

Science, Sculpture and Recycled Materials

GRADES 2-5

OVERVIEW:

Students will identify and use a variety of reusable and recycled materials to make sculpture while exploring the properties of water and air, and motion and energy. Students will recognize reusable components in packaging and containers.

DURATION:

This lesson is composed of eight mini-activities that may be combined in a variety of ways. Each activity presents a specific science exploration. Each activity can be done independently or combined into a mini unit over one or more class periods.

The lessons can be easily grouped into three main areas: WATER (Fountain, Bottle Optics, Water Sculpture), WIND (Wind Sculpture, Wind Chimes) and MOTION & ENERGY (Kinetic Marble Sculpture, Gears, Pendulum).

This lesson will fit well into Rube Goldberg type explorations.

VOCABULARY:

Air
Axle
Buoyancy
Flotation
Friction
Function
Gravity
Gear
Inertia
Installation
Pressure
Molecules
Reuse
Recycle
Sculpture

PREPARATION FOR TEACHERS

Before beginning the activities in this lesson, review the entire lesson to best prepare your checklist of materials and arrange your classroom for an art based activity. You may want to enlist the aide of a classroom helper on the day of the activity. Contact Clark County Solid Waste at 397-6118 X 4830 for assistance with your presentation or materials.



Review the web sources listed below for examples of artwork made from recycled materials. You will be presenting several examples to students during this lesson.

MATERIALS:

Ask students to bring items that can be reused or recycled from home. You will want to post specific examples of the supplies needed.

You can involve parents with this project by sending a letter home requesting the need for recyclables about 2-4 weeks before you begin this project. Provide examples of the types of recyclable materials needed from the material list below.

An itemized materials list by activity is provided for your convenience. Please read the entire lesson plan and review each activity to determine which best fit your learning goals, then select the specific checklist needed below.

The materials for these projects should be collected from the school cafeteria, classroom or home. All materials should be found, not purchased.

Many of the projects will require: glue, scissors, paper punch, masking or duct tape and water. The projects involving water will require plastic tubs or similar pans to hold water, and towels for clean up.

The materials fall into 3 general categories for use:

- Recycled materials you can cut easily with scissors (toilet paper rolls, paper, magazines, milk containers, school lunch trays, etc.)
- Other recycled materials that cannot be cut with scissors (cans, plastic bottles, etc.)
- Yarn, twine, and/or ribbon, shavings or confetti material

An outdoor area is recommended for the water activities.



Material List

Water Activities:	Wind Activities:	Motion & Energy:
<p>Fountain Dishwashing soap bottles or similar plastic bottles Tack, nail or awl</p>	<p>Wind Sculpture Oatmeal canister, coffee canister or similar canister Recycled paper String or yard Plastic or paper cups, plates Cardboard tubes Styrofoam Fabric scraps Lightweight plastic pieces (i.e.: shapes cut from plastic lids)</p>	<p>Kinetic Marble Sculpture Shoebox or other box Cardboard strips Tape Marbles Plastic pipes Baskets Plastic cups Yogurt cups Blocks Cardboard tubes Cans Play dough or clay Pipe insulation Toy car tracks Other materials</p>
<p>Bottle Optics Water bottles WITH caps Soda bottles Lightweight materials such as crayon shavings, confetti or colored grass Water</p>	<p>Wind Sculpture with sound (chimes) metal objects: nuts, bolts, washers, screws, car parts, jar lids, metal pipes shells or driftwood</p>	<p>Making Gears Jar lids Empty spools Thick cardboard Nails Sandpaper</p>
<p>Water Sculpture Plastic tray or container (tofu packaging, meat tray) for holding water Water Styrofoam Foil Straws Wood blocks Spools Wood sticks Plastic cups</p>		<p>Pendulum Dowel String Recycled paper Plastic cups Salt or sand</p>



Project Images

IMAGES COMING SOON

Water Activities:	Wind Activities:	Motion & Energy:
Fountain	Wind Sculpture	Kinetic Marble Sculpture
Bottle Optics	Wind Sculpture with sound (chimes)	Making Gears
Water Sculpture		Pendulum



PROCEDURE:

Read a book or a text passage about recycling to the students. (see Bibliography/ Webography at the end of this lesson for sources). Alternately, you may wish to select a PowerPoint or other book or video found under Teacher Resources on the Recycle Extreme website to show the class.

