

"Tip of the Iceberg"



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2005-2006 IDEA CATALOG OF EXCELLENCE

PROGRAM OVERVIEW

The fate of the Titanic is well known, but can students explain scientifically, seeing only the "tip of the iceberg"? Many times science and math seem to be like the "tip of the iceberg" in that only a few facts are known, the rest seems "hidden". Throughout this unit, eighth grade students will learn many skills on their journey to discover what lies beneath the tip.

As with the tip of an iceberg, students begin exposing the top ten percent of their understanding of density and buoyancy by practicing measurement. In small groups of four, students will use scales to find the masses of a variety of common objects, and graduated cylinders to find the volumes of liquids and irregularly shaped solids, then learn how to record the data. Using the formula: $\text{Density} = \text{Mass} / \text{Volume}$, students will find the density of many of these common objects. They will conduct many lab investigations enabling them to predict accurately whether these objects will sink or float.

Moving to the unknown ninety percent of an iceberg, students will create their own learning experiences. Like Archimedes, a Greek mathematician who lived more than 2000 years ago, they will discover the relationship between buoyancy force, the upward force acting against the downward weight of an object, and the fluid displaced by the object. They will learn why wood floats, but metal does not. Then there are ships; why do they float? Students will design an investigation to discover what they may do to make a boiled egg float. Finally, they will be able to explain why you only see about ten percent of an iceberg.

Students will be able to answer what a fluid is and whether air is a fluid. As culminating activity, students, in groups of two or three, will make hot air balloons. Following directions, students will make a pattern for the gores of their balloon, then cut out their tissue paper gores using their pattern, assemble the gores to make the hot air balloon and finally test it. They will use the scientific method to develop and test hypotheses about variables that may affect the flight of their balloons.

As a means of sharing what they have learned, students will use various visual presentation tools to effectively communicate their learning.

Students will assess their learning along with the teacher. Checklists and a project rubric will be provided for their use to check the progress of their presentations. A project rubric will be used for final grading.

All activities are done in a regular classroom. Many will involve water. I have no sinks in my classroom, so I provide dish tubs I purchased at the dollar store. I also have paper towels handy in case of spills.

OVERALL VALUE

"Tip of the Iceberg" is a unit that integrates science and math. Students become active learners, practicing measurement skills, becoming familiar with metric units. Students love to measure objects and rarely get the opportunity. They love to use lab equipment and rarely get the opportunity. This unit gives them this chance. It demonstrates to students the purpose for learning various science and math skills like measurement, density and buoyancy. Students conduct

investigations that are fun and memorable. Most of all, this unit allows students to become scientists; to think like scientists, if just for an hour during the day, in hopes that for some, it will last a lifetime.

"Tip of the Iceberg" can be adapted to fit into many upper elementary classrooms, especially when teaching measurement (mass, volume, temperature), weather, states of matter, or even flight. It could be used by high school science teachers, as well.

LESSON PLAN TITLES

- Triple Beam Balance
- Density Lab
- Just the Tip fo the Iceberg

MATERIALS

Materials for each lesson are listed with each lesson plan. Overall materials budget including pricing and vendors follows the lesson plans.

ABOUT THE DEVELOPER

A graduate of Florida Southern College, Dawn Stancil has enjoyed teaching students from grades K through 8. She currently teaches math, science and technology to eighth grade students at Lawton Chiles Middle Academy.

A three time Developer, Dawn has received numerous awards including NW Area Teacher of the Year for Polk Cty Schools, Conservation Education Teacher of the Year for the State of FL, and is a two-time Disney Teacherrific Award Winner.



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LESSON PLAN No 1: Triple Beam Balance



SUBJECTS COVERED

Integrated lab

GRADES

Eighth Grade

OBJECTIVES

To understand that mass is the amount of material in an object.

To know that equal volumes of different substances may have different masses.

To know how to use a triple beam balance.

SUNSHINE STATE STANDARDS

SC.A.1. The student understands that all matter has observable, measurable properties.

