

Example of a Tiered Science Activity

Concepts: Density and Buoyancy

Whole Group Engage/Explore or Hook Activities

1. All students took part in an introductory discussion about their swimming and floating experiences.
2. All students read an expository reading selection with appropriate reading scaffolding.
3. Students did an exit card response to assess their understanding of the key idea in the reading selection.
4. Students watched a mini-lab presentation using toys and household items – voting thumbs up or down about whether they thought the various items would float or not.

Teacher Planning of Instruction Based on On-Going Assessment

- ➔ Using assessment based on exit cards, her observations of students during the mini-lab, and her general knowledge of student readiness and learning profile, the teacher assigned each student to one of three activities in a tiered inquiry lab.
 - ➔ Students in all three groups will:
 - Explore the relationship between density and buoyancy
 - Will determine density
 - Conduct an investigation
 - Write a lab summary
 - Work at a high level of thinking
 - Communicate findings with an appropriate audience

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Explain

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The Soda Group

Given 4 cans of different kinds of soda, students determined whether each would float by measuring and recording the density of each can on a teacher-provided data form.

They completed a lab procedure form by stating materials, procedure, and conclusions.

Finally, alone they completed a final analysis. In the analysis section of the lab procedure form each student had to explain why the cans floated or sank, and the relationship between density and buoyancy. Students work with this process in a prescribed rotation of 4 kinds of soda cans until they could figure out the key principle at work in the investigation.

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The Brine and Egg Group

Students followed a prescribed procedure for measuring salt, heating water, dissolving the salt in the water, cooling the resulting brine, determining the mass of water, determining the mass of an egg, recording all data in a data table, pouring water on the cool brine, placing the egg on the cool mixture, stirring the solution, and observing.

Working as a group they answered questions about their procedure and observations on a planning board.

Each student alone then answered questions about why a person can float in water, whether it's easier to float in fresh or seawater, why a helium-filled balloon floats in air, and the relationship between density and buoyancy.

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The Boat Group

Students first wrote for advice to college students who were building concrete boats to enter in a boat race.

They then determined the density of a ball of clay, drew a boat design for the clay boat, noting its dimensions and its density.

They used cylinders of aluminum, brass, and steel as well as aluminum nails for cargo, and determined the maximum amount of cargo their boat could hold.

They build and tested the boat and its projected cargo load.

Working as a group they wrote a descriptive lab report on the notebook paper.

Working alone they explained why the clay ball sank and the boat was able to float, the relationship between density and buoyancy, and how freighters made of steel can carry iron ore and other metal cargo.

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Flexible Grouping

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graph TD; A[Formative Assessment / Evaluate] --> B[Structured Inquiry Investigations]; A --> C[Guided Inquiry Investigations]; A --> D[Open Inquiry Investigations]; B --> E[Summative Assessment]; C --> E; D --> E;
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Formative Assessment / Evaluate
Layering The Unknown
In this performance task, students are challenged to layer four, colored “mystery liquids” of different densities in a clear drinking straw. By making predictions and keeping track of their data students will show that they understand that liquids have a certain property (density) that causes some liquids to float on top of others, and to express their understanding of this property in their own words.

**Structured Inquiry
Investigations
with Student’s
Testable
Questions**

**Guided Inquiry
Investigations
with Student’s
Testable
Questions**

**Open Inquiry
Investigations
with Student’s
Testable
Questions**

**Summative Assessment
Puzzling Scenarios**