DISCUSSION GUIDE

Begin by discussing recycling:

1. Why is it important to reuse and recycle?
2. What items can you recycle at home? What items can you recycle at school?
3. What do you think will happen if people don't reuse and recycle?
(see Background Information for Teachers: Connections from the Cafeteria to the Classroom)

Show the students the images of recycled art that you selected during the Teacher Preparation. Use the following questions to guide the discussion about the images:

1. What do you see?
2. What recycled materials did the artist use?
3. Why do you think the artist used recycled materials?
4. Do you think recycling is important to the artist? How can you tell?
5. What is the artist trying to tell the people who see his/her artwork?
6. Do you think this artwork should be placed in a museum? Why or why not?
7. What different types of texture does the artist use? What do you think the artwork would feel like?
8. If you were going to create a piece of artwork using recycled materials, which materials would you use? What would you create?

Explain to students that they will be creating a sculpture using recycled materials. (See specific activity instructions below).

Show an example of a finished piece and ask students to guess what the different materials are and where they came from, or how they were originally used. After identifying the materials, demonstrate the activity procedure. *Images Coming Soon*

Next, hand out all of the art supplies/materials to the students. Explain the original use of each item to the students to reinforce the idea of REUSE.

Give the students 20-30 minutes to create their sculptures.



Water Activities:

Fountain

Science Concept: Pressure, gravity

The pressure of water increases with depth, caused by the force of gravity. Gravity pulls all things toward the center of the earth. Small air molecules push down on the top of the water. The greatest pressure is at the bottom of the bottle where students will observe the longest water jets.

Note: this activity involves water flow and should be performed outside or in a plastic or metal tub or sink.

1. Working outdoors, use a thumbtack, nail or awl to poke a hole in an empty dishwashing soap bottle, or similar bottle. Then pour water into the bottle and watch how far the water jets.
2. Poke a second hole, high or low in the empty bottle, refill the bottle with water and observe the fountain effect.
3. Poke 1-2 more holes in different spots and see how far these jets compare to the first.
4. Continue adding holes in different places and comparing the jet stream.
5. After completing the activity students will empty the water from the bottles to take their fountains home. Use a towel for clean up.

Bottle Optics

Science Concepts: Density, Buoyancy, Flotation

Lightweight materials, such as crayon shavings, glitter, or colored grass, will be carried around with moving water. These items have the same density as water. These items do not float on top of the water or sink, but are suspended in the water and move when the bottle is shaken.

1. Fill a clear plastic bottle with water.
2. Add crayon shavings, glitter or other small floating materials such as confetti or colored grass.
3. Replace the lid and tighten.
4. Shake the bottle and watch the objects move. Swirling the bottle in one direction will create a tornado effect.
5. Pattern and rhythm can be explored by tipping and shaking the bottle in different ways.
6. Duct tape may be used to secure the lids on the bottles.



Water Sculpture (Installation)

Science Concepts: Density, Bouyancy, Floatation

Objects like corks, wood and small plastic packaging float in water because the water molecules push up on the objects more than gravity pulls them down. The up thrust of the water is called buoyancy. Flotation occurs when the up thrust of water is in balance with the density of the objects. If an object is dense and pushed down more than the water pushed up, the object will sink.

1. Fill a small plastic container, like one used to package tofu or a meat tray, about ½ full.
2. Test the floatation of several small items, like a cork, wood stick, spool or other wood scraps.
3. Begin floating the objects in the pan. Add more objects until the floating sculpture is complete.
4. Items may be connected using glue, wire or paperclips.
5. You may stir the sculpture to move and change the objects.
6. Increase the depth of the water as needed to float objects.
7. After the exploration and sculpture is complete ask students to drain the water from their sculpture into a flower bed, or lawn area. The sculptures are then ready to take home.

Wind Activities:

Wind Sculpture (Function)

Science Concepts: Air (wind)

Wind sculptures can indicate the direction of air currents. Air currents are made up of moving air molecules. We can feel air currents, but not see them. A wind sculpture aides us in seeing the current direction and speed.

1. Cut the ends from an oatmeal canister or similar lightweight canister. Paper Cups may be used.
2. (Alternately, a wire hanger or other frame piece may be used if combining this activity with the wind chimes activity.)
3. Decorate the canister with scraps of construction paper and other found items that can be glued to the surface.
4. Punch several holes near the bottom of the canister.
5. Using string or yarn, tie lightweight plastic or paper pieces or fabric scraps to the canister. Students may also use Styrofoam peanuts. A hole may need to be punched into the plastic pieces. An example might be shapes cut from a plastic lid. Use a hole punch or awl to create holes.



6. Punch 4 holes at the top of the canister. Tie a piece of yarn or string through each hole. Tie the 4 strings to a longer string. This string will be used to hang the wind sculpture.
7. Hang the sculpture outside on a windy day, or from the classroom ceiling and use a moveable fan to explore wind direction.

