2.A.2 Birdhouse

Construction of simple, functional forms using the Engineering Design Process

Grade Level	2
Sessions	1 at 20 minutes 2 at 20 minutes 3 at 20 minutes 4 at 40 minutes 5 at 20 minutes
Seasonality	Fall, Spring
Instructional Mode(s)	Whole Class
Team Size	Individual
WPS Benchmarks	02.SC.IS.01; 02.SC.IS.02; 02.SC.IS.03; 02.SC.IS.05; 02.SC.IS.06; 02.SC.TE.01
MA Frameworks	K-2.TE.1.1; K-2.TE.1.2; K-2.TE.1.3
Key Words	Blueprint, Design, Dimension, Prototype, Ruler, Structure

Summary

This lesson introduces children to the idea of “structure.” It provides them with the opportunity to design and construct both a shelter for their terrarium, and a birdhouse or feeder. Additional objectives include the strengthening of teamwork and manipulative skills, and the provision of a context in which students use the Engineering Design Process.

Learning Objectives

2002 Worcester Public Schools (WPS) Benchmarks for Grade 2

1. **02.SC.IS.01** Ask questions about objects, organisms, and events in the environment.
2. **02.SC.IS.02** Tell about why and what would happen if?
3. **02.SC.IS.03** Make predictions based on observed patterns.
4. **02.SC.IS.05** Record observations and data with pictures, numbers or written statements.
5. **02.SC.IS.06** Discuss observations with others.
6. **02.SC.TE.01** Identify and describe the characteristics of natural materials and human made materials.

Additional Learning Objectives

1. Students will identify and describe the proper use of tools and materials (e.g., glue, scissors, tape, ruler, paper, toothpicks, straws, spools) to construct simple structures.
2. Students will be introduced to the concept of measurement and dimension, as well as recording data.

Required Background Knowledge

Not all students may be able to measure, so it is a good idea to conduct a mini-measurement lesson of sorts before Part 5.

Essential Questions

1. What is a structure?
2. Why do people build structures and what are they used for?
3. What kinds of animals build structures/homes?
4. What steps would you use to build a structure?
5. Why would you choose certain materials for a structure?
6. What is a ruler and what do you use it for?

Introduction / Motivation

The instructor might begin the lesson by asking students what they have seen in their terrariums, and specifically, the behaviors of their animals. The instructor will then explain that the class will build a shelter for their animals to modify a habitat. The class will then construct either a birdhouse or bird feeder, depending on the time of year. Extensions for this lesson also include constructing a "shelter" for the animals in the terrarium.

Part 1 can be combined with Part 5 (or Part 3 and Part 5). When the students are designing the birdhouse/feeder, they can measure and record the parts of their birdhouse/feeder beforehand, and then replicate the measurements during the construction phase.

Procedure

Part 1

1. Discuss the idea of shelter with the students, noting that sometimes, because people want to, and not because the animals require it, people like to build shelters for animals. Introduce the idea of a structure, such as a house.
2. Provide each student with the "My Birdhouse" blueprint. Explain that they will be building a prototype of a new birdhouse or birdfeeder. Inspire conversation about the blueprint, by asking the students what materials they might like to use. Encourage the students to be creative, and that no ideas are wrong; just be sure there is justification for the design.
3. Have the students design a birdhouse on the worksheet. The outline is of a ½ gallon milk carton, and is provided for a rough outline.

Part 2

1. The students will work individually, or divide students into small groups of three to four.
2. Show students the materials and tools available (see Materials List) for the birdhouse/feeder design and construction.
3. Provide each student with a "Design" worksheet (see attachment at end of lesson).

4. Lead students through the worksheet. Now that they see the materials they have, they can think of creative ways to achieve their design intentions with the materials they have.

Part 3 (Do this part only if the students are working in groups. If the students are working individually, skip this part and move on to Part 4.)

1. Group the students in threes or fours, and hand out the individual blueprints from Part 1.
2. Each student will write down, either on the front or back of the blueprint, four things (or any number of things that the teacher feels is appropriate) from his or her design that he or she feels are the most important.
3. Inspire conversation about the blueprint, by asking the students what they might like to change, i.e. color, additional parts, other modifications, or decorations.
4. Hand out one new blueprint per group, and each student must choose one thing out of his or her four to make a group birdhouse. Therefore, the group blueprint will incorporate one important thing from each student.
5. Allow the students to work in teams, designing a new group blueprint to add the features they have discussed and would like to add.

