Exploration Summary

Students will calculate the volume of three objects by using the displacement method. They will enter a radius and height and watch as the object is submerged. The displacement will give the students the volume of the object chosen.

Student Learning Objectives

- Define volume as the amount of space an object occupies.
- Recognize that a solid object displaces a volume of water equal to the volume of the object.
- Identify some aspects of the relationship between shape and volume.
- Calculate the volume of different shapes by using the displacement method.

Student Worksheet

The student worksheet includes questions to check understanding, instructions for how to use the Exploration, and a section for recording Exploration data. Why do the questions come first? In following best practices for teaching science, students are asked to review questions before participating in an activity. When the questions come first, students are more focused on the intended content of the activity. Then they can respond to the questions during the activity or after completion of the activity.

Exploration Procedure

Explain that the purpose of this Exploration is to learn the relationship among shape, dimension, and volume and to calculate the volume of an object by using the displacement method. Follow the appropriate procedure below.

Student Performs Exploration

1. Tell students how much time they will have to complete the Exploration and the student worksheet.
2. Explain how students should proceed:
   - Read the questions before starting the Exploration.
   - Follow the instructions on the worksheet to perform the Exploration.
   - Take notes or record data as necessary.
   - Respond to the questions in writing.
3. Explain that you will be available to help any students who raise their hands.
4. Tell students to begin the Exploration.
5. When time is up, ask students to share their answers.
6. Talk about the Discussion Question below.
Teacher Performs Exploration

1. Draw the Data Chart from the student worksheet on the board.
2. Display the questions from the student worksheet and ask students to tell you what they think they will learn from the Exploration based on its questions. Highlight key words.
3. Read the Introduction and click the Continue button.
4. Note that the radius \( r \) is a measurement from the center of a polygon to one of its vertices.
5. Ask the class to select a shape and then enter values for radius and height within the range given.
6. Press the Play button to watch as the shape is submerged, demonstrating the displacement method.
7. Calculate the volume and enter all data into the Data Chart.
8. Continue with different shape, radius, and height combinations.
9. Pose each of the questions below and ask for answers from the class. Replay parts of the Exploration as necessary to illustrate the answers.
10. Talk about the Discussion Question below.

Optional: Use this Exploration as a small-group activity at a computer station. Assign it to students who need specific reinforcement of the concept.

Questions

1. Define volume.
   Answer: Volume is the amount of space an object occupies
2. When you enter the same radius and height values for triangular and square shapes, how do their volumes compare?
   Answer: The square shape had greater volume.
3. When you enter the same radius and height values for all shapes, how does the different number of sides affect volume?
   Answer: More sides mean more volume.

Discussion Questions

What are some possible uses for the displacement method? Why?
Possible answers
- Determine the volume of oddly shaped solids
- Easiest way to calculate volume of irregularly shaped solids.
- Used most often in chemistry.