Density Video Analysis and Student Perspective Activity

Middle and High School Teacher

https://www.youtube.com/watch?v=JnFocwj2Zfc

Instructions for Teachers

Watch the density video and complete **Part 1 as if you were a middle or high school student** encountering the content during a science lesson.

Although you may already understand density, respond using only the explanations, vocabulary, and examples presented in the video.

As you complete the activity, consider:

- Is the explanation clear enough for students?
- Does the video provide enough information to answer each question?
- Which mathematical or scientific concepts might challenge students?
- What misconceptions might students develop?
- What scaffolds would help students explain their reasoning?

Important Reflection

If you cannot answer a question using the video alone, do not rely on your professional knowledge. Instead, explain how you believe a student might respond.

A student might:

- Guess based on familiar words
- Confuse mass with weight
- Confuse volume with size
- Use the density formula incorrectly
- Provide an answer without evidence
- Leave the question unanswered

Part 1: Respond as a Student

1. In your own words, what is density?

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2. What three quantities are connected when calculating density?

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3. Write the formula for density.

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4. A sample has a mass of 40 grams and a volume of 10 milliliters. What is its density?

Show your work:

Density: _____

5. What units could be used to report the density of this sample?

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6. Two objects have the same volume, but Object A has more mass than Object B. Which object is denser?

☐ Object A
☐ Object B
☐ They have the same density
☐ I need more information

Explain your reasoning:

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7. Two objects have the same mass, but Object A has a smaller volume. Which object is denser?

Explain your reasoning:

8. What evidence or example from the video helped you understand density?

9. What part of the video was unclear or moved too quickly?

10. What question about density would you investigate next?

Part 2: NGSS-Aligned Project Challenge

Design a Density Identification System

Your science team has received several unlabeled solid materials. Your challenge is to develop a method for identifying or comparing the materials using their physical properties.

Driving Question

How can mass, volume, and density help us identify an unknown material?

11. What measurements would your team need to collect?

12. What tools would you need?

☐ Balance or digital scale
☐ Graduated cylinder
☐ Ruler
☐ Water
☐ Calculator
☐ Other: _____

13. Describe how you would determine the volume of:

A regular-shaped object:

An irregular-shaped object:

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14. Create a plan for testing the unknown material.

Step 1: _____

Step 2: _____

Step 3: _____

Step 4: _____

15. How would you organize and record your data?

Material	Mass	Volume	Calculated Density	Observations
Sample 1				
Sample 2				
Sample 3				

16. How would your team use its results to identify or compare the materials?

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17. What sources of error could affect your results?

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18. How could you revise the investigation to make the results more reliable?

Part 3: Teacher Reflection

19. Which question was easiest to answer from the video alone? Why?

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20. Which question was most difficult to answer from the video alone?

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21. If you were unable to answer a question, how might your students respond?

Select all that apply:

☐ Guess without showing reasoning
☐ Confuse mass and weight
☐ Confuse volume and density
☐ Use the formula incorrectly
☐ Forget or misuse measurement units
☐ Repeat the video's language without explaining it
☐ Leave the question blank
☐ Ask a peer or teacher for support
☐ Other: _____

22. Which concepts would require additional instruction before students begin the project?

☐ Measuring mass
☐ Measuring liquid volume
☐ Calculating the volume of a regular solid
☐ Using water displacement
☐ Rearranging the density formula
☐ Selecting and converting units
☐ Interpreting data tables
☐ Explaining conclusions with evidence
☐ Other: _____

23. What scaffolds would support students?

Select all that apply:

☐ Vocabulary guide
☐ Density triangle or formula reference
☐ Worked calculation example
☐ Measurement demonstration
☐ Water-displacement demonstration
☐ Data table template
☐ Calculator support
☐ Sentence starters
☐ Partner or group discussion
☐ Hands-on investigation
☐ Other: _____

24. What student misconception could this lesson reveal?

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25. How could the video serve as an entry event for a project-based learning unit?

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26. What evidence would demonstrate that students understand density rather than simply memorizing the formula?

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27. How could the project be differentiated for middle school and high school students?

Middle School Adaptation:

High School Adaptation:

NGSS Connections

Science and Engineering Practices

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Using Mathematics and Computational Thinking
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Disciplinary Core Ideas

- **MS-PS1.A:** Structure and Properties of Matter
- **HS-PS1.A:** Structure and Properties of Matter

Crosscutting Concepts

- Scale, Proportion, and Quantity
- Patterns
- Cause and Effect
- Structure and Function

Project-Based Learning Connection

The video serves as an introduction to the core concept of density. Teachers then experience how students can move from receiving information to applying it in an authentic investigation.

Students work collaboratively to:

1. Define the problem.
2. Plan a testing procedure.
3. Measure mass and volume.
4. Calculate and compare density.
5. Analyze sources of error.
6. Use evidence to identify an unknown material.
7. Present and defend their conclusions.

The final project should require students to create a product, such as an investigation report, material identification guide, scientific poster, or evidence-based presentation.