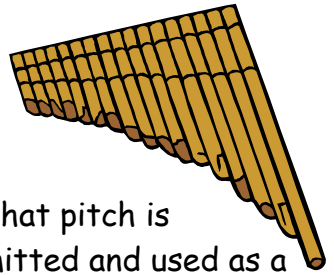
Fifth Grade
Science
Design Brief

Music Makers



Background: We know that sound is a form of energy produced and transmitted by vibrating matter and that pitch is determined by the frequency of a vibrating object. You have been studying sound and how sound is transmitted and used as a means of communication.

Design Challenge: Design and build a musical instrument that will make at least three different pitches, and use it to create a tune of your own. You may use the materials that your teacher provides.

Criteria:
Your instrument must

- have at least three different recognizable pitches
- be accompanied by a paragraph explaining how your instrument works
- use only the materials provided by your teacher
- be attractive and neatly made
- be used to play a short tune.

Materials: You may select from the items below.

- straws
- card stock
- rubber bands
- craft sticks
- 6 inches of tape
- paper clips
- paper cups
- balloons
- tissue paper
- 24 inches of string

Targeted Standard of Learning:	Science 5.2
Supporting Standards of Learning:	Science 5.1 Mathematics 5.11 English 5.1, 5.2, 5.3, 5.6, 5.7
Targeted Standard for Technological Literacy:	9
Supporting Standards for Technological Literacy:	8, 10, 11, 17

Tips for Teachers

Music Makers

Targeted Standard of Learning: Science 5.2

- The student will investigate and understand how sound is transmitted and is used as a means of communication.

Targeted Standard for Technological Literacy: Standard 9

- Students will develop an understanding of engineering design.

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Time Management
• Exposure to targeted Science **Standard of Learning** 5.2 • Some under-standing of the design process	• Check Design Brief for recommended materials. Teacher may substitute materials. • Have various sizes of the following items – rubber bands (widths and lengths) – cups – straws (lengths and diameters) – empty boxes (rice, cereal, tissue, or shoe)	• Insure cleanliness of found objects	• Small groups or pairs • Each student keeps own Guided Portfolio. • Each group member must complete an instrument following the group's plans. • Group members may work together to help write the required paragraph as long as each student turns in his or her own copy.	• Design Brief • Guided Portfolio • Rubric Assessments	• Session 1: Introducing Design Brief and Portfolio (60 min.) • Session 2: Building (60 min.) • Session 3: Sharing and evaluating (60 min.)

Guided Portfolio—1
Name _____

Music Makers

Group Members: _____

_____ _____ _____

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

_____

_____

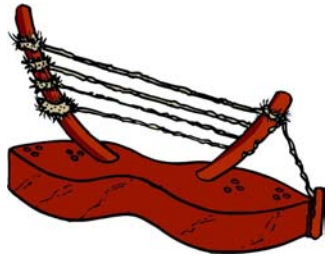
_____

_____

_____

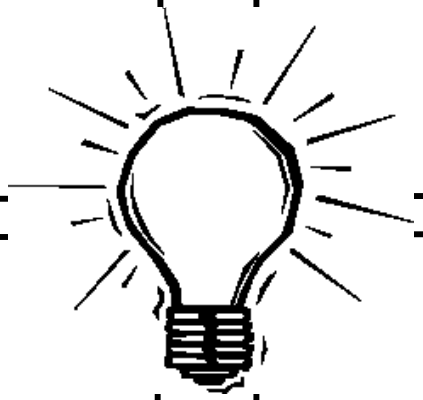
Targeted Standards of Learning:	Science 5.2	Targeted Standard for Technological Literacy:	9
Supporting Standards of Learning:	Science 5.1 Mathematics 5.11 English 5.1, 5.2, 5.3, 5.6, 5.7	Supporting Standards for Technological Literacy:	8, 10, 11, 17

Name _____



2. Brainstorm solutions.

Draw or describe some possible solutions.



Guided Portfolio—3
Name _____

3. Create the solution you think is best.

Keep notes below about the problems you have and how you solve them.

Guided Portfolio—4
Name _____

4. Test your solution.

- Does your instrument have at least three different recognizable pitches? YES NO

- Did you use only provided materials to make your instrument? YES NO

- Is your instrument attractive and neatly made? YES NO

- Did you write a paragraph explaining how your instrument works? YES NO

- Can you play a short tune on your instrument? YES NO

Guided Portfolio—5
Name _____

5. Evaluate your solution.

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

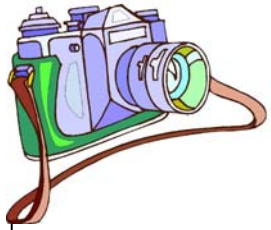
What would you have done differently?

