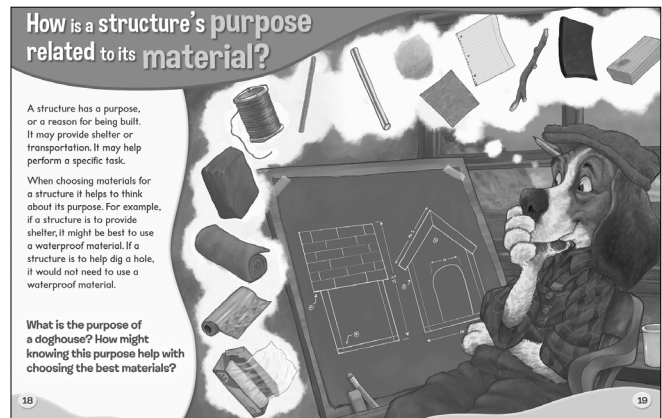
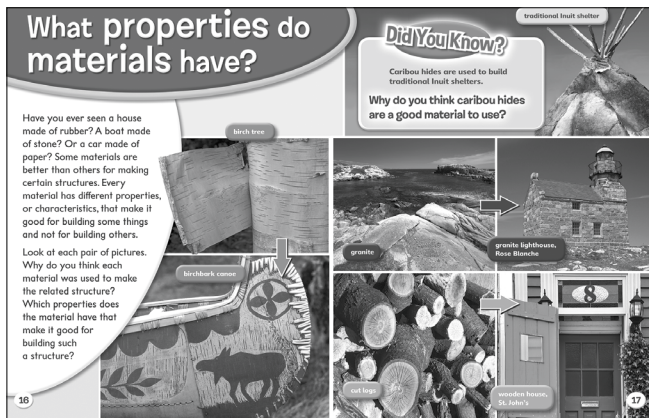


What Are Suitable Materials for Structures?



Focus: Students explore the properties of various building materials and determine which materials are best suited for a particular structure.

Specific Curriculum Outcomes

Students will be expected to:

- 23.0 describe the properties of some common materials and evaluate their suitability for use in building structures [GCO 1/3]
- 6.0 use appropriate tools [GCO 2]
- 24.0 identify the most useful method of sorting [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe some of the properties of various materials
- explain why certain structures are made of certain materials
- sort materials according to their suitability for building a specific structure

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- select, read, and view with understanding a range of literature, information, media, and visual text [GCO 4]
- respond personally to a range of texts [GCO 6]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine pages 16–19 • BLM <i>Placemat</i> • <i>The Little Knight Who Battled a Dragon</i> (Read Aloud) • IWB Activity 5 • BLM <i>Properties Chart</i>	• samples of various materials (blocks of wood, pieces of rubber, twigs, sheets of paper, balls of cotton, straws, pipe cleaners, wires, modelling clay, felt, aluminum foil, plastic wrap, sandpaper) • safety equipment for all students (goggles, aprons) • sheets of plastic or paper towels • various tools (e.g., spray bottles, hand-held fans, rubber mallets, scissors, sandpaper, tweezers, tongs, stir sticks, eyedroppers, hole-punch, stapler, glue gun) • computers or tablets with Internet access	• Prepare a collection of material samples for each group, with one sample of each material. • Prepare a collection of tools for each group, with one of each tool.	• properties • purpose

Safety

- Remind students to use appropriate senses (not taste) when they are examining objects at the Curiosity Centre.
- You may choose to have students wear safety goggles and aprons while they are working with the tools in this lesson.
- Review appropriate safety rules with students before giving them access to any tools.

Science Background

- The use of a material in building a structure is determined by the properties of the material and the purpose of the structure.

- Some properties to consider when assessing the suitability of a material for building a specific structure include its strength, flexibility, texture, water resistance, and durability.
- Natural materials may be processed in a way that enhances or changes their properties.