Wind Chimes

Science Concept: Air (wind), Gravity

Gravity causes objects hanging on a string to hang down. The string keeps the object from falling to the ground. Moving air molecules push against objects in its path. The objects swing and bump into each other. As objects are moved by the wind they swing the other way and then gravity pulls them back down until they are hit again by the wind. The objects swinging back and forth create sound when the metal objects collide.

1. Tie a piece of string to each end of a stick. These strings will be used to hang the wind Chime. (Teacher or assistant may wish to prepare this step ahead of time).
2. Tie pieces of string to selected metal objects.
3. Tie the strings with the metal objects to the stick; make sure they hang so as to bump into each other when moved.
4. Alternately these strings can be added to the wind sculpture completed in the activity above.
5. Hang the sculpture outside on a windy day, or from the classroom ceiling and use a moveable fan to explore wind direction and sound.

Motion & Energy

Marble Sculpture (Kinetic)

Science Concepts: Inertia, Gravity, Friction

A moving marble can be used to demonstrate the law of physics called inertia. This law states that an object in motion will remain in motion. Other laws can get in the way of a rolling marble, like gravity and friction. Gravity is the force that pulls things toward the earth. Friction is the rubbing together of materials. To learn more visit:

<http://www.glenbrook.k12.il.us/gbssci/phys/Class/newlaws/u211a.html>

1. This project may be set up in a shoebox or similar box, or on a table by taping cardboard strips around the edge of the table to keep the marbles from rolling off.
2. Begin building a sculpture for marbles to roll through, into and over.
3. Use inclines and connecting tracks and tunnels for marbles to follow. Play dough or clay can be used to support tubes, pipes and cans for tunnels or tracks.
4. Test the kinetic properties of the sculpture by sending a marble through the sculpture. Revise the sculpture to improve the movement of the marble.
5. Place objects in the path of the marble and see what happens. Can you redirect the marble by placing an object in its path?



Gear Sculpture

Science Concept: Axle, Gear

Gears are toothed or pegged wheels meshed together to transmit motion and force. In any pair of gears the larger one will rotate more slowly than the smaller one, but will rotate with greater force. Each gear in a series reverses the direction of rotation of the previous gear. In this way, a lot of work can be done by turning only one gear.

1. Each student will need a piece of cardboard to use as a base for the gear sculpture.
2. Provide each student with 2-5 spools and an equal number of jar lids.
3. Push a nail up through the cardboard to make an axle for a jar lid.
4. Glue strips of sandpaper around the edges of each jar lid.
5. Glue a spool under each lid.
6. After the glue has dried slip a spool over the nail in the cardboard to create the first gear.
7. Place a second jar lid/ spool gear so that it touches the first gear and push a nail through the cardboard to act as an axle for this gear.
8. Glue a spool or other object to one of the gears to act as a handle.
9. Turn the lid with the handle to test the gears.
10. Add additional lids with sandpaper edges and nail axles. Test each lid as it is placed.
11. Gears may be added to the marble sculpture created in the lesson above. Add a lever to start the movement of the gear.

Pendulum

Science Concept: gravity

A pendulum is a hanging object that swings freely because of the force of gravity. Gravity is the force that pulls things down towards the earth. When the pendulum is swinging gravity tries to pull the object down to earth, but the string prevents it from falling.

1. Make three holes in the rim of a paper cup or similar shaped object.
2. Cut three pieces of string and run them through the three holes. Tie the three ends together.
3. Cut a long piece of String and tie it to the knot in the three pieces of string tied to the rim of the cup.
4. Tie one end of this long string to a broomstick, old tool handle or other reusable dowel.
5. Fill the cup with sand or salt.
6. Swing the pendulum.
7. A small scale version of this pendulum may be added to the marble sculpture above.



Extension:

1. Make a hole in the bottom of the cup before filling it with salt or sand.
2. Place a piece of black paper under the pendulum.
3. Cover the hole with one finger while filling the cup.
4. Swing the pendulum and let go of the hole. As the salt pours from the cup it will mark a pattern of movement on the black paper.
5. Use runny tempera paint to create a pendulum painting. Cover the hole with tape before adding paint to the cup.



ASSESSMENT:

Student will recognize the role of the artist as communicator.

Students will recognize the role of reclaimed, reusable materials in artwork.

Students will recognize packaging as a solid waste item and make choices about reusing and recycling.

Students will be able to discuss the properties of water and air, and motion and energy.

EXTENSIONS:

- Contact Clark County Solid Waste to learn about classroom projects for the Recycled Arts Festival held each June. Also, a craft booth at the RAF provides additional ideas for educators. A classroom or school may wish to sponsor a display or fundraising booth at the Recycled Arts Festival.

- Explore further the role of the artist as communicator.
 1. Ask the students to think about how their sculptures will inform others about the importance of reusing and recycling. *How will your choice of materials express your message about reusing and recycling? What story will you tell through your artwork? Ask students to write an artist's statement about the use of recycled materials in their project*
 2. Once the students have finished creating their sculptures, ask each student to give a short informal presentation explaining the materials used and how this piece of artwork can be used to tell others about the importance of recycling.

- Have the student develop a recycling project at school. Students can use their art projects, posters, etc. to inform their schoolmates about the importance of recycling.
 1. Ask the students to make a list of items that they recycle curbside or deliver to a county drop off site. What items do not appear on this list? (some plastics) Why? (local markets)



Bibliography/Webography

Cerny, Charlene. *Recycled Re-Seen: Folk Art from the Global Scrap Heap*. New Mexico: Harry N. Abrams, 1996.

Martin, Laura C. *Recycled Crafts Box*. Massachusetts: Storey Publishing, 2004.

PBS's Educational Contemporary Art Series

<http://www.pbs.org/art21/>

Recycled Art and Toy Bazaar

http://www.indigoarts.com/store1_recycle.html

This Website has images of toys created out of recycled materials from Africa, Asia, and the Americas.

Kohl, MaryAnn and Cindy Gainer. *Good Earth Art: Environmental Art for Kids*. New York: Bright Ring Publishing, 1991.

Smith, Heather. *Earth-friendly Crafts for Kids: 50 Awesome Things to Make With Recycled Stuff*. New York: Lark Books, 2002.

The Imagination Factory

<http://www.kid-at-art.com/>

This Website teaches kids about the importance of recycling and the different types of art projects they can create with recycled materials. The "Trash Matcher" link allows students to choose a type of recyclable material and provides them with an art/recycling activity that calls for that material.

Environmental Protection Agency: Welcome to Recycle City

www.epa.gov/recyclecity

In this Website, students can explore Recycle City (a town that reduces waste and betters the environment), explore Dumptown (a town that was ravaged by trash), create their own Recycle City, and participate in different recycling activities.



EALR CONNECTIONS

SCIENCE

1. **SYSTEMS:** The student knows and applies scientific concepts and principles to understand the properties, structures, and changes in physical, earth/space, and living systems.
 - 1.1. **Properties:** Understand how properties are used to identify, describe, and categorize substances, materials, and objects, and how characteristics are used to categorize living things.
 - 1.2. **Structures:** Understand how components, structures, organizations, and interconnections describe systems.
 - 1.3. **Changes:** Understand how interactions within and among systems cause changes in matter and energy.
2. **INQUIRY:** The student knows and applies the skills, processes, and nature of scientific inquiry.
 - 2.1. **Investigating Systems:** Develop the knowledge and skills necessary to do scientific inquiry.
 - 2.2. **Nature of Science:** Understand the nature of scientific inquiry.
3. **APPLICATION:** The student knows and applies science concepts and skills to develop solutions to human problems in societal contexts.
 - 3.1. **Designing Solutions:** Apply knowledge and skills of science and technology to design solutions to human problems.
 - 3.2. **Science, Technology, and Society:** Analyze how science and technology are human endeavors, interrelated to each other, society, the workplace, and the environment.

SOCIAL STUDIES:

CIVICS (*extensions*)

4. The student understands the rights and responsibilities of citizenship and the principles of democratic civic involvement.
 - 4.1 understand individual rights and their accompanying responsibilities
 - 4.3 explain how citizen participation influences public policy

GEOGRAPHY

3. The student observes and analyzes the interaction between people, the environment, and culture.
 - 3.1 identify and examine people's interaction with and impact on the environment
 - 3.2 analyze how the environment and environmental changes affect people
 - 3.3 examine cultural characteristics, transmission, diffusion, and interaction.

