avoid evaporation. The student will record the amounts according to labeled levels.

STEP 4:

The student will explore explain why she/he thinks the amounts of water are different.

STEP 5: *Questions to student.*

- *If the prisms of snow were measured out equally, why are their measurements of water different?
- *Can you explain if the temperatures of A, B, and C, have anything in common with the amount of water measured from 2A, 2B, and 2C, if so, what?
- * Does density have anything to do with these observations?
- * How can we measure what the density of each prism of snow was?

The student will have an opportunity to pose questions for guidance of the class discussion.*Student's responses.

Assessment:

The student will find the density of 2A, 2B, and 2C, using the volume of each prism of snow and its weight.

The student will have an opportunity to pose questions for guidance of the class discussion.*Student's responses.

Extension:

The student will estimate the area of the roof of her/his house, estimate the depth of snow on her/his house, and estimate the weight of snow on her/his house using experiment 2.

BIBLIOGRAPHY

Halfpenny, J. C., & Ozanne, R. D. (1989). Winter: An Ecology Handbook.

Boulder, Co: Johnson Books.