

Lesson/Unit Title: Creating An Acoustical Garden

Grade Level(s): Kindergarten – Grade 6

Duration: Multi-week unit



Big Idea/Unit Overview:

The students will design, create, and analyze original musical instruments which are powered by a renewable energy source, such as wind, water, or solar. These instruments will be permanently placed outside in the school's nature habitat with nearby benches. Classes will go out and observe the instruments visually and aurally then reflect in their journals.

Essential Questions:

- *What are the forms of renewable energy and how do they generate energy?*
- *What constitutes musical sound?*
- *How is sound generated in the various instrument families?*
- *How can the principals and materials of renewable energy be used to create a permanent acoustical artifact?*

Objectives/Outcomes:

The students will apply their knowledge of renewable energy and musical instruments to create a new instrument whose sound is generated by at least one form of renewable energy

Vocabulary: Acoustic, percussion, woodwind, brass, strings, vibration, mouthpiece, reed, bell, valve, keys, embouchure, tone

Materials: The need for materials is generated by the ideas of the children. When we did this, we used shells, keys, bolts, galvanized tubs, solar panels, PVC pipe, straws, and many other objects the students requested.

Resources (websites, videos, images, books, etc.): n/a

Procedure:

Introduction:

In music, students “operate” on sample music instruments and deconstruct them to see how they are built.

Demonstration:

Students create samples of renewable energy resources including a solar pump and miniature wind mill in science class. In music, they are given materials to create a kazoo, wind chimes and a mouse run with cardboard tubes and jingle bells.

Process:

1. In music classes, the students were able to describe various instrumental families and how sound was generated. They experimented with dollar store items in creating new instruments, gave them a name and described the family the instrument belonged to.
2. In science classes, the students learned about renewable energy sources and how they generate energy.
3. In small groups, the students created drawings and descriptions of music instruments in which sound was generated by wind, water, and solar energy.
4. Designs were reviewed with students and necessary changes were made.
5. Materials were purchased
6. Instruments were constructed and "planted" outside in our Nature Habitat.

Assessment:

Students sit on benches and record observations of the sights and sounds of the instruments, including what energy source(s) power each instrument and how the instrument was made.

As the students were designing their projects, the classroom teachers gave feedback and students made modifications to their designs. The students were asked to name the instrument family and energy source. When the projects were completed, they were assessed on whether the inventions made a sound and if not, the students had to say why no sound was present, for example, there was no wind or it had not rained yet. Finally, the students were graded on the written records of their observations. For the younger students, this was simply a drawing of what they saw. The older students' observations were more detailed in explaining the process of sound generation.

The students were all successful in creating instruments that generated sound. The acoustical garden is a permanent fixture of our school now and a place where the students can return in the future with a sense of pride.

Thinking Skills

Finding	Transforming	Selecting
Clarifying the Problem	Synthesizing	Evaluating the Best
Acquiring Necessary Information	Comparing	Ideas
Generating Ideas	Contrasting	Creating
Abstracting		Reflection
		Metacognition

Standards:

	Grade Level	Grade Level 3	Grade Level 5	Grade Level 6
<p>NATIONAL CORE ARTS STANDARDS (NCAS): <i>(identify which art form/s)</i></p>		<p>MU:Cr3.1.3a Evaluate, refine, and document revisions to personal musical ideas, applying teacher-provided and collaboratively developed criteria</p>	<p>MU:Re9.1.5a Evaluate musical works and performances, applying established criteria, and explain appropriateness to the context, citing evidence from the elements of music.</p>	<p>MU:Cr3.1.6a Evaluate their own work, applying teacher-provided criteria such as application of selected elements of music, and use of sound sources.</p> <p>MU:Cn11.0.6a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.</p>
<p>ENGLISH LANGUAGE ARTS COMMON CORE STANDARDS (CCSS): <i>(list specifics - Listening, Speaking, Reading, Writing)</i></p>	<p>RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS-2)</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS2)</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS-2)</p> <p>W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of</p>		<p><u>CCSS.ELA-LITERACY.W.5.2</u> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p><u>CCSS.ELA-LITERACY.W.5.2.A</u> Introduce a topic clearly, provide a general observation and focus, and group related information logically; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.</p> <p><u>CCSS.ELA-LITERACY.W.5.2.B</u> Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p><u>CCSS.ELA-LITERACY.W.5.2.C</u> Link ideas within and across categories of</p>	

	<p>different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)</p> <p>W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1),(3-5-ETS1-3)</p> <p>W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)</p>		<p>information using words, phrases, and clauses (e.g., <i>in contrast, especially</i>).</p> <p><u>CCSS.ELA-LITERACY.W.5.2.D</u> Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p><u>CCSS.ELA-LITERACY.W.5.2.E</u> Provide a concluding statement or section related to the information or explanation presented.</p>	
<p>NEXTGEN SCIENCE STANDARDS (NGSS): <i>(list crosscutting concept)</i> Energy and Matter ♣ Energy can be transferred in various ways and between objects. (5-PS3-1)</p>	<p>3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<p>3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<p>3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>	
<p>OTHER CONTENT STANDARDS: <i>(list specifics)</i> <i>Math</i></p>	<p>MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)</p>	<p>MP.4 Model with mathematics. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)</p>	<p>MP.5 Use appropriate tools strategically. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3) 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1),(3-5-ETS1-2)</p>	