Possible Misconceptions

- Students may think that “material” is the same as “fabric” or “cloth.” Emphasize that anything an object is made of can be considered a “material,” such as wood, plastic, metal, animal hide, or fabric. Explain that materials can be natural or made by humans. Point out that some cultures use materials that students wouldn’t normally consider to be a building material such as snow for Inuit snow houses or igloos, or brush for temporary or emergency structures such as a lean to or a bush shelter.
- Students may also have difficulty explaining why certain materials are well suited for certain purposes. This is partly because they are not distinguishing between the object and what material the object is made of. They may, for example, say that a raincoat is well suited for staying dry because that is the purpose of a raincoat. Explain that the material the raincoat is made of is what makes it well suited for staying dry, because the material is waterproof.

ACTIVATE

Curiosity Centre

Have students gather around the Curiosity Centre and examine the structures on it. Invite them to name any materials they recognize (e.g., metal, wood, plastic, rubber, twigs, eggshell, animal hide, birch bark), and record the materials on chart paper.

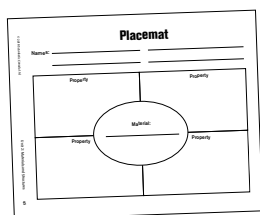
Then choose a structure and ask students what would happen if it were made from a different material. For example, what would an umbrella made of wood be like? A birdhouse made of metal? A shoe made of eggshells?

Materials and Structures

Have students read pages 16–17 of the Student Magazine. Discuss the structures made from each of the natural materials shown. Encourage students to explain why each material was used, discussing one material and structure at a time. As students discuss the materials, record any properties they mention (e.g., warm, strong, easy to find, smooth). Review with students that these are all “properties,” and that every building material has a certain set of properties. Add the word “properties” to the Word Wall.

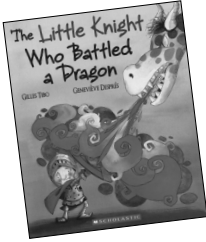
Placemat

Divide the class into groups of four and distribute a copy of BLM *Placemat* to each group. Have each group select a material from the Curiosity Centre. Students write the material in the middle of their placemat. Then have each student think of a property of that material and write his/her ideas in one of the placemat blocks. BLMs can be posted on the wall.



CONNECT

Read Aloud: *The Little Knight Who Battled a Dragon*



Summary

A little knight must face a fire-breathing dragon with only his sword, his shield, and an old iron horse.

Before Reading

Remind students that all materials have certain properties that make them suitable, or sometimes unsuitable, for use in certain structures. Tell students that you are going to share a story about a knight who must face a fire-breathing dragon in order to keep his village safe.

Set a focus for listening by asking students to notice what structures the little knight uses when he faces the dragon and what materials these structures are made of. Explain that students will be asked to describe the suitability of the materials used.

During Reading

Read the story aloud focusing on the main text of the story for the initial reading. Pause to clarify vocabulary or concepts as necessary. Alternate between asking students to respond in a whole group or with a partner. Prompts for discussion could include:

- **Why does the little knight say that he can't battle a fire with a wooden sword, a wooden shield, and a wooden horse?**
- **What are the properties of wood? Why would wood be used to make a sword? A shield? A horse?**
- **Why isn't wood a suitable materials for battling a fire? Which properties make it unsuitable?**
- **What structures do the villagers bring to the little knight? What are these items made of?** (a metal shield, steel lasso, flame-proof breastplate, and an iron horse)
- **What properties do metals such as iron and steel have?**
- **What makes these materials suitable for battling a fire?**
- **Every time the old horse "shook with fear," pieces of metal fell onto the ground. What tools did the little knight use to repair the iron horse?** (pliers and screws)
- **Why were these tools appropriate?**
- **Why was the dragon upset and breathing fire?**
- **Did you like the way the little knight handled the situation with the dragon?**
- **What might you have done to help the dragon get out of the trap?**

After Reading

When you have finished the story, remind the students that the little knight's iron horse fell apart and he had to put all the pieces back together but he didn't really know how to rebuild it. When he put it back together, the iron horse looked different than it did originally. Ask:

- **Was his new horse structure effective and appropriate?** (Yes. The small text says, "it looks different but is stronger than ever.")
- **Do you think structures built for the same purpose (i.e., to transport a rider) can be constructed differently?**

Invite students to sketch their own iron horse and have them label the various materials used to build it.



Suitable Materials

Ask students to read the text on pages 18–19 of the Student Magazine. Then have them brainstorm answers to the two questions:

- **What is the purpose of a doghouse?**
- **How might knowing this purpose help with choosing the best materials?**

Students can then take turns choosing one of the materials pictured on the spread (wood, rubber, twig, paper, sandpaper, cotton ball, straw, pipe cleaner, wire, modelling clay, felt, aluminum foil, plastic wrap) and evaluating how suitable it would be for building a doghouse. For ideas, encourage students to refer to the posted *Placemat* BLMs listing properties of materials.

IWB Activity:

- Using Activity 5: *What is it made of?* (see the Teacher's Website)
- students identify the materials used for each structure and explain whether or not the material was an appropriate choice.

CONSOLIDATE

Properties Chart

Name: _____

Number of Structures: _____

1. Complete the chart below. For each structure, list the materials used. Then list the properties of the materials used.

2. Discuss the properties of the materials used. How do the properties of the materials affect the structure?

3. How might knowing the properties of the materials help with choosing the best materials?

Material	Properties	1	2
Wood	Strong, durable, easy to work with		
Rubber	Flexible, durable, waterproof		
Twig	Light, strong, natural		
Paper	Light, easy to work with, can be shaped		
Sandpaper	Smooth, easy to work with		
Cotton ball	Soft, lightweight		
Straw	Light, strong, natural		
Pipe cleaner	Flexible, easy to work with		
Wire	Strong, durable, easy to work with		
Modelling clay	Plastic, easy to work with		
Felt	Soft, durable, easy to work with		
Aluminum foil	Light, strong, waterproof		
Plastic wrap	Flexible, waterproof, easy to work with		

Properties of Building Materials

Divide the class into small groups and distribute BLM *Properties Chart* to each group. Assign a structure to each group (e.g., chair, slide, tree fort, bunk bed) and have members work together to identify what properties would be required in the materials used to build that structure. Groups can record their structure and properties on the BLM.

Provide students with several samples of the materials on pages 18–19, along with various tools (e.g., spray bottles, hand-held fans, rubber mallets, scissors, tweezers, tongs, stir sticks, eyedroppers, hole-punch, stapler, glue gun). Be sure to review safety rules with students before they access any tools. You may wish to have students wear aprons and safety goggles during this activity, and cover their work area with plastic or paper towels.

Groups can investigate the suitability of various materials by testing them for the properties they require for their structure. For example, if they need materials that are waterproof, they can spray water on various materials.



If they need materials that are windproof, they can place various samples between a hand-held fan and another object. Groups can fill in BLM *Properties Chart* to indicate whether each material has the properties they require. Groups should then sort their materials to decide which ones they would use for their structure. They can record their decisions at the bottom of the BLM.

Note: This activity may require an adult volunteer to provide supervision and assistance as needed.