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

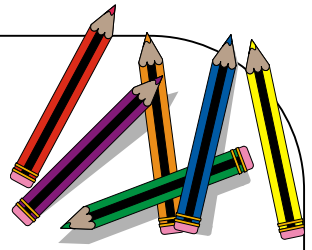
Guided Portfolio—6

Name _____

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



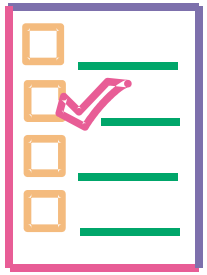
How would you make your project better? Draw a picture showing how it would look after you have made changes to it.



Rubric for *Music Makers*

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 instrument to make sure					
• it had at least three different recognizable pitches					
• it was made of only the provided materials					
• it was attractive and neatly made					
• played a short tune					
• it was accompanied by a paragraph explaining how it works.					
The student evaluated how he/she could make it better next time.					



Rubric for *Music Makers*

Name_____ Date _____

Oral Communication Rubric	no evidence 0	limited understanding 1	some understanding with room for improvement 2	good understanding with room for improvement 3	substantial understanding 4
5.1 The student will listen, draw conclusions, and share responses in subject-related group learning activities.					
a) Participate in and contribute to discussions across content areas.					
b) Organize information to present reports of group activities.					
c) Summarize information gathered in group activities.					
5.2 The student will use effective nonverbal communication skills.					
a) Maintain eye contact with listeners.					
b) Use gestures to support, accentuate, and dramatize verbal message.					
c) Use posture appropriate for communication setting.					
5.3 The student will make planned oral presentations.					
a) Determine appropriate content for audience.					
b) Organize content sequentially or around major ideas.					
c) Summarize main points before or after presentation.					
d) Incorporate visual aids to support the presentation.					
e) Use grammatically correct language and specific vocabulary.					

Standards of Learning

English (2002)

Oral Language

5.1 The student will listen, draw conclusions, and share responses in subject-related group learning activities.

a) Participate in and contribute to discussions across content areas.
b) Organize information to present reports of group activities.
c) Summarize information gathered in group activities.

5.2 The student will use effective nonverbal communication skills.

a) Maintain eye contact with listeners.
b) Use gestures to support, accentuate, and dramatize verbal message.
c) Use facial expressions to support and dramatize verbal message.
d) Use posture appropriate for communication setting.

5.3 The student will make planned oral presentations.

a) Determine appropriate content for audience.
b) Organize content sequentially or around major ideas.
c) Summarize main points before or after presentation.
d) Incorporate visual aids to support the presentation.
e) Use grammatically correct language and specific vocabulary

Reading

5.6 The student will read and demonstrate comprehension of nonfiction.

a) Use text organizers such as type, headings, and graphics to predict and categorize information.
b) Identify structural patterns found in nonfiction.
c) Locate information to support opinions, predictions, and conclusions.
d) Identify cause-and-effect relationships.
e) Identify compare and contrast relationships.
f) Skim materials to develop a general overview of content and to locate specific information.
g) Identify new information gained from reading.

5.7 The student will demonstrate comprehension of information from a variety of print resources.

a) Develop notes that include important concepts, summaries, and identification of information sources.
b) Organize information on charts, maps, and graphs.

Science (2003)

Scientific Investigation, Reasoning, and Logic

5.1 The student will plan and conduct investigations in which

a) rocks, minerals, and organisms are identified using a classification key;
b) estimations of length, mass, and volume are made.
c) appropriate instruments are selected and used for making quantitative observations of length, mass, volume, and elapsed time;
d) accurate measurements are made using basic tools (thermometer, meter stick, balance, graduated cylinder);
e) data are collected, recorded, and reported using the appropriate graphical representation (graphs, charts, diagrams);
f) predictions are made using patterns, and simple graphical data are extrapolated;
g) manipulated and responding variables are identified; and
h) an understanding of the nature of science is developed and reinforced.

Force, Motion, and Energy

5.2 The student will investigate and understand how sound is transmitted and is used as a means of communication. Key concepts include

a) frequency, waves, wavelength, vibration;
b) the ability of different media (solids, liquids, gases) to transmit sound; and
c) uses and applications (voice, sonar, animal sounds, musical instruments).

Mathematics (2001)

Measurement

5.11 The student will choose an appropriate measuring device and unit of measure to solve problems involving measurement of

a) length–part of an inch (1/2, 1/4, and 1/8), inches, feet, yards, miles, millimeters, centimeters, meters, and kilometers;
b) weight/mass–ounces, pounds, tons, grams, and kilograms;
c) liquid volume–cups, pints, quarts, gallons, milliliters, and liters;
d) area–square units; and
e) temperature–Celsius and Fahrenheit units.

Problems also will include estimating the conversion of Celsius and Fahrenheit units relative to familiar situations (water freezes at 0°C and 32°F, water boils at 100°C and 212°F, normal body temperature is about 37°C and 98.6°F).

Standards for Technological Literacy

Standard 8: Students will develop an understanding of the attributes of design.
Standard 9: Students will develop an understanding of engineering design.
Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
Standard 11: Students will develop the abilities to apply the design process.
Standard 17: Students will develop an understanding of and be able to select and use information and communication technologies.