Part 4

1. If the students are working in groups, ask students to reform previous groups.
2. Refresh students' memories with respect to their design ideas and the materials they have chosen for construction, and hand out the blueprints.
3. Allow the students time to construct their models; some classes may require more or less time to construct (approximately 25 minutes). Instead of the students cutting their own holes, just have them trace the holes with a marker, and cut the holes for the students.
4. After each student/group has finished constructing their model, ask the students to describe the function of their birdhouses and bird feeders and explain why they added particular elements.

5. Give each student an “Improve” worksheet. Ask students what they could change about their birdhouse to make it more convenient or comfortable for the birds, and ask them to write it down on the worksheet.

Part 5

1. Ask students to reform previous groups. Each group should now have a prototype of their birdhouse, as well as the group blueprints drawn on the provided worksheet, “My Birdhouse.”
2. Introduce a simple tool, a 12-inch ruler, and the concept of dimension and its notation (1 inch). Discuss the concept of measuring objects and the importance of doing it, i.e. so that someone else can look at the blueprints and reproduce the prototype, and so that the students can describe and compare their birdhouses. Also, ask the students what would be important dimensions of their birdhouses to record on the blueprints.
3. Have the students in each group take turns measuring the outside dimensions (such as the height and width of the birdhouse, as well as the height of the hole) and recording the data on the blueprint.
4. Ask each group to present the measurements of their prototype to the class (not intended to be lengthy, simply say what the height and width are, and how tall the hole is).

Materials List

Materials per class	Amount	Location
12-inch ruler	One per group	Classroom
Aluminum foil	One box	Grocery store
Clear tape	Undefined	Drugstore, office supply store
Duct tape	One roll	Hardware store
Lightweight cardboard	Several pieces per group	Recycled
Milk cartons (1 or ½ Gal.)	One per team	Recycled
“My Birdhouse” worksheet	One per student	Lesson plan
Permanent markers	One set per team	Office supply store
Plastic drinking straws	Several pieces per group	Grocery store, dollar store
Plastic wrap	One roll	Grocery store

Popsicle sticks/tongue depressors	Several pieces per group	Craft supply store
Scissors	One pair per group	Classroom
Scraps of colored paper/fabric	Undefined	Recycled
String	One roll	Hardware store, toy store

Vocabulary with Definitions

1. *Blueprint* – A drawing of an object you plan to build, a map of how something will be constructed
2. *Design* – A plan for making something
3. *Dimension* – A measurement of length between two things
4. *Inch Ruler* – A simple tool used to measure the dimension of an object in inches
5. *Prototype* – An original model of something you design
6. *Structure* – Something made up of a number of parts that are held or put together in a particular way

Assessment / Evaluation of Students

The instructor may assess the students in any/all of the following manners:

1. Observe student groups at work.
2. Collect student worksheets.
3. Determine whether students understood the Engineering Design Process.

Lesson Extensions

1. (Engineering) As they students observe their terrarium, they may wish to construct a shelter for their animals. As a class, the students could build a cave, hut, or other shelter. Though they will not have an original blueprint, they can follow a similar procedure:
    - Ask what the animals in the terrariums need for a shelter.
    - Design a shelter and make a blueprint.
    - Choose appropriate materials based on the environment and material properties.
    - Construct a prototype structure.
    - Measure and record the dimensions of the structure on the blueprint.
    - Put structure in terrarium and observe how the animals react and interact with it.
2. (Science) Discuss other animals that build structures: Beavers, Birds, Ants, Bees, Squirrels, Groundhogs, and the animals in your classroom.

3. (Science/Engineering) Students can decide to place a birdfeeder/birdhouse outside, in the playground for example. Then they can observe if birds or other animals use it. What features of the birdhouse are animals using and why? Based on their observations, do the students think that their design can be improved in any way?

Attachments

1. Birdhouse Design Worksheets
2. My Birdhouse Blueprint Worksheets
3. Birdhouse Improvement Worksheets

Troubleshooting Tips

1. Craft glue takes considerable time to dry, so tape is preferred.

Safety Issues

1. Teacher should have the students outline the hole on the birdhouse/milk carton and cut it for them. A good resource for proper scissor use is: http://kid.lifetips.com/subcat/65307/educational/correct-scissor-use/

Additional Resources

1. Wauer-Ferus, Loraine (1999). *Bird Houses & Feeders*. Retrieved October 30, 2005, from Billy Bear for Kids and Teachers: Billy Bear's Playground Website: http://www.billybear4kids.com/holidays/earthday/birds/house.htm
2. Langis, Judith (2005). *Structures*. Retrieved October 27, 2005, from ThinkQuest for Tomorrow's Teachers Website: http://t3.preservice.org/T0211983/design.html
3. *Correct Scissor Use*. Retrieved October 30, 2005, from Life Tips Website: http://kid.lifetips.com/subcat/65307/educational/correct-scissor-use/

