

Subject: Science

Grade: Sixth

Standard: #3 The Physical Setting

Key Concept: Matter can be described by its physical properties, including measurements of its mass, volume, and density.

Generalization: Density can be used to identify and distinguish one substance from another.

Background:

Students are beginning a study of the nature of matter. They have just covered the concepts of mass and volume. Although the book, **Mr. Archimedes' Bath**, ISBN: 0-207-17285-4 is written for elementary students, it is a great story and would appeal to this age group as well. You may want to introduce the study of density by reading it aloud to the class.

Students who have mastered the concept of mass and volume and can readily calculate these properties should be in the advanced tier for this activity. Students who understand the basic concepts of mass and volume but are still a bit weak with calculations should be placed in the grade level tier and students who have had trouble with mass, volume, and the mathematical skills required should be placed in the basic tier.

The book, **Science for Fun: Experiments with Easy-to-Make Projects on Magnets, Sound, Light, Electricity and Much More**, ISBN: 0-7613-0517-3, is used for the Basic tier. The other two tiers will work with **Discovering Density**, one of the GEMS units from the Lawrence Hall of Science.

Before beginning any of the investigations, ask students to ponder this question as they work: **Which is heavier, 1 lb. of lead or 1 lb. of feathers?**

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

Tier I: *Basic*

Students at this level will perform the investigation “Different Depths,” pp 150-151 of the Science for Fun book. In this activity, students make a hydrometer and test several liquids. I would suggest testing the hydrometer in water first, marking that level on the device with a fine-point permanent marker. If you do this, there will be some benchmark to use when testing the other liquids. Data should be displayed in a table or chart. Students may simply mark whether the hydrometer floated higher or lower than it did in water. Students who finish and understand the concepts involved may want to do the investigation on pp.146-7 of this book, including the “further ideas” section.

Tier II: *Grade Level*

These students will perform the investigation “Layering the Unknown,” from Discovering Density. The objective of this investigation is for students to grasp the concept of density and to express that understanding in their own words. There is a bit of preparation necessary for this investigation and the one at Tier III. There are no mathematical calculations involved. Clear, step-by-step directions are provided for this activity in the book, along with a materials list, directions for preparation, teacher notes and a blackline master for the table.

Tier III: *Advanced*

These students will perform the investigation, “Layering Salt Solutions,” from the book, Discovering Density. After completing this activity, students should be able to explain the meaning of density and how it differs from weight. Students will actually calculate density in this activity. Clear, step-by-step directions are provided for this activity in the book, along with a materials list, directions for preparation, teacher notes and a blackline master for the table.

Assessment:

Teacher observation and student interviews during the investigation will serve as formative assessments. In each activity, a chart or table is prepared. This, along with the lab notebook detailing the investigation, will serve as summative assessment.

In a whole class discussion, ask students this question again: Which is heavier, 1 lb. of lead or 1 lb. of feathers? Students should be able to tell you that 1 lb. is 1 lb. regardless of the composition of the objects. Then ask, which is heavier, a cup of lead or a cup of feathers. Answers to these questions will help you assess the students' understandings of density.

You may want to have students discuss how they use density in their everyday lives.