

High Flying Balloons



Background: In our study of science we have been investigating the three stages of matter: solids, liquids and gases. You will use your knowledge of a gas to complete the following challenge.

Design Challenge: Work with a group of two to three classmates. Design and build a model of a hot air balloon, using the materials provided by the teacher. Once the balloons are completed, each group will test its balloon to see how high it will fly. A hairdryer will be used as the source of hot air.

Criteria:

Your balloon must

- use only the materials provided
- float off the ground by itself for 15 seconds.

Materials: You may select from the items below.

- lightweight, small-to-medium plastic trash bag
- paper cup
- string or thread (5 feet)



- hole punch
- scissors
- masking tape (about 6 inches)

Targeted Standard of Learning: Science 2.3
Supporting Standards of Learning: Science 2.1
English 2.3, 2.8, 2.9, 2.11
Mathematics 2.12, 2.23

Targeted Standard for Technological Literacy: 16
Supporting Standards for Technological Literacy: 9, 18

High Flying Balloons



Targeted Standard of Learning: Science 2.3

- The student will investigate and understand basic properties of solids, liquids, and gases.

Targeted Standard for Technological Literacy: Standard 16

- Students will develop an understanding of energy and power technologies.

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Time Management
<ul style="list-style-type: none"> • Exposure to targeted Science Standard of Learning 2.3 • Some understanding of the design process • Some research on the basics of hot air balloons 	<ul style="list-style-type: none"> • See Design Brief for recommended materials. • Teacher may substitute materials. • Teacher will supply a hair dryer and extension cord. • Pictures of hot air balloons • Experiment with the size and weight of the plastic and cup. 	<ul style="list-style-type: none"> • Safe use of hair dryer and extension cord 	<ul style="list-style-type: none"> • Two to three students per group • You will want to fly your balloons in a cool place such as an air-conditioned room or outside when the temperature is cool. 	<ul style="list-style-type: none"> • Design Brief • Guided Portfolio • Rubric Assessment • KWL Sheet • Graph Sheet 	<ul style="list-style-type: none"> • Session 1: Introducing Design Brief and Portfolio (30 min.) • Session 2: Building (45 min.) • Session 3: Testing (45 min.) • Session 4: Evaluating and graphing (40 min.)

Guided Portfolio—1

Name _____



High Flying Balloons

Group Members:

1. What is the problem? State the problem in *your own words*.

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Name _____



2. Brainstorm solutions

Draw or describe some possible solutions.

A large graphic organizer consisting of four rounded rectangular boxes arranged in a 2x2 grid. In the center of the grid is a black and white illustration of a lit lightbulb with radiating lines, symbolizing an idea or solution. The boxes are empty, intended for drawing or describing solutions.

Name _____

4. Test your solution.

- Did you use only the materials provided? YES NO
- Did your balloon float for 15 seconds? YES NO



Name _____



5. Evaluate your solution.

Was it the best solution? Would one of your other ideas have been better? Why or why not?

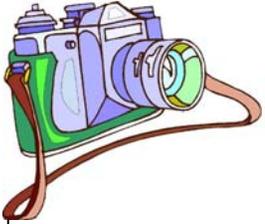
What would you have done differently?

Could you add to it to make it better? What would you add to it?

Guided Portfolio—6

Name _____

Attach a photograph of your final project here. If you do not have a photograph, draw a picture of your final project.



A large, empty rounded rectangular box for attaching a photograph or drawing a picture of the final project.

How would you make your project better? Draw a picture showing how it would look after you have made changes to it.



A large, empty rounded rectangular box for drawing a picture showing how the project would look after improvements.

Name _____

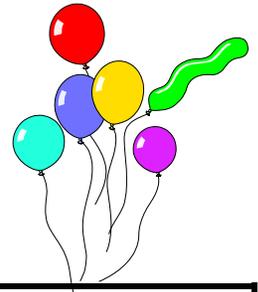
Hot Air Balloon Graph



Directions: Watch your balloon carefully as it rises in the air. Color the graph to show how high it goes on each flight.

Height Balloon Reaches	Ceiling			
	6 Feet			
	5 Feet			
	4 Feet			
	3 Feet			
	2 Feet			
	1 Foot			
		Flight One	Flight Two	Flight Three

Name _____



KWL: High Flying Balloons

What we <u>K</u> now.	What we <u>W</u> ant to know.	What we <u>L</u> earned.
	<p style="text-align: center;">Sample Questions</p> <p>What state of matter is air?</p> <p>Does air have mass and take up space?</p> <p>What happens to air when it is heated?</p> <p>Note: The teacher should make sure that all required information is listed in question form on the "W" (what we want to learn) section of the KWL. Use the <i>Virginia SOL Teacher Research Guide</i> to check what knowledge, skills, and processes are considered essential for the targeted Standard of Learning.</p>	