HISTORY (*extensions*)

3. The student understands the origin and impact of ideas and technological developments on history and social change.
 - 3.1 explain the origin and impact of an idea on society
 - 3.3 understand how ideas and technological developments influence people, resources, and culture



COMMUNICATION

1. The student uses listening and observation skills and strategies to gain understanding.
 - 1.1 Uses listening and observation skills and strategies to focus attention and interpret information.
 - 1.2 Understands, analyzes, synthesizes, or evaluates information from a variety of sources.
2. The student uses communication skills and strategies to interact/work effectively with others.
 - 2.2. Uses interpersonal skills and strategies in a multicultural context to work collaboratively, solve problems, and perform tasks.
3. The student uses communication skills and strategies to present ideas and one's self in a variety of situations. (*extensions*)
 - 3.1. Uses knowledge of topic/theme, audience, and purpose to plan presentations.
 - 3.2. Uses media and other resources to support presentations.
 - 3.3. Uses effective delivery.The student analyzes and evaluates the effectiveness of communication.
 - 4.1. Assesses effectiveness of one's own and others' communication.
 - 4.2. Sets goals for improvement.

MATH

1. The student understands and applies the concepts and procedures of mathematics
 - 1.1 understand and apply concepts and procedures from number sense
2. The student uses mathematics to define and solve problems.
 - 2.1 investigate situations
 - 2.2 formulate questions and define the problem
 - 2.3 construct solutions
3. The student uses mathematical reasoning.
 - 3.1 analyze information
 - 3.2 predict results and make inferences
 - 3.3 draw conclusions and verify results
5. The student understands how mathematical ideas connect within mathematics, to other subject areas, and to real-life situations.
 - 5.2 relate mathematical concepts and procedures to other disciplines
 - 5.3 relate mathematical concepts and procedures to real-life situations

HEALTH & FITNESS

3. The student analyzes and evaluates the impact of real-life influences on health.
 - 3.1 understand how environmental factors affect one's health
 - 3.4 understand how emotions influence decision making

ARTS:

1. The student understands and applies arts knowledge and skills.
 - 1.1 Understand arts concepts and vocabulary
 - 1.2 Develop arts skills and techniques
 - 1.3 Understand and apply arts styles from various artists, cultures and times
 - 1.4 Apply audience skills in a variety of arts settings and performances



2. The student demonstrates thinking skills using artistic processes.
 - 2.1 Apply a creative process in the arts:
 - 2.3 Apply a responding process to an arts presentation:
3. The student communicates through the arts.
 - 3.1 Use the arts to express and present ideas and feelings
 - 3.2 Use the arts to communicate for a specific purpose
 - 3.3 Develop personal aesthetic criteria to communicate artistic choices
4. The student makes connections within and across the arts to other disciplines, life, cultures, and work.
 - 4.2 Demonstrate and analyze the connections between the arts and other content areas
 - 4.4 Understand that the arts shape and reflect culture and history
 - 4.5 Demonstrate knowledge of arts careers and the knowledge of arts skills in the world of work



OSPI ENVIRONMENTAL/ SUSTAINABILITY GUIDELINES:

These Environmental Education Guidelines for Washington Schools clarify the interdisciplinary nature of any study of the environment and show directly how it advances the fundamentals of student learning. Throughout the basic subject areas, there are innumerable opportunities to introduce students to matters and context related to the environment while at the same time meeting the essential academic learning requirements.¹

EE Goal I. The student will develop knowledge about the components of the environment and understand their interactions within natural systems.

Objective A: The student will analyze the interrelationships of living and nonliving components within ecosystems.

Objective B: The student will investigate how, over time, populations of organisms are influenced by limiting factors within ecosystems.

Objective C: The student will evaluate interactions occurring between humans and the environment.

Objective D: The student will examine the implications of resource conservation.

EE Goal II. The student will understand how social and natural systems are fundamental in supporting our lives, economy, and emotional well-being.

Objective A: The student will explain the relationship between health and the environment.

Objective B: The student will investigate the relationship between a viable economy and responsible use of natural resources.

Objective C: The student will explore the relationship between nature and creativity.

Objective D: The student will examine the role that cultural values plays in how people relate to the environment.

Objective B: The student will understand how ideas and technology can influence the natural and built environment.

EE Goal III. The student will recognize how individual decisions and actions impact the environment.

Objective A: The student will investigate how individuals can shape and influence cultural interactions with the environment.

Objective B: The student will analyze how personal decisions and actions alter the outcomes of environmental topics.

EE Goal IV. The student will develop and utilize the knowledge and skills necessary for cooperative action to maintain or enhance the environment.

Objective A: The student will evaluate the usefulness of effective communication and participation in resolution of environmental topics.

Objective B: The student will evaluate historical and contemporary interactions between governments (local, state, and national) and interest groups in environmental policymaking.

Objective C: The student will investigate how involvement in political and legal processes is paramount to resolving environmental topics.

Objective D: The student will actively participate in seeking sound scientific information and participate in developing and applying this information for solving environmental problems.

¹ *Environmental Education Guidelines for Washington Schools, July 2000, pg. i*