SC.C.1. The student understands that types of motion may be described, measured, and predicted.

SC.C.2. The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.

MA.A.3. The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.

MA.A.4. The student uses estimation in problem solving and computation.

MA.B.1. The student measures quantities in the real world and uses the measures to solve problems.

MA.B.2. The student compares, contrasts, and converts within systems of measurement (both standard /nonstandard and metric/ customary).

MA.B.3. The student estimates measurements in real-world problem situations.

MA.B.4. The student selects and uses appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.

MATERIALS (PER GROUP)

per group of four:

- Triple beam balance
- one jumbo paper clip
- one cork stopper
- one bottle of glue (full)
- one roll of cash register tape
- one box of jumbo paper clips with a few paper clips taken out

DIRECTIONS

Before you measure anything, make sure the riders are moved all the way to the left and that the pointer rests on zero. If necessary, slowly turn the adjustment knob until the pointer rests on zero. This is called zeroing the balance.

What is the mass of the largest object the triple beam balance is able to measure accurately?

What is the mass of the smallest object the triple beam balance is able to measure accurately?

Which rider on the balance should always be moved first when finding the mass of an object?

ADDD INFORMATION

Measuring mass directly:

1. Place a small solid object on the balance pan. The beams will rise and the pointer will point above zero.
2. Move the rider on the middle beam one notch at a time until the pointer drops and stays below zero. Move the rider back one notch.
3. Move the rider on the back beam one notch at a time until the pointer drops and stays below zero. Move the rider back one notch.
4. Slide the rider on the front beam slowly until the pointer stops at zero. The mass of the object is equal to the sum of the readings on the three beams. Record the mass to the nearest tenth of a gram in the table below.

What is the mass of:

one jumbo paper clip	
one cork	
one large bottle of glue	
one shell	
one roll of paper	

EVALUATION / ASSESSMENT

Challenge:

- Without counting the paper clips, tell how many are in the box?
- What procedure did you use?
- How do you find the mass of a liquid?
- After using the balance, how should it always be left?



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LESSON PLAN No 2: Density Lab



SUBJECTS COVERED

Integrated lab

GRADES

Eighth Grade

OBJECTIVES

To measure mass and volume using the correct equipment. To determine that density is the relationship between mass and volume.

SUNSHINE STATE STANDARDS

SC.A.1. The student understands that all matter has observable, measurable properties.

SC.C.1. The student understands that types of motion may be described, measured, and predicted.

SC.C.2. The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.

MA.A.3. The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.

MA.A.4. The student uses estimation in problem solving and computation.

MA.B.1. The student measures quantities in the real world and uses the measures to solve problems.

MA.B.2. The student compares, contrasts, and converts within systems of measurement (both standard /nonstandard and metric/ customary).

MA.B.3. The student estimates measurements in real-world problem situations.

MA.B.4. The student selects and uses appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.

MATERIALS (PER GROUP)

One per group or up to four:

- Triple beam balance
- 500 mL beaker
- 100 mL graduated cylinder
- 10 mL graduated cylinder
- Metric ruler
- Several objects that may either sink or float

DIRECTIONS

Question:

Why do some objects float, while others sink? We will explore the relationship between mass and volume.

Lab Activity:

Have students draw the following chart on their paper. Determine the number of rows by the amount of objects you will have them measure.

Pick up one object and place on the pan of the triple beam balance. Measure its mass, and then record the data on the chart. Continue until each item has been measured and all data recorded.

Object	Mass	Volume	Density

To determine the volume of an object you may have to use displacement of an irregular shaped object or L x W x H for a cube or regular shaped object. After finding the volume, record the data on the chart.

To calculate the density, divide the mass of an object by its volume. The formula is written $d = m/v$. After calculating the density, round to the nearest hundredth and record on the chart.

Discussion:

- What observations were made concerning objects floating or sinking while determining volume?
- Is there a correlation between this observation and density?
- Suppose you were given an object that you could not identify. Could you determine what it is by determining its density?

EVALUATION / ASSESSMENT

Answer the following in complete sentences.

What observations were made concerning objects floating or sinking while determining volume?

Is there a correlation between this observation and density?

Suppose you were given an object that you could not identify.

Could you determine what it is by determining its density?



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LESSON PLAN No 3: Just the Tip of the Iceberg



SUBJECTS COVERED

Integrated lab

GRADES

Eighth Grade

OBJECTIVES

- To know that equal volumes of different substances may have different masses.
- To observe a model of an iceberg in simulated seawater, drawing inferences of the dangers to ships.

SUNSHINE STATE STANDARDS

- SC.A.1. The student understands that all matter has observable, measurable properties.
- SC.C.1. The student understands that types of motion may be described, measured, and predicted.
- SC.C.2. The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.
- MA.A.3. The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.
- MA.A.4. The student uses estimation in problem solving and computation.
- MA.B.1. The student measures quantities in the real world and uses the measures to solve problems.
- MA.B.2. The student compares, contrasts, and converts within systems of measurement (both standard /nonstandard and metric/customary).
- MA.B.3. The student estimates measurements in real-world problem situations.

MA.B.4. The student selects and uses appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.

MATERIALS (PER GROUP)

- balloon
- water
- freezer
- bucket
- ruler
- plastic container
- kosher salt in solution - 1/3 salt to 2/3 water (kosher salt is used because it is pure salt, - no additives that make salt pour when it rains)

DIRECTIONS

Fill a round balloon with tap water and tie it off. Place in a container and freeze overnight. .remove the balloon from the ice ball and place it into a bucket with the salt water solution. Observe and measure the height of the whole iceberg. Measure the height of the iceberg above the water line. Subtract the number above the water from the total height to determine the amount below the water line. Calculate the percentage of the ice above, and below the water line (amount above ÷ total = _____, then multiply by 100 = percent). Draw your iceberg and label the percentage above and below the water level.

EVALUATION / ASSESSMENT

- What is an iceberg made of?
- What is the density of an iceberg? How do you know this?
- Why does it float?
- Why would an iceberg be dangerous if it floats into the shipping lanes or oil rigs?

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LESSON PLANS MATERIALS BUDGET



Materials Budget

SUPPLIER	ITEM DESCRIPTION	COST	QUANTITY	TOTAL COST
Polk Cty Schools Storeroom	1000234 Tissue paper 20" x 30"	\$3.59	2	\$7.18
	1000342 White glue, 8oz., 12/box	\$9.80	1	\$9.80
	1000532 Scissors, 4" long, 12/box	\$13.67	1	\$13.67
FREY Scientific	15594219 100mL Graduated Cylinder	\$2.80	20	\$56.00
			less 20%	\$11.20
				\$44.80
Delta Education	WW034-0977 Density Cubes	\$19.95	4	\$79.80
	WW111-2932 Determining Density Activity Model Kit	\$29.95	1	\$29.95
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Polk Co. receives a 20% discount with no S & H from FREY. Please check on Outlook for the current bid. </div>				
			Subtotal	\$185.20
			Tax if applicable	
			S/H if applicable	\$15.00
			TOTAL BUDGET AMOUNT	\$200.20
Teacher's Name <u>Dawn Stancil</u> School: <u>Lawton Chiles Middle Acad.</u>				



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Related Materials



Instructions for building a hot air balloon:

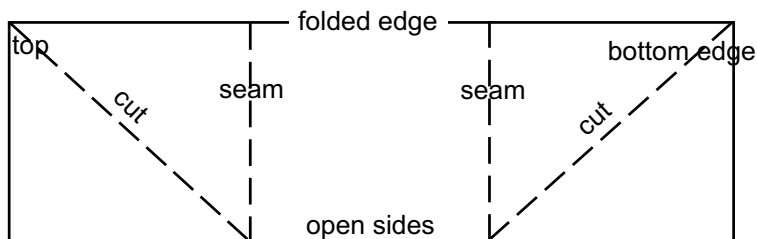
Materials

For a 6 foot balloon you will need three sheets of tissue paper for each gore, 7 gores for a 4 foot balloon you will need two sheets per gore, 5 gores. White glue or glue stick Brown grocery bag

Procedure for the 6 foot balloon:

Glue 3 sheets of tissue paper for the 6 foot balloon (2 sheets for the 4 foot balloon) together to make a long panel. Glue will seep through so be careful, glue on a sheet of wax paper or something it won't stick to and don't let one touch another until dry. Make sure there are no gaps, no holes. You could use glue sticks, but they do not seem to glue as well, however they are neater.

When panels have dried, fold them in half the long way then cut the gores as shown.



Open gores and line up two gore panels, one on top of the other. Slide the top one off the bottom one, exposing about one inch of the bottom gore. This exposed side is where you will place a continuous line of white glue or you may use a glue stick. It is important that the line is continuous. Slide the top gore back onto the top of the bottom panel, lining up the sides. Press the sides together and set aside to dry (remember it will stick to anything, even itself so lay it aside carefully, I drape them over chairs, or a clothes line). Make three sets of panels, leaving one panel by itself. When the glue has dried, open one of the glued sets and lay it down. Open another set up and align it on top

of the first set. Just like you did with the first sets, slide the top off the bottom one, exposing about one inch and place a continuous line of glue along the side. The pointed top gets glued, but make sure that the bottom straight edge stays open, unglued. Slide the gores back together, lining them up and pressing them down, making sure there are no unglued gaps. Lay aside carefully so it does not stick to itself where glue may have leaked through. Continue until all gores are glued together and the final panel is glued in making a balloon. Check for unglued gaps. If the top did not close apply some glue and pinch closed or cut a circle about the size of a dessert plate out of tissue paper and glue it over the top. If panels stuck together where they were not supposed to, they may be torn apart carefully, trying not to tear too much. Patches may be made from the scraps of the tissue paper you cut away earlier.

You may make ornate shaped patches from contrasting colors and put several scattered around on your balloon to sort of camouflage the holes or make patches from the same color.

The bottom edge should be reinforced with a brown grocery bag. Cut a strip from a bag that is about 3 inches wide. Fold the strip in half the length way. Put a continuous line of glue on the inside of the fold and sandwich the bottom of the balloon in the strip making it look like a cuff on the bottom of the balloon. Overlap the ends of the paper strip about an inch or two and cut off the excess. This stiff cuff will hold the bottom of the balloon open, as well as help keep the tissue paper balloon from catching on fire.

Follow the same instruction for the 4 foot balloon, adjusting the cutting lines for the shorter balloon. The six foot

balloon does fly higher and for a longer time, but you may not want that. If you are near a highway or power lines, you may choose the 4 foot balloon for safety.

To Launch:

I have purchased a 3 foot section of 6 to 8 inch stove or chimney pipe from the local home improvement store to use with a propane camp stove or a propane turkey fryer. The chimney does get hot so warn your students that they must stay a safe distance from it. Center the balloon bottom over the chimney. You control the heat going into the balloon by holding the bottom. Don't start off with the burner on high, start out low and increase the heat if needed. The students may hold the side of the balloon to keep it open and to stabilize it while you heat the air. They will be able to feel the balloon getting hotter. There is a possibility of the balloon catching on fire, so watch it carefully. If you see scorch marks, move the balloon quickly away from the stove pipe, you are too close. If it catches on fire, let go. I keep a cup of sand and a container of water nearby, just in case. I have launched over a hundred balloons and had only one catch on fire. I just dropped it, moved back, threw sand on it and doused it with water. You may also use a hairdryer, however it does not get as hot and you could over heat the dryer.

Try to launch early in the day when the wind is minimal and on a cool day, if possible.