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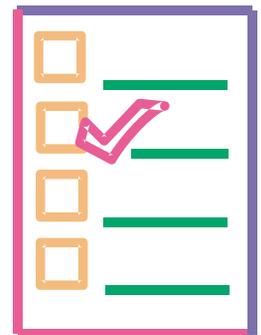
Targeted Standard for Technological Literacy: 16
Supporting Standards for Technological Literacy: 9, 18

Rubric for *High Flying Balloons*

Name _____

Date _____

Design Brief Rubric	no evidence 0	limited understanding 1	some understanding with room for improvement 2	good understanding with room for improvement 3	substantial understanding 4
The student restated the problem in his/her own words.					
The student brainstormed more than one idea.					
The student created and labeled a sketch to use as a "blueprint."					
The student included notes about problems that occurred and their solutions.					
The student tested the balloon to make sure <ul style="list-style-type: none"> • it used only the materials provided • it floated for 15 seconds 					
The student completed the graph.					
The student evaluated how he/she could make it better next time.					



Rubric for *High Flying Balloons*



Name _____

Date _____

<p style="text-align: center;">Oral Communication Rubric</p>	<p style="text-align: center;">no evidence 0</p>	<p style="text-align: center;">limited understanding 1</p>	<p style="text-align: center;">some understanding with room for improvement 2</p>	<p style="text-align: center;">good understanding with room for improvement 3</p>	<p style="text-align: center;">substantial understanding 4</p>
<p>2.1 The student will demonstrate an understanding of oral language structure.</p> <ul style="list-style-type: none"> a) Create oral stories to share with others. b) Create and participate in oral dramatic activities. c) Use correct verb tenses in oral communication. d) Use increasingly complex sentence structures in oral communication. 					
<p>2.2 The student will continue to expand listening and speaking vocabularies.</p> <ul style="list-style-type: none"> a) Use words that reflect a growing range of interests and knowledge. b) Clarify and explain words and ideas orally. c) Follow oral directions with three or four steps. d) Give three- and four-step directions. e) Identify and use synonyms and antonyms in oral communication. 					
<p>2.3 The student will use oral communication skills.</p> <ul style="list-style-type: none"> a) Use oral language for different purposes: to inform, to persuade, and to entertain. b) Share stories or information orally with an audience. c) Participates as a contributor and leader in a group. d) Summarize information shared orally by others. 					

Standards of Learning

English (2002)

Oral Language

- 2.3 The student will use oral communication skills.
- a) Use oral language for different purposes: to inform, to persuade, and to entertain.
 - b) Share stories or information orally with an audience.
 - c) Participate as a contributor and leader in a group.
 - d) Summarize information shared orally by others.

Reading

- 2.8 The student will read and demonstrate comprehension of fiction and nonfiction.
- a) Make predictions about content.
 - b) Read to confirm predictions.
 - c) Relate previous experiences to the topic.
 - d) Ask and answer questions about what is read.
 - e) Locate information to answer questions.
 - f) Describe characters, setting, and important events in fiction and poetry.
 - g) Identify the problem, solution, and main idea.
- 2.9 The student will demonstrate comprehension of information in reference materials.
- a) Use a table of contents.
 - b) Use pictures and charts.
 - c) Use dictionaries and indices.

Writing

- 2.11 The student will write stories, letters, and simple explanations.
- a) Generate ideas before writing.
 - b) Organize writing to include a beginning, middle, and end.
 - c) Revise writing for clarity.
 - d) Use available technology.

Science (2003)

Scientific Investigation, Reasoning, and Logic

- 2.1 The student will conduct investigations in which
- observation is differentiated from personal interpretation, and conclusions are drawn based on observations;
 - observations are repeated to ensure accuracy;
 - two or more attributes are used to classify items;
 - conditions that influence a change are defined;
 - length, volume, mass, and temperature measurements are made in metric (centimeters, meters, liters, degrees Celsius, grams, kilograms) and standard English units (inches, feet, yards, cups, pints, quarts, gallons, degrees Fahrenheit, ounces, pounds);
 - pictures and bar graphs are constructed using numbered axes;
 - unexpected or unusual quantitative data are recognized.
 - simple physical models are constructed;

Matter

- 2.3 The student will investigate and understand basic properties of solids, liquids, and gases. Key concepts include
- mass and volume; and
 - processes involved with changes in matter from one state to another (condensation, evaporation, melting, and freezing).

Mathematics (2001)

Measurement

- 2.12 The student will estimate and then use a ruler to make linear measurements to the nearest centimeter and inch, including measuring the distance around a polygon in order to determine perimeter.

Probability and Statistics

- 2.23 The student will read, construct, and interpret a simple picture and bar graph.

Standards for Technological Literacy

- Standard 9: Students will develop an understanding of engineering design.
- Standard 16: Students will develop an understanding of and be able to select and use energy and power technologies.
- Standard 18: Students will develop an understanding of and be able to select and use transportation technologies.