EXPLORE MORE

Materials Lab

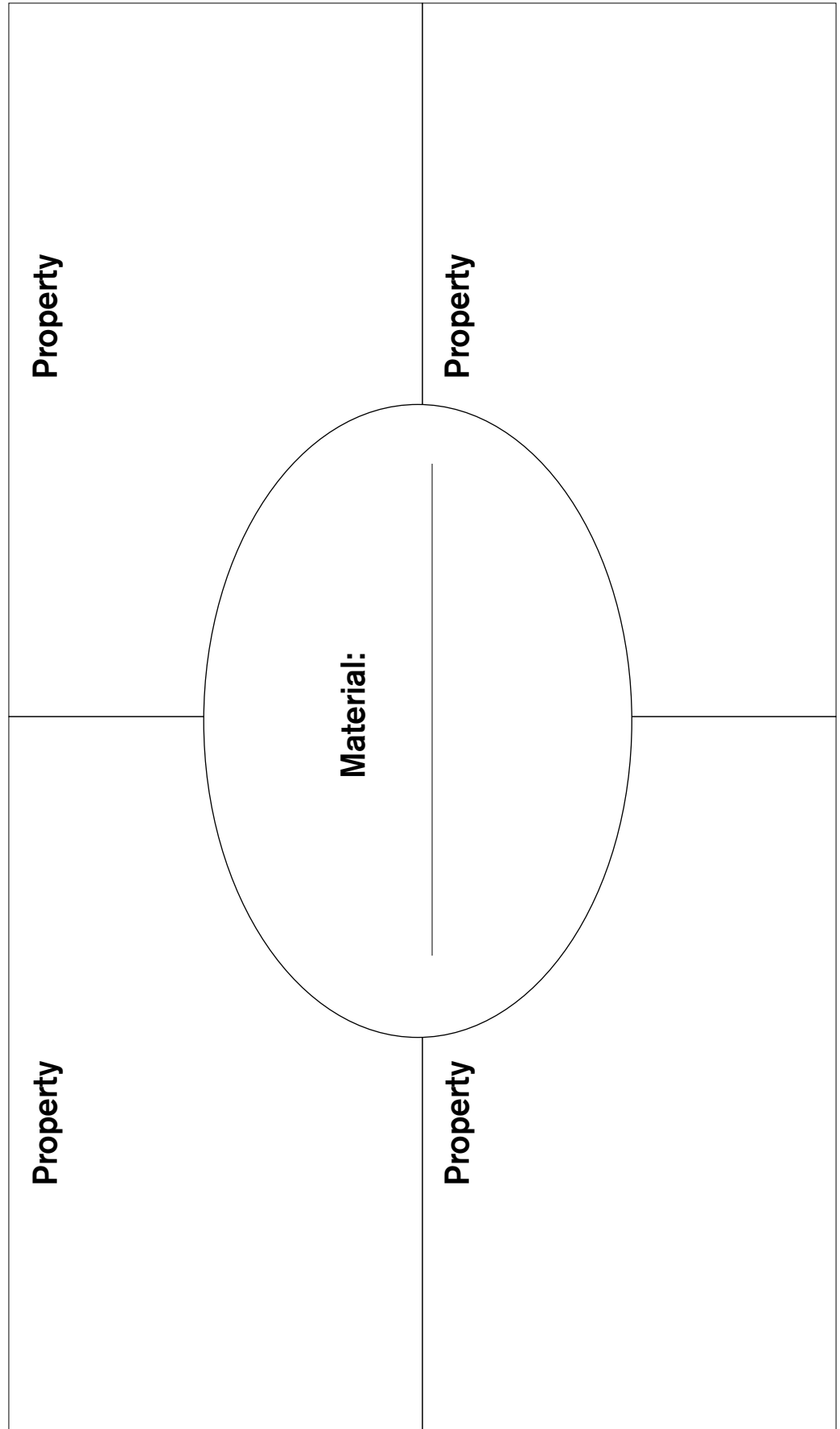
Students can work with the Materials Lab at the Website <http://www.pbs.org/wgbh/buildingbig/lab/materials.html>.

Shelters

Students can research and compare the traditional shelters of the Vikings at L'Anse aux Meadows with those of the Beothuk, the Mi'kmaq, Inuit, and the Innu, and even to early European settlers' log cabins and salt box houses. Their research should focus on why these shelters were made with certain materials and not others. Students can prepare posters to share their research with others.

Placemat

Names: _____



Properties Chart

Name: _____

Name of Structure: _____

1. Choose three properties that your building materials need to have. Write the properties in the top row of the chart below.
2. On the left side of the chart, list the materials you are investigating. Add rows if needed.
3. In each box, write a ✓ or an X to show which materials have the properties you need.
4. After you have investigated all the materials, decide which ones would be best for your structure. List them at the bottom of the page.

Properties			
Material	1:	2:	3:
1:			
2:			
3:			
4:			
5:			
6:			
7:			
8:			