Name: _____ Date: _____

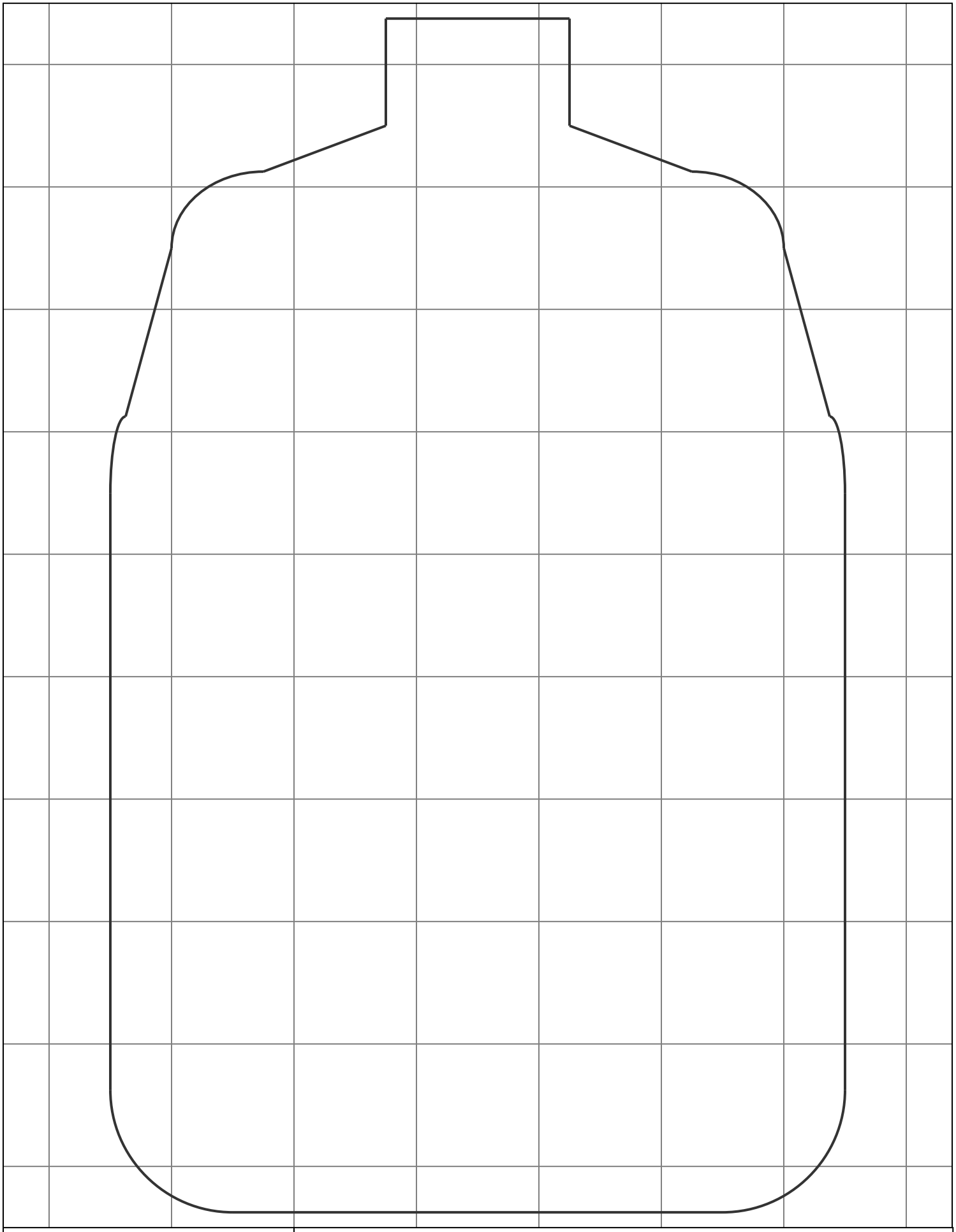
Design

Material	Why will you use the material to construct your birdhouse?
Aluminum Foil	
Clear Tape	
Duct Tape	
Lightweight Cardboard	
Pipe Cleaners	
Plastic Drinking Straws	
Plastic Wrap	
Popsicle Sticks	
String	

Name: _____ Date: _____

Improve

What can you do to your Birdhouse or Bird Feeder to make it better?



My Birdhouse	Name: