

Grade 1 Properties of Objects and Materials

TEACHER'S GUIDE

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Properties of Objects and Materials

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Let's Do Science, Newfoundland and Labrador

Grade 1 Unit 3: Properties of Objects and Materials Teacher's Guide

Reviewers:

Catherine Phillips, NL

Janice Ryan, NL

Science Consultants:

Ron Ballentine, ON

Nadine Norris, ON

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175 Hillmount Road, Markham, Ontario, Canada, L6C 1Z7.

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Welcome to the *Properties of Objects and Materials* Unit

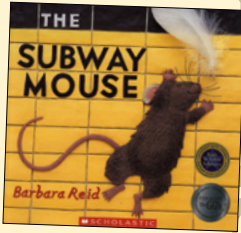
In this unit, students develop their understanding of familiar objects (including the purposes for which these objects are used, the materials from which they are made, and methods for joining materials) through a variety of explorations and investigations. Students identify a problem and use the knowledge gained to construct a useful object to solve the problem.

Science Cards

This collection of 10 Science Cards will support students' exploration of the properties of objects and materials with each large-format card focusing on a different concept. The bright, colourful photographs and detailed illustration will engage students and give them multiple opportunities to explore a variety of concepts. These stand-alone cards can also be used at centres to stimulate student explorations. Also, digital versions of these cards are available on the Teacher's Website to be used with an Interactive Whiteboard.

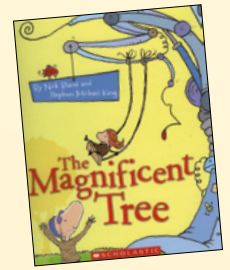


Science Read Alouds



Two Read Aloud texts allow you to introduce and engage students with science concepts. *The Subway Mouse* by Barbara Reid uses engaging Plasticine art which incorporates a variety of found objects. This book is used to invite students to observe and describe objects based on similarities and differences. This includes exploring the purpose for the objects—where they're found, how they're used, and what materials they're made from.

The Magnificent Tree by Nick Bland and Stephen Michael King invites students to compare two different solutions to a problem—how to create a tree so the birds will stay. This book acts as an engaging introduction to the design process and illustrates how different solutions follow the same process to completion.



Anchor Video



The Anchor Video: *Properties of Objects and Materials*, found on the Teacher's Website, introduces students to essential questions about objects and the materials they're made from. Students are invited to identify materials, to observe objects and identify which materials are used to make them, and to consider how the material or materials affect the usability of the objects. The video gives a number of examples to activate students' thinking and to promote questions.

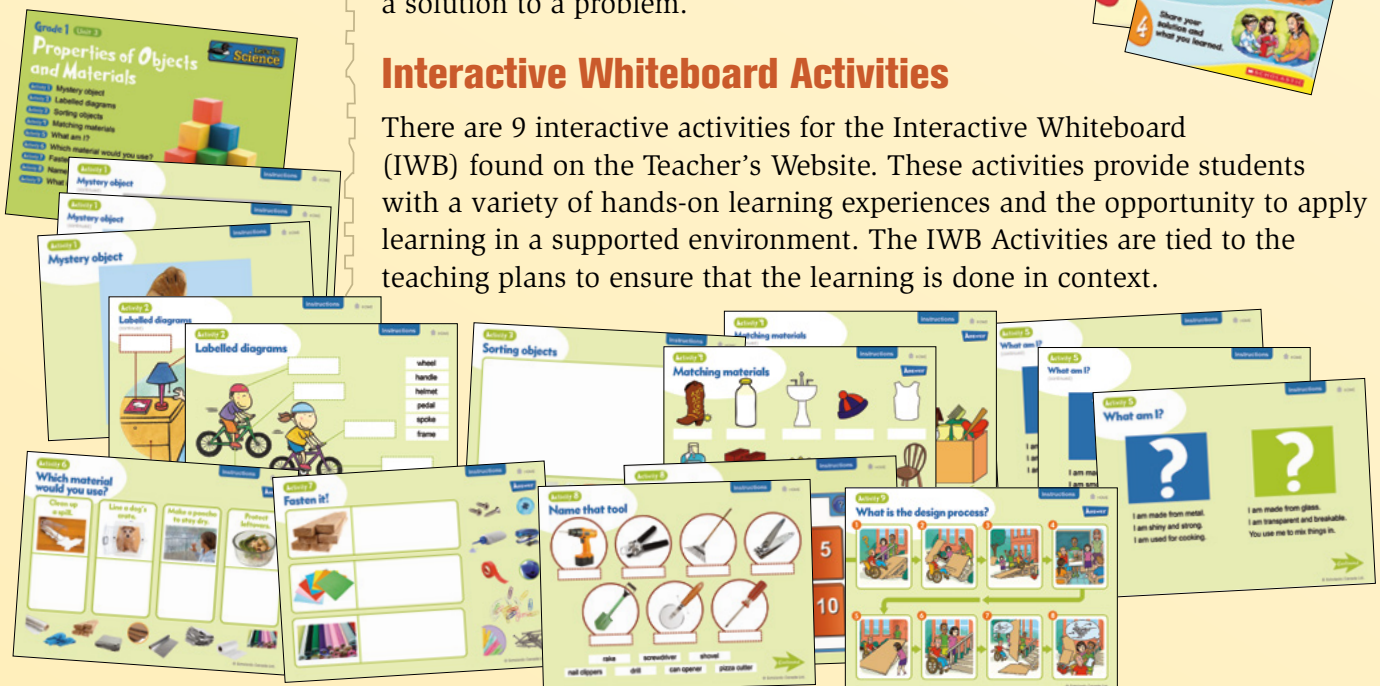
Posters

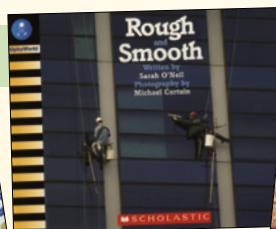
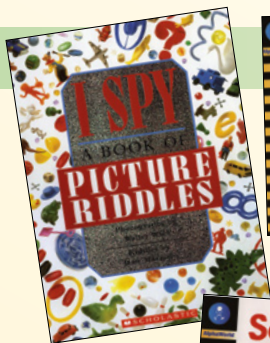
Two classroom posters—*What Is the Inquiry Process?* and *What Is the Design Process?*—will support students as they follow the steps for guided and open inquiries and learn to use the design process to create a solution to a problem.



Interactive Whiteboard Activities

There are 9 interactive activities for the Interactive Whiteboard (IWB) found on the Teacher's Website. These activities provide students with a variety of hands-on learning experiences and the opportunity to apply learning in a supported environment. The IWB Activities are tied to the teaching plans to ensure that the learning is done in context.





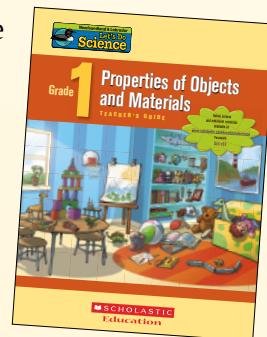
Science Library

The Science Library provides a collection of colourful and engaging non-fiction and fiction texts at a variety of reading levels. These texts support students as they explore various science concepts and skills. See the *Science Library Guide* in the Teacher's Guide Binder or online for brief summaries, science connections, and suggested reading approaches (e.g., Independent Reading and Read Aloud).

Teacher's Guide

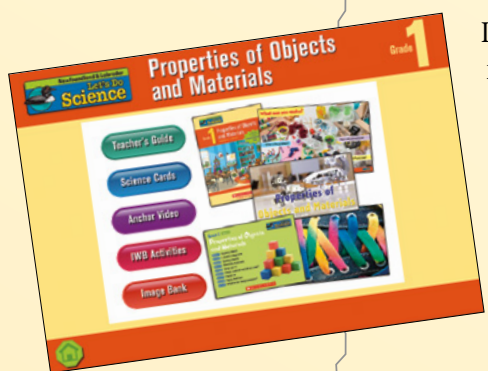
This guide provides detailed suggestions for using all of the components including the Science Cards, Anchor Video, reproducible Blackline Masters (BLMs), and IWB activities with your students. Visual cues such as book covers, thumbnail images, and icons highlight the use of each component along with tools such as Science Folders and Journals, the Word Wall, and the I Wonder Wall. Strategies and tools you need to assess students' learning, such as rubrics and checklists, are also included.

Embedded within the teaching plans are connections to Guided, Shared, and Read Aloud texts from *Literacy Place for the Early Years*, Grade 1 that relate to the concepts explored in *Properties of Objects and Materials*.



Teacher's Website

In addition to the Science Cards, Anchor Video, and IWB Activities mentioned above, the Teacher's Website provides a digital copy of the Teacher's Guide for this unit along with access to an image bank containing the variety of photographic images found on the Science Cards and IWB Activities. These images may be used for teachers to create new IWB activities or for students to incorporate into presentations. Find the Teacher's Website at scholastic.ca/education/nlscience
Password: Sci1nL2



Planning Guide for *Properties of Objects and Materials*

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
What Are Objects? Students explore various objects and the purpose for which these objects are used.	STSE/K [GCO 1/3] • 25.0	- IWB Activity 1 - Anchor Video: <i>Properties of Objects and Materials</i> - Science Card 1 - BLM <i>Draw Objects</i> - IWB Activity 2	- mystery object of choice - assortment of familiar objects for students to explore - digital camera (optional) - students' Science Journals	<i>Making Things</i> (Guided Reading, Level A)
What Are Objects Like? Students learn about and describe objects based on similarities and differences.	Skills [GCO 2] • 7.0 STSE/K [GCO 1/3] • 26.0	- Science Card 2 <i>The Subway Mouse</i> (Read Aloud) - IWB Activity 3	- objects featured in <i>The Subway Mouse</i> - students' Science Journals - collection of buttons - mystery bags (drawstring bags) - objects with interesting shape and texture (e.g., seashells, Silly Putty, pine cone, bark chipping, corrugated cardboard) - digital camera - various tools for close-up viewing (e.g., magnifying glasses, gooseneck camera, hand-held microscope, rulers)	
What Are Materials? Students learn about materials based on similarities and differences and the objects they make.	STSE/K [GCO 1/3] • 26.0 • 27.0	- Science Card 3 - Science Card 4 - BLM <i>Materials in the Classroom</i> - BLM <i>Venn Diagram</i> - IWB Activity 4	- students' Science Journals - students' Science Folders - small photo albums (one per small group)	
How Do You Describe Objects and Materials? Students investigate the properties of objects and materials at hands-on activity centres.	STSE/K [GCO 1/3] • 26.0 • 27.0	- Science Card 5 - BLM <i>How Does It Feel?</i> - BLM <i>What Does It Look Like?</i> - IWB Activity 5	- variety of objects and materials for students to compare (e.g., stuffed animals, dolls, blocks, seashells, hard and soft balls, modelling clay, feathers, straw hat, wool hat, soft and hard cover books, aluminum foil, mirror, cellophane wrap) - flashlight - pan balance - collection of crayons of varying sizes - digital camera (optional) - students' Science Journals	<i>What Can Float?</i> (Guided Reading, Level B)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
Introducing the Design Challenge Students become familiar with (or review) the design process.	Skills [GCO 2] • 24.0 • 7.0 • 8.0 STSE/K [GCO 1/3] • 26.0 • 27.0	<i>The Magnificent Tree</i> (Read Aloud) <i>What Is the Design Process?</i> poster - Science Card 6	students' Science Journals	
Testing Materials Students will determine the purpose of various materials and test their properties using the inquiry process.	Skills [GCO 2] • 24.0 • 10.0 • 20.0 • 13.0 STSE/K [GCO 1/3] • 28.0	<i>What Is the Inquiry Process?</i> poster - BLM <i>Signs for Centres 1 and 2</i> - BLM <i>How Materials Are Used</i> - IWB Activity 6	- various materials for the seven centres for students to test their properties (see chart on page 43) - plastic water bottle - plastic bag - piece of Styrofoam - white tissue paper - students' Science Folders	<i>Munchal Munchal Munchal</i> (Read Aloud–Inferring Strategy Unit)
How Do You Join Materials? Students explore various ways to join different materials.	Skills [GCO 2] • 8.0 • 24.0 STSE/K [GCO 1/3] • 29.0	- Science Card 7 - IWB Activity 7 - Science Card 8	- variety of familiar objects with fasteners - variety of objects and materials to join (e.g., paper, paper bags, aluminum foil, beads, blocks of wood, buttons, cardboard, fabric, foil plates, paper plates, paper towel rolls, pencils, plastic containers and lids, craft sticks) - joining materials/fasteners (e.g., different types of tape and glue, elastic bands, stapler and staples, buttons, pipe cleaners, plastic ties, zippers, wool, ribbon, shoelaces) - students' Science Journals - tools such as scissors, colouring pencils, crayons, markers, paint and brushes	<i>Let's Make Cards</i> (Guided Reading, Level F)

Continued on next page...

Planning Guide for *Properties of Objects and Materials* (continued)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
How Do You Use Objects? Students examine the purpose of objects and record their findings. Students design a new tool.	Skills [GCO 2] • 22.0 STSE/K [GCO 1/3] • 25.0 • 27.0	- Science Card 9 - BLM <i>How Do We Use Objects?</i> - IWB Activity 8 <i>What Is the Design Process?</i> poster <i>The Magnificent Tree</i> (Read Aloud) - Science Card 10	- variety of tools, for example: - workshop tools: pliers, screwdrivers, measuring tape, sandpaper - gardening tools: garden trowel, watering can - office tools: tape dispenser, staple remover - kitchen tools: pancake flipper, bottle opener, pizza cutter, egg beater, measuring spoons - small boxes, pencils or straws, cardboard - students' Science Journals <i>The Polar Bear in the Pack: Two Windows on the World</i>, by Derek Wilton (optional)	
Modelling the Design Process Teacher models the design process for students or, if students have experience with the design process, guides students through the process of making a pencil holder.	Skills [GCO 2] • 31.0 • 22.0 • 32.0 • 18.0 • 30.0 • 7.0 • 8.0	<i>What Is the Design Process?</i> poster - IWB Activity 9	- sample pencil holder - materials to build and decorate a pencil holder	
The Design Challenge Students apply their understanding of the properties of objects and materials to complete the design challenge to build a useful object of their choice using recycled materials.	Skills [GCO 2] • 24.0 • 31.0 • 22.0 • 32.0 • 18.0 • 30.0 • 7.0 • 8.0 STSE/K [GCO 1/3] • 29.0 • 28.0 • 30.0	<i>What Is the Design Process?</i> poster - Science Card 6 - BLM <i>Student Self-Assessment of Design Process</i> - BLM <i>Design and Build a Useful Object</i> - BLM <i>My Useful Object</i>	- recycled materials such as string, yarn, paper towel rolls, cans, cotton balls, buttons, broken toy parts, plastic containers and bottles - digital camera (optional)	<i>Art for the Birds</i> (Shared Reading—I Can Make a Difference Inquiry Unit)

Preparing for the Unit

1. Curiosity Centre

The Curiosity Centre gives students an opportunity to investigate science ideas and tools through active participation, free exploration, and independent play. In this hands-on centre, students can explore objects related to the properties of objects and materials.

The Curiosity Centre could have

- a variety of objects, such as stuffed animals, dolls, blocks, beads, seashells, hard and soft balls, modelling clay, feathers, straw hat, wool hat, soft and hard cover books, mirror, pencils, crayons of varying sizes
- materials for construction, such as craft sticks, pieces of wood, construction paper, straws, pipe cleaners, string, glue, tape, elastic bands, nuts and bolts, stapler and staples, plastic ties, ribbon, shoelaces, paper clips, clothespins, wire, cotton, plastic string, thread, foam, flat cardboard, corrugated cardboard, ceramics, vinyl, plastic wrap, aluminum foil
- old books, magazines, and photographs of various objects and materials (e.g., office or school supply catalogue), paper, wallpaper, wrapping paper
- samples of fabric along with a variety of fasteners, such as yarn, Velcro, snaps, buttons
- recycling box materials, such as plastic bottles, Styrofoam trays, cereal boxes, plastic containers and lids, egg cartons, paper towel rolls, pop cans

Check the centre frequently to ensure it is well stocked with items. Invite students to contribute to the centre by bringing in items or photographs related to the properties of objects and materials. Remind students to tidy up the materials when they are finished.

Note: You may choose to display new items every few days.

2. Science Journals and Folders



Check that students are recording appropriately in their Science Journals. Continue to encourage them to add new questions or ideas to their journals as often as they like. Students can also record their findings and what they learned during investigations.

Remind students that they should store completed BLMs, design plans, drawings, stories, etc. that are related to the *Properties of Objects and Materials* unit in their Science Folders.

3. Word Wall



Add any relevant science terminology to the Word Wall throughout the unit. Urge students to use the terms as often as possible as they work through the unit.

4. I Wonder Wall

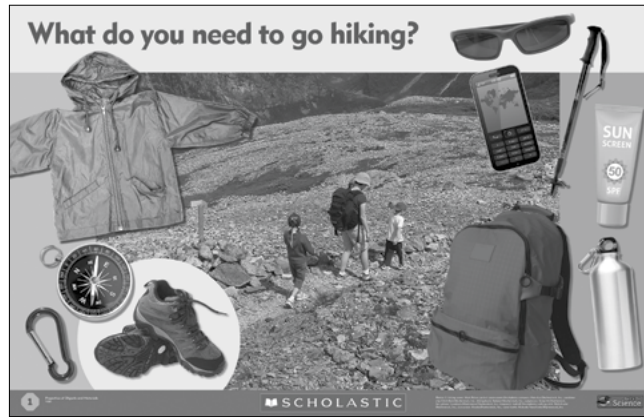


Build the I Wonder Wall throughout the unit by posting students' questions as they arise. Remind students to add questions they have as they explore the properties of objects and materials at the Curiosity Centre. Refer to the I Wonder Wall often and select questions that students may be ready to answer.

5. Reading Centre

Add texts (books, magazines, and photographs) relating to the properties of objects and materials to the Reading Centre. The titles in the Science Library will help start off a collection of books. Also refer to the list of texts pertaining to objects and materials in the Additional Resources section of this guide (pages 86–87).

What Are Objects?



Focus: Students will be actively engaged in exploring various objects and the purpose for which these objects are used.

Specific Curriculum Outcomes

Students will be expected to:

- 25.0 identify objects, how they are used, and for what purpose they are used [GCO 1/3]

Performance Indicators

Students who achieve these outcomes will be able to:

- identify familiar objects and communicate the purpose for which the objects are used

NOTES:

Attitude Outcome Statements

Encourage students to:

- show interest in and curiosity about objects and events within the immediate environment [GCO 4]
- work with others in exploring and investigating [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]
- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- select, read, and view with understanding a range of literature, information, media, and visual text [GCO 4]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• IWB Activity 1 • Anchor Video: <i>Properties of Objects and Materials</i> • Science Card 1 • BLM <i>Draw Objects</i> • IWB Activity 2 Literacy Place: • <i>Making Things</i> (Guided Reading, Level A)	• mystery object of choice • assortment of familiar objects for students to explore • digital camera (optional) • students' Science Journals	• Find an object that will be unfamiliar to students.	• human-made • material • natural • object

Science Background

- Objects are made from one or more materials and can be natural or human-made.
- Objects are things we use for a purpose.
- Some objects have a single purpose; others have multiple purposes.
- Many different objects can have the same purpose.

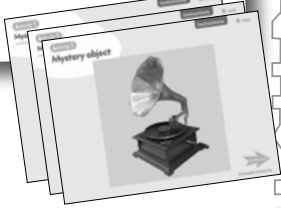
Possible Misconceptions

- Students may not think that articles of clothing, or soft items, are objects. In this unit, they will discover that an object can be anything that is constructed and has a purpose.

ACTIVATE

IWB Activity:

- If you can't find an unusual object, use
- Activity 1: *Mystery object* (see the
- Teacher's Website)
- and display one of the photographs
- (phonograph, tri-lens camera, door knocker)
- for students to identify.



Mystery Object

Bring in an unusual object to intrigue students. It could be something they haven't seen before or an old version of something they know. It should be something that engages them and prompts their thinking about what it is and what it does. Remind students that an object is anything that can be seen or touched and that a material is what objects are made of.

When showing the mystery object, ask students:

- What do you think the object is?
- How would you describe it?
- What do you think it does?

Have students talk to a partner before sharing in the large group.

Anchor Video

Play the Anchor Video: *Properties of Objects and Materials* which can be found on the Teacher's Website. Provide a focus for viewing. Say:

- Watch the video and look for at least five different objects.

Have students list the objects viewed on the video and create a class list of the objects and their purposes. Revisit the I Wonder Wall as a place to capture questions about objects and materials. Encourage students who are able, to record their own questions on the I Wonder Wall.

Model questions prompted by viewing the video. For example:

- What materials would I use to make a toy?
- The video mentioned that wood, metal, and wool are materials. What other materials are used to make objects?



Literacy Place Connection:

Making Things (Guided Reading, Level A) shows different objects students can make using different materials. Discuss with the students the different objects in the book and what materials were used to make them. Ask:

- Which of the things in this book have you made?
- Did you use the same or different materials?

CONNECT

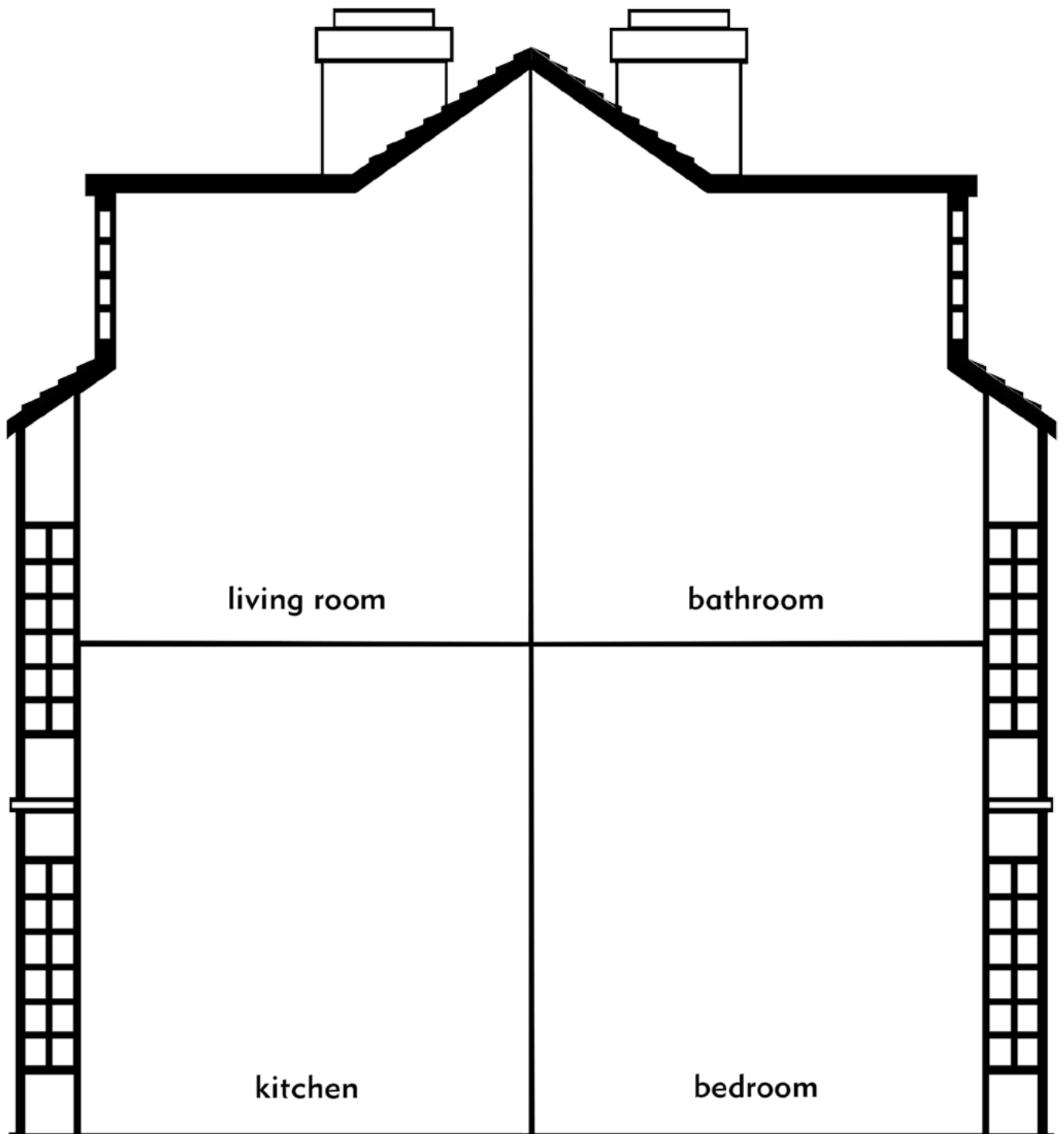
Curiosity Centre

Provide an assortment of familiar objects for students to explore. Observe students during their exploration and prompt discussion by asking questions:

- What object is that?
- What is it used for?

Draw Objects

Name: _____



What Are Objects Like?



Focus: Students learn about and describe objects based on similarities and differences.

Specific Curriculum Outcomes

Students will be expected to:

- 26.0 observe objects and describe their similarities and differences [GCO 1/3]
- 7.0 make and record observations and measurements [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- observe two objects and describe how they are the same and how they are different

NOTES:

Attitude Outcome Statements

Encourage students to:

- show interest in and curiosity about objects and events within the immediate environment [GCO 4]
- willingly observe, question, and explore [GCO 4]

Cross-Curricular Connections

Math

It is expected that students will:

- demonstrate an understanding of measurement as a process of comparing (identifying attributes that can be compared; ordering objects; making statements of comparison) [1SS1]

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]
- respond personally to a range of texts [GCO 6]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]
- create texts collaboratively and independently, using a variety of forms for a range of audiences and purposes [GCO 9]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 2 • <i>The Subway Mouse</i> (Read Aloud) • IWB Activity 3	• objects featured in <i>The Subway Mouse</i> (e.g., pine cone, button, pencil, penny, candy wrappers, Popsicle stick, feather, popcorn, bits of newspaper, string, crayon, ticket stub, straw, balloon, lip balm, necklace, earring, paper clip, marble, bottle cap, maple key, jelly bean, bobby pin, seed packet, sunflower seed) • students' Science Journals • collection of buttons • mystery bags (drawstring bags) • objects with interesting shape and texture (e.g., seashells, Silly Putty, pine cone, bark chipping, corrugated cardboard) • digital camera • various tools for close-up viewing (e.g., magnifying glasses, gooseneck camera, hand held microscope, rulers)	• Ensure you have enough mystery bags for each small group.	• object • purpose • shape • texture

Science Background

- Observing is the key to describing objects. Objects can be described by what they look like (shape, size, colour) and what they feel like (soft, rough, smooth, bumpy), as well as what they smell, taste, and sound like.
- Objects can also be described by their purpose, where they are found, how they are used, and what material they are made from.
- Some objects can be made from one material; other objects can be made of two or more materials.

Possible Misconceptions

- Students may be confused about whether certain items are classified as objects or materials. Generally, if the item is used to create an object, then the item must be a material. Some items can be both a material and an object. For example, string is an object when it is used to tie up cardboard boxes for weekly recycling. String is a material, however, when it is used to make a basketball net.

ACTIVATE



Finding Objects

Ask students to examine the illustration on Science Card 2. Point out and read aloud the title question: *Which objects do you see?* Then read aloud the supplemental questions: *What do they look like? What are they used for? What are they made of?*

Invite students to identify all the various objects in the illustration. Ask:

- **What sorts of objects do you see?**
- **What do they look like?**
- **What are they used for?**
- **What are they made of?**
- **How are these objects the same or different from the ones you have seen, used, played with?**

Explain to students that asking questions helps us learn about things in the world around us. Then ask:

- **What yes-no questions can you ask about the objects on this page?**

Students may respond that they could ask: Is it round? Is it heavy? Is it soft? Is it made of metal? Is it made of wood? Can you play with it? Ensure that students address various aspects such as shape, size, colour, and what the objects are made of. Point out that some objects are made of two or more materials.

Once students understand how to form yes-no questions, encourage them to play a guessing game using the illustration on Science Card 2. Have one student choose an object, secretly, and let the other students ask a yes-no question to discover the object.

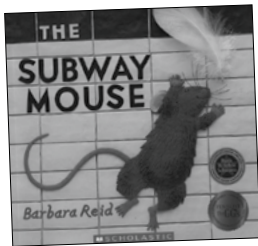


Ask students how objects are the same and how they are different. Make sure they explain their thinking, noting similar or different uses, materials, shapes, and so on. Talk to students about the importance of using descriptive words in science. Encourage students to observe objects in detail and to look for similarities and differences that are not always obvious at first glance. Add new descriptive words to the Word Wall.

CONNECT

Read Aloud: *The Subway Mouse*

Before Reading



Explain to students that you will be reading a book about a mouse named Nib who lives below the platform of a busy subway station and who loves to collect strange and wonderful objects that he finds around his home. Nib soon finds a friend and has more adventures when he sets out on a journey to find a beautiful but dangerous place called Tunnel's End.

Ask students to close their eyes and imagine what Tunnel's End might look like. Invite them to share with a partner what they think Nib will find at Tunnel's End. Have several students share their ideas.

ESL Note:

To help ESL learners develop appropriate vocabulary, begin with a picture walk of the text. Focus on the art and discuss the various objects being shown.

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations. Alternate between asking students to respond in a whole group or with a partner. Prompts for discussion could include:

Pages 2–3:

- What objects do you see?
- There are a lot of shoes. How are the shoes the same or different?

Pages 4–5:

- What objects do you see?
- What are they used for?

Pages 6–7:

- What objects do you see?
- Are the objects made of one or more than one material?

Pages 8–9:

- What objects do you see?
- How are these objects the same or different?

- **What do they look like?**
- **What do you think they're made of?**
- **What are they used for?**
- **How do you think these objects got there for Nib to find?**
- **How are these objects the same or different from ones you have seen, used, or played with?**

Pages 18–19:

- **What object do you see?**
- **What do you think it's made of?**
- **What is it used for?**

Pages 20–21:

- **What objects do you see?**
- **How are they the same or different?**
- **What are they used for?**

Pages 28–29:

- **What objects do you see?**
- **What are they used for?**
- **Are they made of one material or more than one material?**
- **What do the objects look like?**
- **How are they the same or different?**

Pages 34–35:

- **How are the objects the same as, or different from, Nib's treasures in Sweetfall (see pages 8–9)?**
- **Why might Nib collect different types of objects in his new home at Tunnel's End?**

After Reading

Ask students if their predictions about what Tunnels' End might look like and what Nib would find there were correct. Invite students to describe some treasures that they have collected and what makes the objects so interesting.

Discuss with students how observing objects allows us to describe and sort them. Ask questions such as:

- **What properties can be described by how something looks?** (e.g., shape, size, colour, lustre)
- **What properties can be described by how something feels?** (texture, e.g., soft, rough, smooth, bumpy)
- **How else can we describe objects?** (e.g., what they're used for, what materials they're made from, if they're made from one or more materials)
- **How do these observations help us to sort objects?**

Story Objects

Provide various objects and materials featured in *The Subway Mouse* (e.g., pine cone, button, pencil, penny, etc.). In pairs, have students choose two objects and describe how they are the same and how they are different. To extend and enhance their observations, encourage students to use magnifying glasses, digital cameras, gooseneck cameras, hand-held microscopes, rulers and so on. To prompt thinking, ask:

- What is it?
- What does it look like?
- What does it feel like?
- What is made of?
- Is it made of one of more materials?
- Does it have a single purpose or more than one purpose?
- What is the difference between this object and this object?
- How can we sort some of the objects?



Invite students to record their observations in their Science Journals.

Sorting Objects

Provide a collection of buttons of varying materials, sizes, shapes, and colours for students to sort. (If you do not have a collection of buttons, use a collection of another object already available, e.g., used crayons, coins, elastic bands, leaves.)

Tell students that you are going to pick different sorting rules for them to sort the buttons. The first sorting rule will be based on colour. Ask students to sort the buttons by a specific colour and use a sorting mat or hula hoop for students to show their work. At the bottom of the mat or hoop, have students record their sorting rule, for example, “All Brown Buttons.”

Then ask students to sort by other criteria (e.g., a different colour or by size, shape, number of holes in the button, or the material the button is made of) and to record their sorting rule.

Lead students to see that some buttons can be placed in more than one category; for example a large red button with two holes would belong in the “red” category, the “large” category, and the “two-hole” category.

Challenge students to choose their own sorting rule, then invite them to go on a gallery walk to view or guess the sorting rules used by others. Students can take photos of their sorted objects and compile them into a class book.

IWB Activity:

- To provide students with an additional challenge for sorting objects using various sorting rules, invite them to use Activity 3: *Sorting objects* (see the Teacher's Website).



CONSOLIDATE

Mystery Bag

Provide small groups of students with a mystery bag that houses an object with an interesting shape or texture. Ask students to take turns feeling the object and describing it. Some examples of interesting objects include seashells, Silly Putty, pine cones, hair brush, bark chippings, bubble wrap, and so on.



Students can take turns placing objects with interesting textures and shapes inside the bag for the rest of the group to describe.

As a whole group, have students discuss the experience. Ask:

- **What were some of the words you used to describe how the objects felt?**
- **Why is it difficult to figure out what the materials were?**

Look at the collection of the objects that were put in the bag. Ask:

- **What categories can we sort the objects into?**

Describe Me

Ask students to help you describe the objects they have been investigating. Students may respond that objects can be all different shapes, sizes, made from different materials, etc. Add any new vocabulary generated from this discussion to the Word Wall. Record any questions students have on the I Wonder Wall.

EXPLORE MORE

Show and Compare

In pairs, students can compare an item they each have (for example, coat, shoes, pencil case, backpack, water bottle, etc.). Invite students to take pictures of the two items and provide a sentence that compares them in some way (e.g., Lisa's water bottle is tall, but mine is short. John's coat is puffy. Mine is thin.) Students could extend this activity further by recording the purpose for both items but noting the differences (e.g., Both our pencil cases carry things, but mine is made of cloth and Jordan's is made of plastic.). Students could compile their work into a "Class Book of Objects."

What Are Materials?



Focus: Students learn about materials based on similarities and differences and the objects they make.

Specific Curriculum Outcomes

Students will be expected to:

- 26.0 observe objects and describe their similarities and differences [GCO 1/3]
- 27.0 compare and describe properties of objects and materials [GCO 1/3]

Performance Indicators

Students will be expected to:

- identify familiar materials and the objects they are used to make
- describe some properties of materials
- communicate the similarities and differences between materials

NOTES:

Attitude Outcome Statements

Encourage students to:

- consider their observations and their own ideas when drawing a conclusion [GCO 4]
- appreciate the importance of accuracy [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 3 • Science Card 4 • BLM <i>Materials in the Classroom</i> • BLM <i>Venn Diagram</i> • IWB Activity 4	• students' Science Journals • students' Science Folders • small photo albums (one per small group)	• Print photographs of objects made of wood, plastic, metal, fabric, and glass from the Image Bank (see the Teacher's Website).	• human-made • material • natural • property

Safety

- Review school safety rules before students go on a neighbourhood walk.

Science Background

- Materials are divided into two broad categories: natural materials and human-made materials. Examples of natural materials are wood, cotton, silk, wool, sand, and slate. Examples of human-made materials include polymers (plastics, paints), metal, glass, and ceramics.
- Materials have unique properties. The knowledge of a material's properties allows scientists to select the best materials to suit various jobs and applications. It also helps engineers create new materials for new products and technological devices.

ACTIVATE



Recognizing Materials

Ask students to examine the images on Science Card 3. Point out and read aloud the title question: *Which materials do you see?* Point to the photos and ask students to look at them closely. Read the supplemental question: *What do materials look like?* Explain that the photos are of materials. Point to each photo individually and ask:

- **What material do you think it is?**
- **Why do you think that?**
- **What does it look like?**

Display Science Card 3 with labels (see the Teacher's Website) on the IWB and discuss each material with students. Explain that some materials are natural (come from nature) and some are human-made (manufactured by people). Ask:

- **Which of these materials are natural and which are human-made?**
- **What other materials can you think of which are not included on this page?** (fur, ceramic, wicker, cork, silk, bamboo, shell, foam, rubber, paint)



Which Materials?

Now ask students to examine the images on Science Card 4. Point out and read aloud the title question: *What can materials make?* Point to the photos and ask students to look at each image closely. Ask:

- **What is each object made of?**
- **Are any of the objects made from more than one material?**

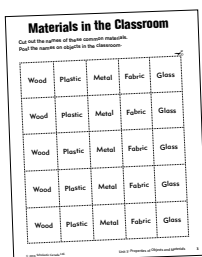
Have students work in pairs to compare Science Card 3 and Science Card 4. Ask:

- **Which objects are made from which material(s)?**

Encourage students to record their answers in their Science Journals.



CONNECT



Identifying Materials

Hand out BLM *Materials in the Classroom* to small groups of students. Tell the students to look for objects that are made from the materials listed (wood, plastic, metal, fabric, glass). Challenge each group to find at least three objects made of each material. They can affix the labels to objects around the classroom.

(As an extra challenge, have students figure out the best way to attach the labels. Tape is obvious and shouldn't harm surfaces, but clothespins could be used to affix labels to fabric, such as curtains.) Invite students to record their findings in the form of a simple chart, by drawing the objects and/or printing the names of the objects.

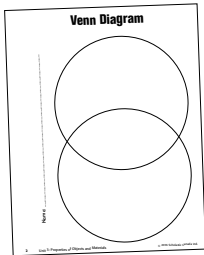
This sample chart is partially completed.

Wood	Plastic	Metal	Fabric	Glass
desk ruler	chair math counters	stapler magnetic tape	curtain rug	window vase

As a group, discuss why they think the objects in each column are made of that material. Ask:

- **Why is this material a good choice for this object?**

Add the words that students use to describe the materials (e.g., strong, soft, clear) to the Word Wall.

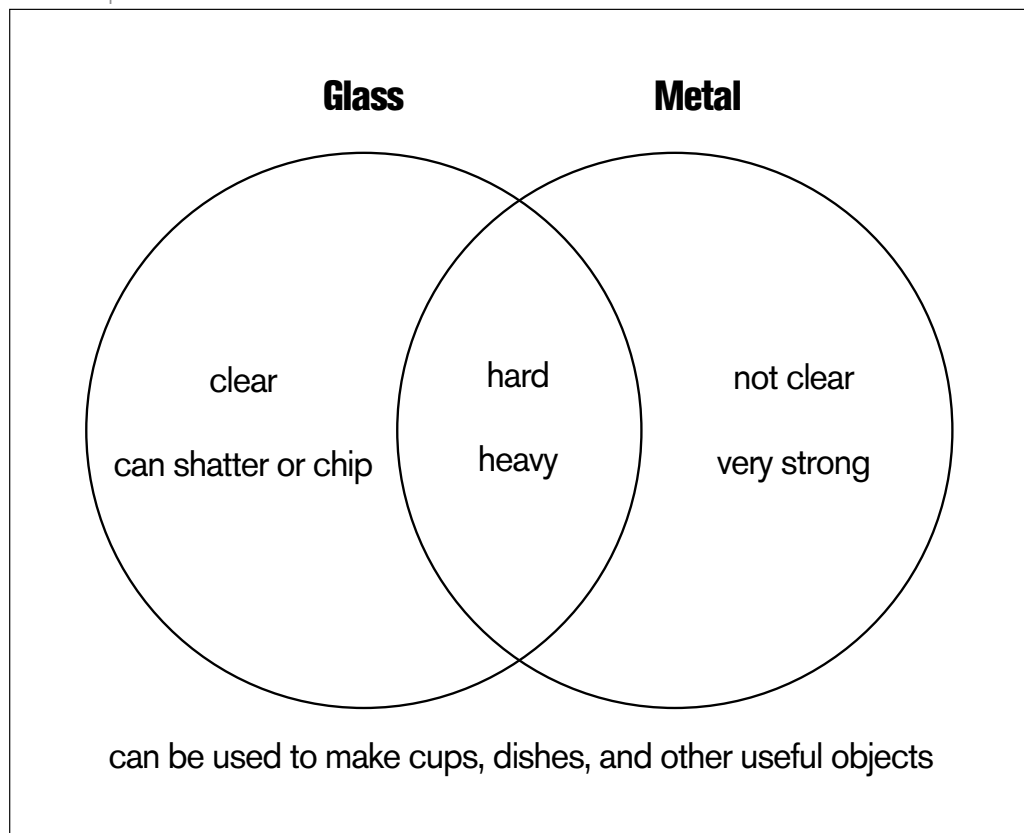


Comparing and Contrasting Materials

Draw two large intersecting circles on chart paper or on the IWB and invite students to help you create a Venn diagram using words and pictures to show how glass compares to metal. Ask:

- **What is the same and what is different about these two materials?**

Provide copies of BLM *Venn Diagram* and have students record the information on the BLM. Remind students to store their completed BLMs in their Science Folders.



Next, have students work in small groups to compare and contrast other materials, orally. Ask each group to list their points. Use the information to create additional Venn diagrams on the board or on the IWB.

CONSOLIDATE

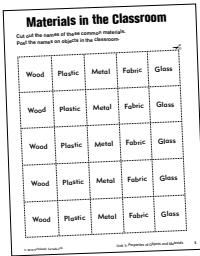


Photo Album

Provide printed photographs of objects from the Image Bank (see the Teacher's Website) and have small groups of students place their collection of photos into photo albums with the appropriate labels from BLM *Materials in the Classroom*. Guide students to recognize that materials can be used to make different objects, and some objects can be made from more than one material.

EXPLORE MORE

IWB Activity:

- Invite students to use slide one of Activity 4:
- **Matching materials** (see the Teacher's Website) to drag and drop the labels to match them to the correct objects. Using slide two, students drag and drop each item from the box to match a label.



Natural or Human-made?

Have students look around the classroom and identify some objects that are made by people. Next, take the students on a walk in the neighbourhood or in the school and collect objects made by nature. List the objects students find under either the heading "Objects Made by People" or "Objects Made by Nature."

Name That Material

Using the chart generated from the activity above, challenge students to name the material the objects under the two headings are made from. Students could write their answers on sticky notes and add them next to each object on the chart.

Materials in the Classroom

Cut out the names of these common materials.

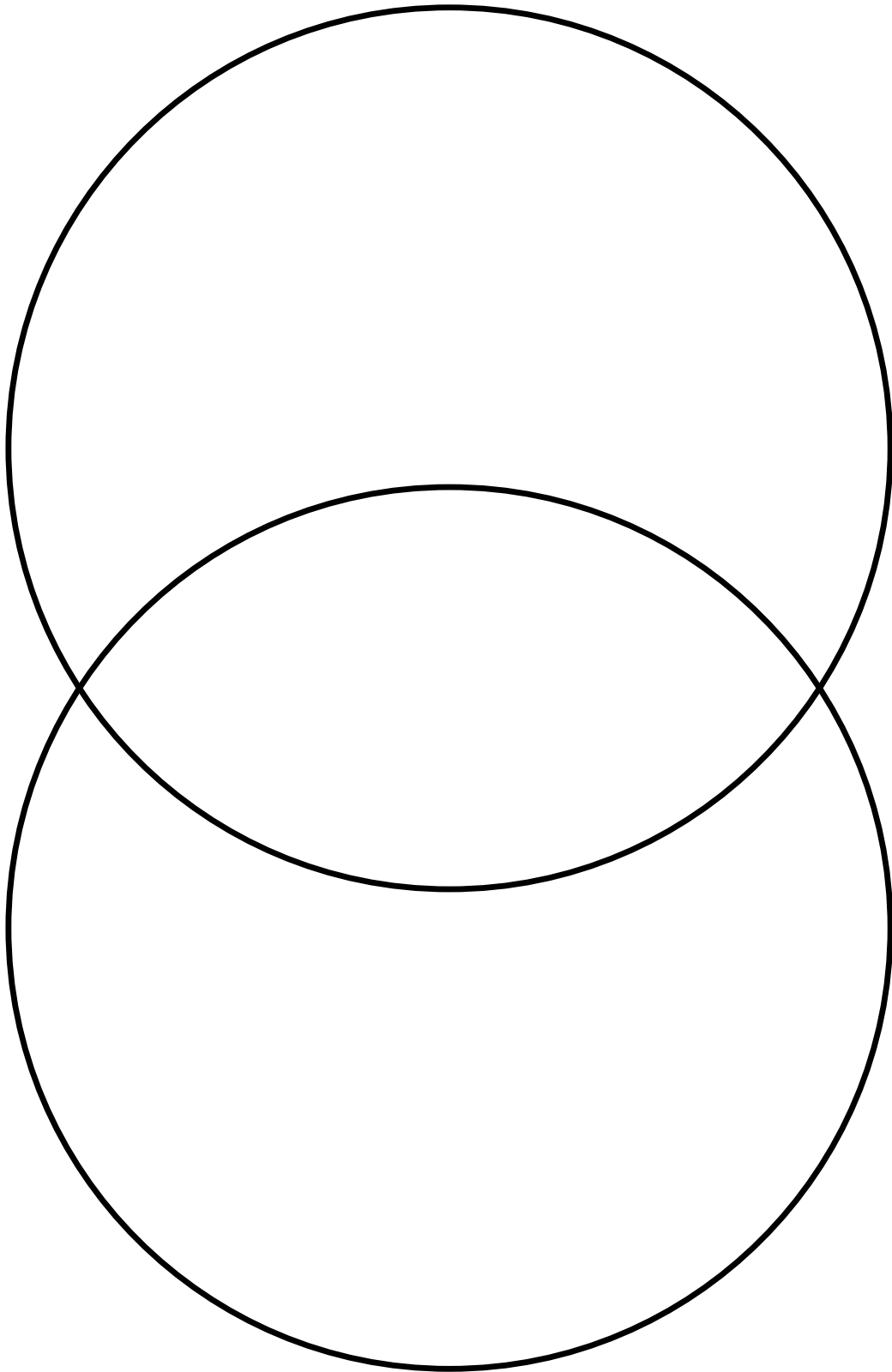
Post the names on objects in the classroom.



Wood	Plastic	Metal	Fabric	Glass
Wood	Plastic	Metal	Fabric	Glass
Wood	Plastic	Metal	Fabric	Glass
Wood	Plastic	Metal	Fabric	Glass
Wood	Plastic	Metal	Fabric	Glass

Venn Diagram

Name: _____



How Do You Describe Objects and Materials?



Focus: Students investigate the properties of objects and materials at science activity centres.

Specific Curriculum Outcomes

Students will be expected to:

- 26.0 observe objects and describe their similarities and differences [GCO 1/3]
- 27.0 compare and describe properties of objects and materials [GCO 1/3]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe the properties of objects and materials using at least three descriptive terms
- select the most appropriate object or material for a task based on its properties (e.g., plastic is the best material for drinking cups because it is waterproof, light, and strong)

NOTES:

Attitude Outcome Statements

Encourage students to:

- recognize the role and contribution of science in their understanding of the world [GCO 4]
- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

Math

It is expected that students will:

- demonstrate an understanding of measurement as a process of comparing (ordering objects) [1SS1]

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]
- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 5 • BLM <i>How Does It Feel?</i> • BLM <i>What Does It Look Like?</i> • IWB Activity 5 Literacy Place: <i>What Can Float?</i> (Guided Reading, Level B)	• variety of objects and materials (e.g., stuffed animals, dolls, blocks, seashells, hard and soft balls, modelling clay, feathers, straw hat, wool hat, soft and hard cover books, aluminum foil, mirror, cellophane wrap) • flashlight • pan balance • a collection of crayons of varying sizes • digital camera (optional) • students' Science Journals		• dull • lustre • shape • shiny • texture

Science Background

- Properties are attributes that can be observed with the senses.
- The term property is used when talking about an attribute exhibited generally by objects and materials (e.g., a shiny lustre is a property of all metals).
- The term characteristic is used when talking about an attribute exhibited by a specific object or material (e.g., a shiny lustre is a characteristic of stainless steel cutlery).

- We compare and describe objects and materials based on their properties, such as colour, lustre (the way it looks), shape, size, texture (the way it feels), and weight.
- Other useful properties include: absorbency, flexibility, insulating ability, magnetism, strength, transparency, water resistance, etc.

Possible Misconceptions

- Students at this age will likely have knowledge of simple words with little descriptive value, such as nice and colourful. Explain that in this lesson, they will focus on learning richer descriptive words (e.g., heavy, smooth, dull, triangular, wide, narrow, bumpy).

ACTIVATE



Describing Objects and Materials

Ask students to examine the images on Science Card 5. Point out and read aloud the title question: *What is it like?* Point to the photos and ask students to look at each image closely. Ask:

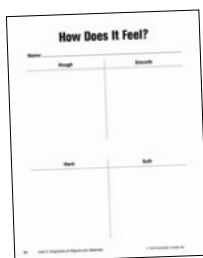
- **How would you describe the objects and materials you see?**

Explain to students that by answering this question, they are describing the properties of objects and materials. To help students come up with answers, explain that properties of objects and materials can be observed with our senses. Then focus students' attention on the supplemental questions on the card. Read each question aloud: *What does it look like? How does it feel? What shape is it?*

As a class, have the students answer each of these questions for each image on the card. Add any new descriptive words to the Word Wall.

Note: Students may need more prompting with “How does it feel?” at this point since they have only the photos as reference. Explain to them that they will be exploring this question in greater detail at centres.

CONNECT



Testing and Observing

Provide a variety of materials (see the Getting Organized chart on page 30 for suggestions) at four separate mini centres. Invite students to rotate through the centres to test and observe various properties of objects and materials.

Rough or Smooth and Hard or Soft – Using the various objects and materials provided, ask students to test and observe how each one feels. Students are to record their findings for each using BLM *How Does It Feel?* by sorting the objects into a T-chart using the two different sets of descriptors—Rough or Smooth and Hard or Soft.

Shortest to Longest – Provide a variety of objects such as a collection of crayons of varying sizes and ask students to sequence them from shortest to longest.

Shiny or Dull – Using the various objects and materials provided, ask students to test and sort objects and materials as shiny or dull. You may want to review the definition of these terms before students begin this activity.

shiny: you can see your reflection in it, and it is bright when light shines on it

dull: you don't get any reflection, and it is not shiny even when light shines on it

Students are to record their findings using BLM *What Does It Look Like?*

Heavy or Light? – Using the various objects provided, ask students to weigh each in a pan balance and sequence them from lightest to heaviest. Encourage students to share the procedure they followed and record their findings by taking a digital photograph of their end results.



Literacy Place Connection:

What Can Float? (Guided Reading, Level B) shows different objects that can either sink or float. Discuss with the students the different objects in the book and what materials were used to make them. Ask:

- Why do you think some of the objects can float and others cannot?

CONSOLIDATE

IWB Activity:

- Have students guess objects from their descriptions using
- Activity 5: *What am I?* (see the Teacher's Website). Then pairs or small groups of students can play a game of "What am I?" with objects from the classroom or ones they bring in.



"I Spy"

Play "I Spy" with students using riddles that describe multiple properties of a classroom object [e.g., I spy something that is round, hard, and black and white (clock); I spy something that is blue, short, and square (recycling bin); I spy something that is square, pink, and smooth (eraser)]. Once students become familiar and comfortable with the riddles, they can create their own. Encourage them to work with a partner to solve one another's riddles.

Asking Questions

Invite a student to come to the front of the class. Attach a picture of an object to his or her back with a piece of tape so that all of the students can see it. Challenge the student to ask yes-no questions to try to determine what the object is.

EXPLORE MORE

Property Hunt

Have students to go on a “Property Hunt” at school or at home in search of objects which possess three properties of their choice (e.g., round, soft, blue). Have students share with the class the objects they found which have these three particular properties.

Research the Source of Materials

Students might be interested in doing research to find out the source of various materials and identifying objects made from these materials. Brainstorm research questions with the students, for example:

- **Where does wood come from? What is made from wood?**
- **Where does glass come from? What is made from glass?**

Students can draw a diagram of their findings in their Science Journals. The source materials, e.g., wood from trees can be drawn in the centre. Objects made from wood could be drawn around it. Lines can be drawn to connect the tree to the objects.



How Does It Feel?

Name: _____

Rough

Smooth

Hard

Soft

What Does It Look Like?

Name: _____

Object/Material	Shiny	Dull
aluminum foil	✓	

Introducing the Design Challenge



Focus: Students become familiar with (or review) the design process. Students are introduced to the design challenge at the end of the unit so that they have a context for learning about objects and materials.

Specific Curriculum Outcomes

Students will be expected to:

- 26.0 observe objects and describe their similarities and differences [GCO 1/3]
- 27.0 compare and describe properties of objects and materials [GCO 1/3]
- 24.0 select and use materials to carry out their own explorations and investigations [GCO 2]
- 7.0 make and record observations and measurements [GCO 2]
- 8.0 communicate while exploring and investigating [GCO2]

Performance Indicators

Students who achieve these outcomes will be able to:

- ask reasonable questions and make accurate observations
- experiment with materials and objects to learn about them

NOTES:

Attitude Outcome Statements

Encourage students to:

- recognize the role and contribution of science in their understanding of the world [GCO 4]
- appreciate the importance of accuracy [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]
- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]
- respond personally to a range of texts [GCO 6]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>The Magnificent Tree</i> (Read Aloud) • <i>What Is the Design Process?</i> poster • Science Card 6	• students' Science Journals		• design • invent • invention

Science Background

- The Design Process is a sequence of steps used to solve problems.
- The process can be broken down in four steps:
 1. Identify and describe the problem. Then think of a solution and make a plan.
 2. Gather materials and build a prototype.
 3. Test and evaluate your solution/device.
 4. Share your solution/device and what you learned.

ACTIVATE

Read Aloud: *The Magnificent Tree*



Summary

This endearing story illustrates how sometimes the simplest ideas are the best. Bonny and Pop dream of creating a magnificent tree that will make the beautiful birds want to stay. They both use their ideas to create a tree for the birds but which tree will the birds prefer?

Before Reading

Explain to students that you will be reading a book about two people who want to create a magnificent tree for the birds in their neighbourhood. Before you start reading, invite students to close their eyes and visualize what a magnificent tree might look like. Ask:

- **Why might someone want to create a magnificent tree?**

Involve students in a Think-Pair-Share strategy. After providing some time for students to ponder the question, have them turn to the person they are sitting beside and share their thinking. After students have had a chance to share their thinking with a partner, invite a few students to share their ideas with the class.

Ask students to listen as you read to discover why Pop and Bonny created a magnificent tree and whether their ideas were the same or different.

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations (many illustrations have multiple meanings within them). Alternate between asking students to respond in a whole group or with a partner. Prompts for discussion could include:

After reading the first page:

- **What does bursting with ideas mean? Have you ever been bursting with ideas?**

After looking closely at the illustrations on the next two pages:

- **What made Bonny's ideas simple and clever? What does properly made mean?**

After reading about Pop's ideas:

- **What was different about Pop's ideas and Bonny's ideas?**
- **Do you think that one type of idea was better than the other? Why or why not?**

After reading the page, "Bonny and Pop loved the birds and wished they could stay.":

- **Why do you think the birds wouldn't stay?** (e.g., no trees, place to land, easy for predators to get them, lack of food)

On the page where Pop is making notes and drawing pictures:

- **What strategy was Pop using to design his tree?** (planning with diagrams and writing)
- **How can doing this help you when you are designing something?**

After reading about and viewing Bonny's idea:

- **What was Bonny's idea? Why didn't Bonny need to draw diagrams and make notes? What would Bonny have to consider with her idea?** (What does a seed need to grow?)

After the birds flew all around Pop's tree:

- **Why do you think birds only flew around Pop's tree?**

After the birds landed in Bonny's "simple, clever and properly made" tree:

- **Why did the birds prefer Bonny's real tree over Pop's invention?**

After reading the rest of the text:

- **What did Bonny enjoy about Pop's tree? What do you think she watched as she swung on her swing?**
- **In the end, were Bonny and Pop successful in building a magnificent tree?**

After Reading

Prompts for discussion could include:

- **Why do you think the birds were attracted to the real tree?**
- **What might a real tree provide for the birds that an artificial tree might not provide?**

Focus on the Design Process by asking questions, such as:

- **What was the main problem in the story?**
- **How did Pop and Bonny solve this?**
- **What was the same about the two solutions? What was different?**
- **Do you think a problem can be solved in more than one way?**
- **What materials did Bonny use to solve the problem? What materials did Pop use?**



Point out the *What Is the Design Process?* poster. Read the steps with the students. Compare the process and steps Pop and Bonny used with the process and steps on the poster.

CONNECT

Curiosity Centre

Invite students to further explore and learn about more objects and materials at the Curiosity Centre. While they are exploring, encourage students to think



about any questions they may have. These questions can be recorded on sticky notes and attached to the I Wonder Wall.

Model asking questions:

- I wonder how many objects at the centre are made of the same materials?
- Can objects be made of many different types of materials?
- What is the best type of material to use when making baby toys? Why?
- I know glass is made by humans. How is glass made?

CONSOLIDATE



Building a Useful Object

Ask students to look at Science Card 6. Introduce the Design Challenge by explaining to students that they are learning about objects and materials and the design process so that they can design and build a useful object on their own, just like Pop and Bonny did.

Review the problem and solution in *The Magnificent Tree*. Have students look at the materials on Science Card 6 and invite them to start thinking about what useful object they would like to build in order to solve a problem.

EXPLORE MORE



Examining Multi-Part Objects

Students can take a multi-part object apart (e.g., a pen), identify the materials that each individual part is made from, and describe the properties of each material. Ask students to draw a picture of the object in their Science Journals and label the different parts.

Testing Materials

Focus: Students will determine the purpose of various materials and test their properties using the inquiry process. As part of the guided inquiry investigations, students should make and record predictions, propose an answer to the initial inquiry question, investigate, and draw a conclusion.

Specific Curriculum Outcomes

Students will be expected to:

- 24.0 select and use materials to carry out their own explorations and investigations [GCO 2]
- 10.0 predict based on an observed pattern [GCO 2]
- 20.0 follow a simple procedure [GCO 2]
- 28.0 describe and demonstrate ways to use materials appropriately and efficiently [GCO 1/3]
- 13.0 propose an answer to an initial question or problem and draw a simple conclusion [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe properties of materials using descriptive terms
- select materials to carry out their own investigations and explain the thinking behind their choices
- make predictions, follow simple procedures, make observations, and draw conclusions
- identify the best materials to use for specific purposes

NOTES:

Attitude Outcome Statements

Encourage students to:

- be open-minded in their explorations [GCO 4]
- show concern for their safety and that of others in carrying out activities and using materials [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]
- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>What Is the Inquiry Process?</i> poster • BLM <i>Signs for Centres 1 and 2</i> • BLM <i>How Materials Are Used</i> • IWB Activity 6 Literacy Place: • <i>Muncha! Muncha! Muncha!</i> (Read Aloud–Inferring Strategy Unit)	• various materials for the seven centres (see chart on page 43) • plastic water bottle • plastic bag • piece of Styrofoam • white tissue paper • students' Science Folders	• Set up the centres with the suggested materials (see chart on page 43). • Copy and laminate signs for the centres using BLM <i>Signs for Centres 1 and 2</i>	• characteristic • material • property

Note: There is a “menu” of seven centres to choose from. You may choose all seven or less depending on the space and needs of your classroom. (See page 43.)

Centre	Materials Required	Tips for Organizing	Inquiry Question	Suggested Materials to Test
Does It Absorb Water?	sign for centre, jug (for water), measuring spoons, tray (optional), yogurt containers	Place container in a large plastic tray to contain spillage.	Which material is best for wiping up spills?	scrap paper, newspaper, tissue paper, an old towel, paper towel, plastic bag, and so on
Does It Keep Water Off?	sign for centre, small toy watering can, large plastic tray or bowl	Provide a small toy watering can and have students measure a set amount into the watering can so that each sample is sprinkled with the same amount of water. Have students hold the samples in a large plastic tray or bowl. They will need to be able to see whether water rolls off the sample, so the samples shouldn't be laid down in the tray or bowl.	Which material resists water being dropped on it?	waxed and unwaxed cardboard, paper, parchment paper, aluminum foil, waxed paper, glass, Styrofoam, various fabrics, paper towel, sponge, and so on
Does It Mark Surfaces?: Black Paper	sign for centre, black construction paper		Which material is most visible from a distance on black paper?	paint, markers, highlighters, pastels, crayons, chalk, and so on
Does It Mark Surfaces?: Mirror	sign for centre, small mirrors (or broken mirror with the edges duct taped for safety)		Which material is best for writing on mirror?	chalk, marker, crayon, water colour paint, pencil, pen, and so on
Is It Magnetic?	sign for centre, magnet		Which material is attracted most to a magnet?	small objects made from fabric, glass, metal, paper, plastic, rubber, wood Styrofoam, sawdust, cotton balls, wool, aluminum foil, paper towel, newspaper, various fabrics, and so on
Does It Insulate?	sign for centre, yogurt container, ice cubes	Fill a yogurt container with ice cubes.	Which material is the best to insulate an ice cube from melting?	Styrofoam, sawdust, cotton balls, wool, aluminum foil, paper towel, newspaper, various fabrics, and so on
Is It Transparent?	sign for centre, flashlight		Which material lets light pass through it?	acetate, aluminum foil, cardboard, fabrics, glass, metal, paper, paper towel, parchment, plastic, Styrofoam, wax paper, wood

Science Background

- We compare and describe objects and materials based on their properties, such as colour, lustre (the way it looks), shape, size, texture (the way it feels), and weight.
- Other useful properties include: absorbency, flexibility, insulating ability, magnetism, strength, transparency, water resistance, etc.
- Different materials are used to make different objects for different reasons.

ACTIVATE



Literacy Place Connection:

Revisit or read *Muncha! Muncha! Muncha!* by Candace Fleming. Discuss with students the materials Mr. McGreely decided to use to build his fence and why he might have chosen those materials. Ask:

- Were they the right materials to use?
- Do you think Mr. McGreely tested his materials to find the best one?

Testing Materials—Ask a Question

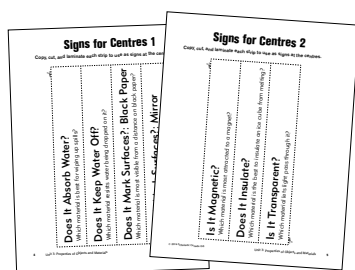
Point out the *What Is the Inquiry Process?* poster hanging in your classroom. Read the steps with the students. Explain that making a plan, exploring, recording results, and drawing conclusions are all part of finding an answer to a question.

Next, challenge students to work in small groups to investigate any questions they may have about the properties of materials. Some students may find it difficult to devise questions. To assist with this, you may wish to prompt their thinking by role playing some quick scenarios. Adding some humour will engage students further and motivate them to find a viable solution. For example, collect a plastic bag, Styrofoam, and some white tissue paper. Then spill some water on a desk. Exaggerate your facial expressions and act upset. Say, “Oh dear! What can I use to wipe up the spill?” Try the plastic bag and make a mess. Then try soaking up the water with Styrofoam. Next, apply some white tissue paper (for crafts) and show how the tissue paper dissolves into small pieces of wet paper. Ask:

- How can I find the right material to wipe up the spill?

Introduce the seven centres and their purpose—to test the properties of various materials. Explain that each centre has an inquiry question that students are trying to answer. Review the questions by referring to the sign at each centre.

- Which material is best for wiping up spills?
- Which material resists water being dropped on it?
- Which material is most visible from a distance on black paper?



- Which material is best for writing on mirror?
- Which material is attracted most to a magnet?
- Which material is the best to insulate an ice cube from melting?
- What material lets light pass through it?

CONNECT

Make a Plan

Using one of the centres as a model, have students suggest ways to test the properties of the materials at the centre in order to answer the inquiry question. Discuss ways to record results from experimentation. As students will be sharing materials, review ways to work co-operatively with fellow students as they investigate.

Be sure to circulate among the groups, giving students the opportunity to ask for additional help. Ask probing questions that will facilitate deeper thinking about the experiment, such as:

- Have you decided how you can measure the results?
- How are you going to record your results?

Perform and Record

Remind students to follow the inquiry process. The next steps are:

- Collect the materials (if they want to add any beyond what you have given them).
- Make predictions about which materials will be the most effective for the question they are investigating.
- Conduct the investigation (following the steps of their plan).
- Record the results. Remind students about using a chart format to record results.

Evaluate Results and Make Conclusions

When students have finished their investigations, ask them to think about their results. Ask:

- What did you learn about the properties of various materials?
- Did you answer your question?
- What conclusion can you make about the materials you were testing? Were your predictions right?
- Reflect on what you did. Did you follow the steps of the process correctly? Did you have to change the process once you started? What had you not thought of?

Have each group share their results orally with the class. Ask what they learned about the various materials and their properties.

Challenge students to think about, and discuss, why manufacturers might try to create materials that perform better than others, using paper towels as an example. (Paper towels that absorb more liquid will perform better.) Ask students to suggest a more environmentally friendly alternative.

Discuss with students why we need to understand the properties of materials. Ask:

- **Why is it important to choose the right material for the job? After a big snowfall, if you wanted to go tobogganing, which type of material do you think would be best to make a toboggan?** (Students might respond, wood or metal, and then debate which is faster.)
- **Which material would make the best umbrella?** (nylon or waterproof fabric)
- **Why isn't rubber used to make umbrellas?** (too heavy and too thick)
- **Do you ever help out at home with dusting? Which material would make the worst type of dusting cloth?** (Students might respond sandpaper, or plastic wrap, or burlap.)

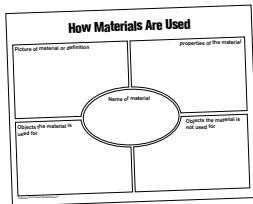
CONSOLIDATE

How Materials Are Used

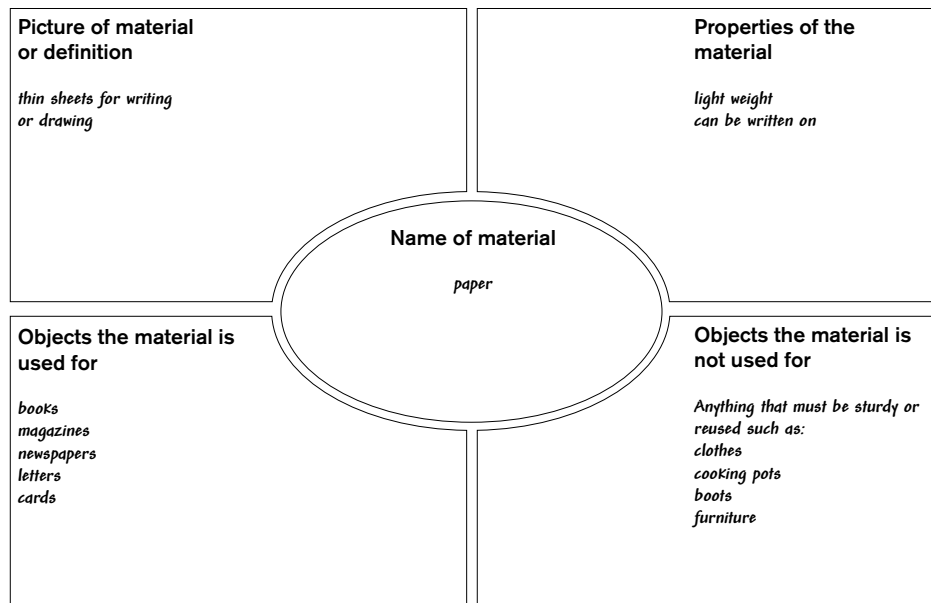
Encourage the students to discuss the materials they used in the inquiry and the ways they have seen these materials used in everyday life. Ask:

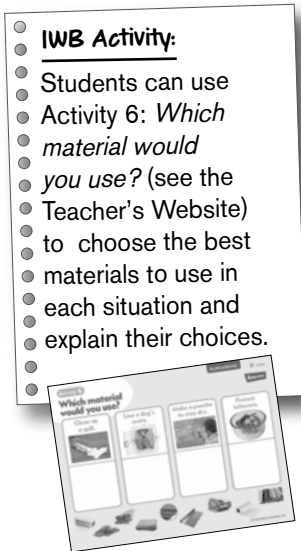
- **How are the materials suited for these uses?**
- **Could some other material be used instead?**

Display the BLM *How Materials Are Used* on the IWB. Work through one example with the students, following the headings for each section. For example,



How Materials Are Used





Have students pick a material and record answers using the BLM *How Materials Are Used*. Remind students to store their completed BLMs in their Science Folders.

As an extra challenge, you could ask:

- **Which materials do you think need the most work done to them before they are changed from their original form to the form you tested?** ("Correct" answers aren't important here; this is an opportunity to make students aware of the processing that many of our products undergo.)
- **How might changes to material such as these affect the environment?**

EXPLORE MORE

3R's

Encourage students to think of ways they can use their knowledge of materials to reduce, reuse, and recycle when bringing in their lunches from home. Make a list of student suggestions and add to the list if necessary. Make sure to cover points such as bringing in lunches in a lunch box rather than a plastic or paper bag; using a reusable container for their drinks rather than juice boxes and bottles, and so on.

Signs for Centres 1

Copy, cut, and laminate each strip to use as signs at the centres.

 Does It Absorb Water? Which material is best for wiping up spills?	Does It Keep Water Off? Which material resists water being dropped on it?	Does It Mark Surfaces?: Black Paper Which material is most visible from a distance on black paper?	Does It Mark Surfaces?: Mirror Which material is best for writing on mirror? 
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Signs for Centres 2

Copy, cut, and laminate each strip to use as signs at the centres.

 Is It Magnetic? Which material is most attracted to a magnet?	Does It Insulate? Which material is the best to insulate an ice cube from melting?	Is It Transparent? Which material lets light pass through it? 
--	--	--

How Materials Are Used

Picture of material or definition	Properties of the material
Objects the material is used for	Objects the material is not used for

Name of material

Adapted from Frayer Model Diagram

Age Group	Percentage
18-24	~10%
25-34	~25%
35-44	~20%
45-54	~15%
55-64	~10%
65-74	~5%
75-84	~2%
85+	~1%



Focus: Students will be actively engaged in exploring various ways to join different materials.

Specific Curriculum Outcomes

Students will be expected to:

- 29.0 explore ways to join materials [GCO 1/3]
- 8.0 communicate while exploring and investigating [GCO 2]
- 24.0 select and use materials to carry out their own explorations and investigations [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- name various joining materials
- investigate the best way to join materials together
- group materials by how they can be joined and/or what they can join
- test various joining materials

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]
- willingly observe, question, and explore [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- select, read, and view with understanding a range of literature, information, media, and visual text [GCO 4]
- create texts collaboratively and independently, using a variety of forms for a range of audiences and purposes [GCO 9]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 7 • IWB Activity 7 • Science Card 8 Literacy Place: • <i>Let's Make Cards</i> (Guided Reading, Level F)	• variety of familiar objects with fasteners • variety of objects and materials to join (e.g., paper, paper bags, aluminum foil, beads, blocks of wood, buttons, cardboard, fabric, foil plates, paper plates, paper towel rolls, pencils, plastic containers and lids, craft sticks) • variety of joining materials/fasteners (e.g., different types of tape and glue, elastic bands, stapler and staples, buttons, pipe cleaners, plastic ties, zippers, wool, ribbon, shoelaces) • students' Science Journals • tools such as scissors, colouring pencils, crayons, markers, paint and brushes	• Create and display a T-chart.	• describe • fasten • property

Science Background

- Objects have many parts which have to be joined together.
- There are a number of ways to join parts together: different types of tape and glue, nuts and bolts, nails, rope, buttons, zippers, thread, Velcro.
- Sometimes parts are attached to objects with the aid of fasteners, for example, buttons are fastened to shirts with thread. Fasteners range from simple early types to more sophisticated ones.
- Zippers, buttons, buckles, barrettes, clips, pins, laces, snaps, staples, paper clips, are all different types of fasteners we see and use every day.

Possible Misconceptions

- When investigating ways to join or fasten materials, students may become focused on the types of fasteners used on clothing. This lesson will help them broaden their thinking and appreciate the different ways to join materials and the wide variety of fasteners available in hardware stores, stationery stores, and in sewing supply stores.

ACTIVATE

Examining Joins

With the class, develop a list of ways that materials are joined together. Students may suggest gluing, taping, tying, or clipping materials together. Glue, tape, yarn, string, thread, paper clips, binder clips, hair clips, zippers can all be used to join materials together. Challenge students to think of other joining materials and add their suggestions to the list. Ask:

- **What else could you use to join materials?**



Literacy Place Connection:

Let's Make Cards (Guided Reading, Level F) demonstrates how to make cards. Discuss with the students the different materials that were used and what was used to join them (glue). Invite students to suggest other materials and fasteners that could be used to make cards.

Putting It All Together

Provide a variety of familiar objects that are joined together in some way for the students to explore. These items could include clothes, toys, shoes, furniture, backpacks, books, food storage containers, or supply cases. Ask:

- **How are these objects put together?**
- **How are the materials joined?**
- **What joining materials are being used?**

Add the way these objects are joined together to the class list. Students could also examine objects in the classroom that are joined together and add the joining materials to the list.

Joining Materials

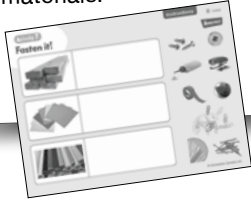
Ask students to look at Science Card 7. Read aloud the title question: *How do you join materials?* and have pairs of students discuss the various fasteners shown on the card. Read the supplemental question: *What can you join with these fasteners?* Prompt discussion by asking questions such as:

- **What do you see that can join materials?**
- **What materials can they join?**
- **How can they join them?**



IWB Activity:

- Students can use
- Activity 7: *Fasten it!*
- (see the Teacher's
- Website) to identify
- fasteners that can be
- used to join various
- materials.



As a class, create a T-chart of the different materials that can be joined with the fasteners featured on the science card (e.g., hammer and nails are used to join wood; brass fasteners and paper clips are used to join paper, buttons and zippers are used to join clothes, and so on). Record each fastener on one side of the T-chart and the materials that can be joined with it on the other side.

What Are You Wearing Today?

Designate different parts of the classroom for different numbers of fasteners students are wearing (laces, Velcro, buttons, zippers, hair clips). Ask students to stand in the area that matches how many fasteners they are wearing. Make a list of how many students have which number of fasteners. Discuss the role fasteners play in clothing and shoes (makes things easier/faster to put on, stays attached).

Make a list of all the different fasteners students are wearing and create a bar or pictograph of the number of students wearing each kind of fastener.

CONNECT

Exploring Fasteners

Provide groups of students with a variety of materials (be sure to include paper), different types of tape (plastic, masking, painter's, packing, electrical, duct, double-sided) and glue (all purpose, craft, super, spray, glitter, rubber cement, and glue stick). Encourage students to explore and test how the tapes and glue join the different materials. As they explore, model asking questions that can lead to exploration and investigation:

- Which materials are you trying to join?
- How are you trying to join them?
- Why are you trying this method?
- What are some other ways that you could join the same materials?
- How could you conduct a test to see which way is best?



Let the students know that they should take notes and draw pictures about what they learned in their Science Journals so that they can share their findings with the rest of the class and refer back to these notes when they make their own paper bag puppet.

When the students have finished exploring, discuss as a group their findings and what tapes and glue they would recommend to use to join materials.

CONSOLIDATE

Making Paper Bag Puppets

Show students Science Card 8. Read aloud the title question: *How will you make a puppet?* Explain to students that they will be making paper bag puppets. Have students look at the puppets featured on the card and examine the ways these puppets may have been put together. Read the supplemental questions: *What materials will you use? How will you join them?*



Provide students with an assortment of objects and materials that they could use to make a paper bag puppet (e.g., paper bags, buttons, cardboard, construction paper, craft sticks, tapes, glues, elastic bands, stapler and staples, buttons, pipe cleaners, plastic ties, zippers, wool, ribbon, shoelaces) and other common craft tools (scissors, colouring pencils, crayons, markers, paint and brushes).

Challenge students to design and build a paper bag puppet. As they think about their design, ask:

- **What materials will you use to make your puppet?**
- **How will you join your materials?**
- **What do you think is best to use for the puppet's eyes/hair/mouth? How will you attach that?**
- **What else could you add to your puppet?**

Presenting and Testing Puppets

After the students have finished their puppets (and they are ready to be tested), ask them to present their puppets to the class. As a group, discuss the methods used by students to join the pieces.

- **How well did your method work?**
- **Did you change any materials or joining methods while you were working on your puppet?**
- **What did you learn?**
- **What would you recommend to others?**

Now ask students to test their puppets and discuss any new findings:

- **Put your hand in the puppet and shake it around quickly. Did anything fall off?**
- **What would you change?**
- **If it stayed together, what did we learn?**

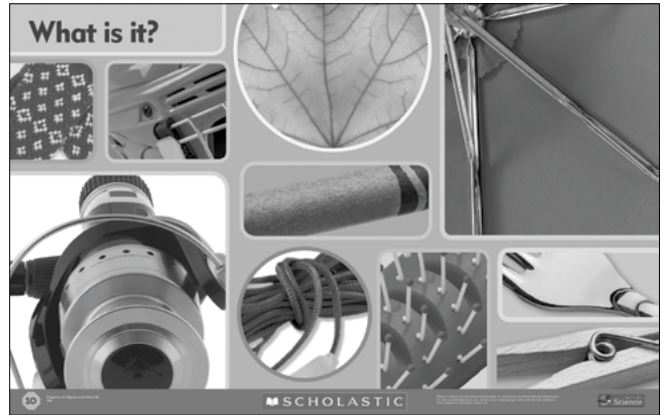
Give students the chance to rethink and repair the construction of their puppet. Ask:

- **Did you think there is a better way to build your puppet? What is it?**
- **Why do you think that way will be better?**

EXPLORE MORE

Make a Bracelet

Invite students to make their own small models of a simple bracelet using different objects and fasteners (e.g., beads and string, elastic bands, paper clips, construction paper and tape, or anything else they choose that could make and fasten a bracelet). You might challenge students who are ready to create a repeating pattern in their bracelets.



Specific Curriculum Outcomes

- 25.0 identify objects, how they are used, and for what purpose they are used [GCO 1/3]
- 27.0 compare and describe properties of objects and materials [GCO 1/3]
- 22.0 use appropriate tools [GCO 2]

Students who achieve these outcomes will be able to:

- NOTES:**

Attitude Outcome Statements

Encourage students to:

- be sensitive to the needs of other people, other living things, and the local environment [GCO 4]
- consider their observations and their own ideas when drawing a conclusion [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- select, read, and view with understanding a range of literature, information, media, and visual text [GCO 4]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 9 • BLM <i>How Do We Use Objects?</i> • IWB Activity 8 • <i>What Is the Design Process?</i> poster • <i>The Magnificent Tree</i> (Read Aloud) • Science Card 10	• a variety of tools, for example: 1) workshop tools such as pliers, screwdrivers, measuring tape, a piece of sandpaper; 2) gardening tools such as a garden trowel, a watering can; 3) office tools such as a tape dispenser, a staple remover; 4) kitchen tools such as a pancake flipper, a bottle opener, a pizza cutter, an egg beater, measuring spoons • small boxes, pencils or straws, cardboard • students' Science Journals • <i>The Polar Bear in the Rock: Two Windows on the World</i>, by Derek Wilton (optional)		• invention • property • purpose • tool • use

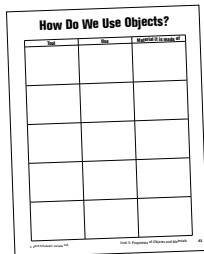
Science Background

- Tools are specialized objects that are designed by humans to do specific tasks and to make certain jobs easier.

Possible Misconceptions

- Students may think that tools make people stronger. In fact, tools help people use their strength more efficiently, which saves energy and physical exertion.

ACTIVATE



What Are Tools?

Discuss the fact that some objects are made to help us do certain jobs, and that these objects are known as tools. Ask volunteers to find a tool in the classroom, hold it up, and describe what it does.

Show students Science Card 9. Read aloud the title question: *How do you use objects?* Tell students that there are a variety of objects shown on the card. Some are tools and some are regular objects. Ask:

- What tools do you see?
- What are these tools used for?
- Which of these tools do you use?

If students are struggling, ask:

- What does the grater do? What's it for? (helps us make food smaller, such as cheese or carrots, for cooking or baking.)
- What does the plush dog do? What's it for? (a toy, to cuddle and play with; it doesn't really do anything)

As a group make a list of the tools. Model how to complete the BLM *How Do We Use Objects?* With the students' help, fill in the first line with one of the tools from the card. Then give students their own copy of the BLM to complete.

Have students work individually or in pairs to fill in the chart. Circulate around the classroom, providing support as needed. Then complete a chart together, using the IWB.

How Do We Use Objects?

Tool	Use	Material it is made of
scissors	to cut paper	metal plastic

IWB Activity:

- Students can use Activity 8: *Name that tool* slide 1 (see the Teacher's Website) to identify tools. Using slide 2, students match the appropriate tool to use with each object or in each situation.



Examining Tools

Provide an array of tools from the workshop, kitchen, gardening shed, and school or office in different centres. (See Getting Organized on page 57 for suggestions.) Have students examine these tools in small groups. Use the following questions to discuss their function, design, and how they are used:

- What does this object do?
- What is it for?
- How does it work?
- Why is it shaped the way it is?
- How is it used?
- What is it made of? Why?

As much as possible, let the students use, or pretend to use, the tools. This will help them understand how to use the tools and in what circumstances.

You could set up a drama centre such as a bakery or a restaurant with all the required tools labelled and have students prepare pretend baked goods/meals.

CONNECT



Design a New Tool

Begin a discussion about engineers and tools. Talk about some tools that have changed our lives (e.g., the zipper or the telephone). Then explain to students that they will be designing a useful tool. Encourage them to think like an engineer and to be creative.

Tell students that engineers follow the Design Process. (Note: for this activity, students will complete only the first step in the process: identifying a problem and finding a solution.) Have students look at the *What Is the Design Process?* poster as you read it aloud. Remind students that the first step is to identify the problem, think of a solution, and make a plan. Ask:

- **What is the problem you want to solve?** (e.g., wet paintbrushes always get stuck together and don't dry properly when left in a cup)
- **How can you solve the problem?** (e.g., find a way to keep the brushes separate from each other so that they keep their shape and dry thoroughly)

Students can use the tools from the Examining Tools activity (see page 58) for ideas of tools that they could design to solve a problem they have identified.

Remind students to ask questions and gather information to find out more about the problem. Then ask them to think of a solution and draw it. Remind students about the notes and pictures that Pop drew in *The Magnificent Tree* to make a plan for his ideas. Students can work individually, in pairs, or small groups.

For this activity, the building and testing steps will not be completed. Tell students they'll have the opportunity to build an object later on in the unit.

Have students evaluate their design. Ask:

- **Are you pleased with your design?**
- **Did you add labels to your sketch?**
- **How will your new tool work?**
- **Would you like to make any changes to its design? What would these changes be?**

Ask for volunteers to share their designs with the class.

CONSOLIDATE



Describing Tools

As a class or in small groups, have students demonstrate the uses of different tools through role play. They can use the tools from the Examining Tools activity (see pages 58-59) or those shown on Science Card 9 for ideas. For example, a student might demonstrate how to use a whisk by pretending to beat an egg in a bowl. Another could use mime to demonstrate how to use a can opener with an imaginary can of tuna. Classmates can identify the tools and the action (e.g., a whisk “beats” eggs).

What Do You See?

Show students Science Card 10 and read aloud the title question: *What is it?* Invite students to play a game of What is it?. Explain that the photos are close-ups of actual objects/tools. Have students work in pairs to guess what each is, what it is used for, and what materials it is made of. (Answers and full photos of objects can be found on the Teacher’s Website.)



Close-up Look

Have students use a digital camera to take close-ups of common classroom objects, pieces of clothing, and/or kitchen gadgets. Have them take a large view of the object as well. Glue the close-up on one side of cardstock and the larger view on the other side. In pairs, students can guess the object from the close-up image and check the reverse to see if they are correct.

Alternatively, you or the students could use the images to create a slide presentation showing the close-up image followed by the large view of the object as the answer. You might also use the images to create an IWB activity.

EXPLORE MORE



Make a Car

Using small boxes, pencils or straws, and cardboard wheels, challenge students to make toy cars that move. (Pencils go through the box with room to turn and the cardboard wheels are attached to the pencil.) Students can record their plan in their Science Journals. Ask the students to take their cars home and explain and demonstrate to their families how they made them and how the wheels and axles work.

Reading Centre

You may wish to read aloud the picture book *The Polar Bear in the Rock: Two Windows on the World*, written by Derek Wilton (see page 87 of Additional Resources). Begin on page 4 and skip over the marginal text, which contains information about geology. Finish your reading on page 20 and ask students to identify the tools described and pictured in the story (kayaks, paddles, skin tents, *ulus* or knives, spears, and a *Kilautik* or shaman’s drum).

How Do We Use Objects?

Tool	Use	Material it is made of

Modelling the Design Process

Focus: The teacher models the design process to build a pencil holder. Or, if students have experience with the design process, the teacher can guide them through the process of making the pencil holder. This is in preparation for students' final task when they will use the design process to create a useful object.

Specific Curriculum Outcomes

Students will be expected to:

- 31.0 identify problems to be solved [GCO 2]
- 22.0 use appropriate tools [GCO 2]
- 32.0 compare and evaluate personally constructed objects [GCO 2]
- 18.0 communicate procedures and results [GCO 2]
- 30.0 create a product by safely selecting, joining, and modifying materials [GCO 2]
- 7.0 make and record observations and measurements [GCO 2]
- 8.0 communicate while exploring and investigating [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- use a variety of materials to create their own pencil holders
- use tools appropriately and with an awareness of safety
- conserve materials and use materials wisely
- problem-solve effectively to create a form that resembles a pencil holder
- communicate how they built their pencil holder

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]
- work with others in exploring and investigating [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]
- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>What Is the Design Process?</i> poster • IWB Activity 9	• sample pencil holder • materials to build and decorate a pencil holder		• design • invent • invention

Safety

- Discuss safety procedures, such as wearing safety goggles when working with tools, before beginning any construction.

Science Background

- The Design Process is a sequence of steps used to solve problems.
- The process can be broken down in four steps:
 1. Identify and describe the problem. Then think of a solution and make a plan.
 2. Gather materials and build a prototype.
 3. Test and evaluate your solution/device.
 4. Share your solution/device and what you learned.

ACTIVATE



The Design Process

Review the steps to the design process using the *What Is the Design Process?* poster. Ask:

- How does using the design process help us to solve a problem?

Clarify any questions students may have regarding the process.

CONNECT

Step 1: Identify a Problem, Think of a Solution, and Make a Plan

Tell students that you have a problem. You are having a hard time finding a pencil when you want one because your pencils always end up all over the place. Ask:

- What type of object might help solve my problem?

Lead students to the idea of a pencil holder. Model questions which will help with the design:

- What makes a good pencil holder?
- What should it look like?
- How many pencils should it hold?
- What materials could I use to build one?
- Which materials would be the best?

If necessary, show students a sample pencil holder to discover design ideas. Point out the *What Is the Design Process?* poster and say:

- These are the things I need to think about as I design and build my pencil holder.



Make a Plan: Design

On chart paper or on the IWB, model the thinking process for ‘making a plan.’ Begin by saying: “I want to create a pencil holder to help solve my problem. I think the pencil holder should be able to hold at least ten pencils.” Then ask questions, such as:

- What shape would be the best to hold pencils?
- What easy-to-find materials should I use for my pencil holder design?
- What recycled materials could I use?
- Will my pencil holder hold at least 10 pencils?
- How can I design it so it will stand up without falling over?

Encourage students to ask you questions to help with the design process.

Model drawing several ideas and then choosing the best one. Say: “When I design my pencil holder, I’m going to make several drawings of my ideas, just like Pop did when he designed his magnificent tree. I want my pencil holder to hold at least 10 pencils, to be able to stand up without falling over, and to be attractive to look at. I also want to use recycled materials if I can so that I am helping the environment.”

Materials

Ask students to help you decide what materials you should use. To prompt questions about materials, ask:

- Can I find these items in our classroom?



- **Why do you think it's a good idea to use recycled materials?**
- **What can I use to make the shape I have chosen?**
- **What will I use to decorate the pencil holder?**

Discuss the pros and cons of using various materials for the pencil holder. Ensure students understand that some materials will be more effective than others due to their unique properties.

As you talk about materials introduce terms, such as “bendy” or “flexible,” “firm” or “rigid,” “strong” or “durable.” Add these words to the Word Wall.

Demonstrate how to add labels to your design to indicate the materials you are going to use to create the pencil holder. (Show a rough sketch of a pencil holder with labels, e.g., tall plastic container, ribbon.)

Discuss tools that would be necessary for constructing the pencil holder (e.g., scissors, glue, wire cutters).

Steps for Constructing

On the IWB or chart paper, record the steps of your plan. Use a Shared Writing approach where you and the students co-construct the text. Have students make suggestions as to how to build the pencil holder using the chosen materials. (Although the steps are helpful when building, remind students that sometimes plans change during the building phase.) Remember to model your thinking as you write.

Step 2: Gather Materials and Build a Prototype

Gather the materials needed to build the pencil holder. Then follow the plan to build the pencil holder. Read out each step as you or a volunteer completes it. Ensure that safety goggles are worn when working with tools such as wire cutters, hammer, and so on.

Step 3: Test and Evaluate Your Solution/Device

When the pencil holder is finished, test it. Put the required number of pencils in the holder. Model asking questions as you test it, such as:

- **Does it fit all the pencils I want?**
- **Does the shape suit my purpose?**
- **Will it tip over?**
- **Does it fit on my desk?**
- **Is it attractive (nice to look at)?**

To evaluate the pencil holder, think aloud as you ask yourself questions, such as:

- **Does it work the way I wanted?**
- **Can I improve it?**

- Did I follow my steps accurately?
- Should I have done something differently?

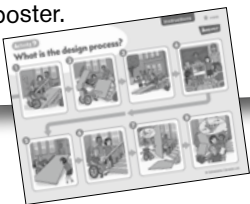
Be sure to point out something that could be improved. For example, “The holder is sturdy and fits my pencils but the plastic container is smooth and it slides on the desk. I think gluing a piece of felt to the bottom would keep my holder from sliding around.” Make the necessary changes, then test and evaluate the holder again.

CONSOLIDATE

Step 4: Share Your Solution/Device and What You Learned

IWB Activity:

- Use Activity 9:
- *What is the design process?* (see the Teacher’s Website)
- to reinforce students’ understanding of the steps in the design process by challenging them to arrange the pictures in order to tell a story about how some students solved a problem using the design process.
- Students may refer to the *What Is the Design Process?* poster.



Talk About the Design Process

Discuss with the students what they learned about the design process. Refer to the *What Is the Design Process?* poster and ask:

- Did we follow the process?
- What could we have done differently to make the pencil holder better?
- Will it be sturdy enough to last a long time?
- Do you have any questions about the process?

Remind students that they will be following the process to build their own useful objects.



The Design Challenge



Focus: Students apply their understanding of the properties of objects and materials to complete the design challenge: build a useful object of their choice using recycled materials.

Specific Curriculum Outcomes

Students will be expected to:

- 24.0 select and use materials to carry out their own explorations and investigations [GCO 2]
- 29.0 explore ways to join materials [GCO 1/3]
- 28.0 describe and demonstrate ways to use materials appropriately and efficiently [GCO 1/3]
- 31.0 identify problems to be solved [GCO 2]
- 22.0 use appropriate tools [GCO 2]
- 32.0 compare and evaluate personally constructed objects [GCO 2]
- 18.0 communicate procedures and results [GCO 2]
- 30.0 create a product by safely selecting, joining, and modifying materials [GCO 1/3]
- 7.0 make and record relevant observations and measurements [GCO 2]
- 8.0 communicate while exploring and investigating [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- make reasonable choices and predictions as to which materials best suit an object
- record a problem, pose questions, and design a solution
- use materials wisely, responsibly, and resourcefully
- test and evaluate their design and make suggestions to improve their design

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [GCO 4]
- appreciate the importance of accuracy [GCO 4]
- be sensitive to the needs of other people, other living things, and the local environment [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- respond personally to a range of texts [GCO 6]
- create texts collaboratively and independently, using a variety of forms for a range of audiences and purposes [GCO 9]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• <i>What Is the Design Process?</i> poster • Science Card 6 • BLM <i>Student Self-Assessment of Design Process</i> • BLM <i>Design and Build a Useful Object</i> • BLM <i>My Useful Object</i> Literacy Place: • <i>Art for the Birds</i> (Shared Reading—I Can Make a Difference Inquiry Unit)	• recycled materials such as string, yarn, paper towel rolls, cans, cotton balls, buttons, broken toy parts, plastic containers, and so on • digital camera (optional)		• build • design • device • fastener • purpose • invention

Safety

- Ensure students follow safety procedures including wearing goggles when working with tools. Students should also wash their hands after handling materials and tools.

Possible Misconceptions

- Students may think that recycling objects is enough to reduce the negative impacts of garbage. Students need to learn that reducing our consumption of materials—by using resources and materials sparingly—is a better way to be stewards of our planet.

ACTIVATE



Literacy Place Connection:

Read or revisit *Art for the Birds* by Tara Harte in the *Literacy Place I Can Make a Difference* Inquiry Unit. Ask students to think about what problem the class had and what they did to solve the problem.

Connect the action in the story with the steps in the Design Process by asking questions such as:

- **How did you feel when you discovered what had hit the window?**
- **Why did Malik ask, “What if other birds do the same thing?”** (He was worried that other birds might get hurt in the same way.)
- **How is this a key question?** (This question made the class try to think of a way to solve the problem of keeping the birds safe.)
- **What solution did the students think of?** (The narrator said they could tape artwork on the windows.)
- **Why was this a good solution to the problem?** (By taping art to the classroom windows, the students made the windows easier to see and this stopped other birds from flying into the glass.)
- **How did the students in Mr. Sloane’s class share their idea?** (They wrote a letter to the principal urging her to ask the whole school to make window art.)
- **Were the birds safe?** (Yes, the window art kept the birds safe from flying into the glass.)



Point to the *What Is the Design Process?* poster and read aloud the steps. Then compare the steps in the poster to what the fictional characters did in the *Art for the Birds* story. Explain that the kids followed the same steps. Say that identifying a problem and solving it are key parts of the design process.

Review the steps of the design process as they relate to this text.

1. The kids in the story identified a problem. Then they thought of a solution and made a plan.
2. They made some artwork and taped it to the windows.
3. They saw that their plan worked.
4. They told others about their plan and how it solved the problem.



Design Challenge

Review the Design Challenge with the students: Design and build a useful object using recycled materials.

Show students Science Card 6. Read the title question aloud: *What can you make?* Then read the supplemental questions: *What is the problem? How will you solve it? What materials will you use?*

Explain to students that they can use the card for ideas on how to follow through with the Design Challenge.

Introduce the BLM *Student Self-Assessment of Design Process* by showing it on the IWB. Read through the points on the BLM with the students. Tell them that after they have built their useful object, they will use this form to assess how well they did.

CONNECT

Step 1: Identify a Problem, Think of a Solution, and Make a Plan

The first step is for students to identify a need. Remind students of building a pencil holder to solve the problem of never being able to find a pencil.

Discuss recycled materials and build a list for the students to refer to as they work through the process. Recycled materials could include string, yarn, paper towel rolls, cans, cotton balls, buttons, broken toy parts, plastic containers, bottles, and so on.

Encourage students to look at the objects and materials in the Curiosity Centre as well as Science Card 6 for ideas. Have students meet with a partner to discuss possible problems and solutions.

Provide students with copies of BLM *Design and Build a Useful Object* for them to draw their designs. You may want to encourage students to keep their designs fairly simple so that construction isn't too challenging. For example, if some students want to design a birdhouse, you might encourage them to create a design that requires minimal sawing and hammering. These are activities that will require adult assistance. Instead, students might consider using plastic containers, which are easier to work with.

Look at students' designs and offer constructive feedback to help them. Ask thought-provoking questions to help students identify trouble spots themselves. For example:

- **Will birds stay dry in this birdhouse?**
- **Could you use a recycled material in place of this material?**

Share some students' designs with others to demonstrate how recycled materials can be incorporated. This will allow you to make comments such as, "See how this design uses a yogurt container for the main form of the object?" Or, "Look at the way the string is used to join the container to the tin can in this design. The string makes a good fastener."

Remind students to think about which materials will work best for their design. Then ask them to think about which tools will help them build their object.

Step 2: Gather Materials and Build a Prototype

Remind students of safety rules when working with tools and encourage co-operation and sharing of materials. Circulate around the classroom, observing students as they work and provide prompts, such as:

- How big will your object have to be to work properly?
- Have you used too much glue?
- How much string do you think you'll need?
- Have you figured out how to attach A to B?
- Are scissors the best tool for making a hole?
- How could you make that stronger?

Step 3: Test and Evaluate Your Solution/Device

After students have tested their object to make sure it meets their need, encourage them to evaluate their own designed objects. Ask:

- Does your object solve the problem? How?
- Did you use some recycled materials?
- Is your object useful? What can it be used for?
- Are you happy with your object?
- What would you do differently?

A form titled "Student Self-Assessment of Design Process" with a header "Name: _____". Below the header is a row of five smiley face icons (happy, neutral, sad, very sad, and very happy) with the text "Rating from (1) to (5)". The form contains five sections, each with a question and a row of five smiley face icons for rating:

Question	Rating (1-5)
Q1: I solved the problem.	
Q2: I used a material and made a plan.	
Q3: I used my solution.	
Q4: I tested my solution.	
Q5: I improved my solution.	

At the bottom, there is a section for "Comments" and a footer "Copyright © 2010 by Pearson Education, Inc."

You could also encourage students to compliment features they like in other students' objects. Encourage students to give positive feedback about the useful objects other students have made.

Have students complete BLM *Student Self-Assessment of Design Process*. You may need to read the questions to some students and have them answer orally.

CONSOLIDATE

Step 4: Sharing Your Solution/Device

A form titled "My Useful Object" with a header "Name: _____". Below the header is a row of five smiley face icons (happy, neutral, sad, very sad, and very happy) with the text "Rating from (1) to (5)". The form contains five sections, each with a question and a row of five smiley face icons for rating:

Question	Rating (1-5)
Q1: This is my _____	
Q2: It's made of _____	
Q3: I like it because it _____	
Q4: It's good for _____	
Q5: _____	

At the bottom, there is a section for "Comments" and a footer "Copyright © 2010 by Pearson Education, Inc."

Provide time for students to present their objects to others in the class. You may choose to provide copies of BLM *My Useful Object* to help students plan what they will say. After, ask the students to talk about how other people found solutions to their problems, particularly if some students found solutions to similar problems.

Or, you could have a "Design Day" for students to share their work with parents or others outside the classroom.

Ask the students to think about how they are going to explain their object, including what it does, and what materials it is made from. Or you could have students take digital photos and write a sentence or two about the object they designed and created. Post these photos and explanations to the school Website or on a school bulletin board.

WRAPPING UP THE UNIT



Revisit the questions posted on the I Wonder Wall and have students discuss answers in small groups or with a partner. If there are questions which cannot be answered at the time, these can remain on the I Wonder Wall for students to research independently. Discuss what the students have learned about the properties of objects and materials and the design process.

Design and Build a Useful Object

Name: _____

Problem: _____

Design:

Materials and tools:

My Useful Object

Name: _____

This is my _____.

It's made of _____
_____.

I like it because it _____

_____.

It's good for _____

_____.

Specific Curriculum Outcomes Checklist

Name: _____ Date: _____

Rating: 1 – not evident; 2 – with assistance; 3 – mostly on own; 4 – on own consistently

Specific Curriculum Outcomes	Rating and Observations
25.0 identify objects, how they are used, and for what purpose they are used [GCO 1/3]	
26.0 observe objects and describe their similarities and differences [GCO 1/3]	
27.0 compare and describe properties of objects and materials [GCO 1/3]	
28.0 describe and demonstrate ways to use materials appropriately and efficiently [GCO 1/3]	
29.0 explore ways to join materials [GCO 1/3]	
30.0 create a product by safely selecting, joining, and modifying materials [GCO 1/3]	
31.0 identify problems to be solved [GCO 2]	
32.0 compare and evaluate personally constructed objects [GCO 2]	
7.0 make and record observations and measurements [GCO 2]	
8.0 communicate while exploring and investigating [GCO 2]	
10.0 predict based on an observed pattern [GCO 2]	
13.0 propose an answer to an initial question or problem and draw a simple conclusion [GCO 2]	
18.0 communicate procedures and results [GCO 2]	
20.0 follow a simple procedure [GCO 2]	
22.0 use appropriate tools [GCO 2]	
24.0 select and use materials to carry out their own explorations and investigations [GCO 2]	

My Inquiry

Name: _____

My question:

My plan:

My results:

My conclusion:

How I will share what I learned:

Student Self-Assessment of Inquiry Process

Name: _____

Rating Scale  = Great  = Good  = Needs to be better

Step 1

I asked a question.



I made a plan.



Step 2

I followed my plan.



I recorded my results.



Step 3

I thought about my results.



I made a conclusion.



Step 4

I shared what I learned.



Teacher Assessment of Inquiry Process

Name: _____ Date: _____

	1	2	3	4
Initiating and Planning				
• poses a question that leads to exploration or investigation				
• makes a prediction based on an observed pattern				
• makes a simple plan				
• selects and uses materials				
Performing and Recording				
• carries out the plan/follows a simple procedure				
• uses appropriate tools				
• makes observations				
• records observations and measurements				
• uses a variety of sources of information and ideas				
• follows safety procedures and rules				
Analyzing and Interpreting				
• sequences or groups materials and objects				
• proposes an answer to the initial question and draws a simple conclusion				
• poses new questions that arise from what was learned				
Communicating and Teamwork				
• communicates while exploring and investigating				
• communicates using scientific terminology				
• communicates procedure and result				
• responds to ideas and actions of others in constructing their own understanding				

Comments:

Inquiry Process Rubric

	Level 1	Level 2	Level 3	Level 4
INITIATING AND PLANNING	talks about things that are of interest makes guesses about the outcome of an inquiry with prompting, offers ideas for a procedure with prompting, identifies some materials which could be used to carry out the plan	asks simple questions about objects and events that are observable makes simple predictions about the outcome of an inquiry, but they may be hoped-for outcomes contributes ideas for a procedure, but they may not be complete identifies some materials which could be used to carry out the plan	uses observations to ask questions to investigate, but questions are not always realistic makes simple predictions about the outcome of an inquiry based on prior observations provides ideas for a simple procedure selects and uses materials to carry out the plan	uses observations and prior knowledge to ask questions to investigate makes thoughtful predictions about the outcome of an inquiry based on prior observations and knowledge provides clear, sequential steps for a simple procedure selects and uses appropriate materials to carry out the plan and explains reasons for choice
PERFORMING AND RECORDING	carries out the plan/ follows a simple procedure with prompting with prompting, uses some appropriate tools with assistance makes simple observations using senses with prompting, records observations and measurements gets information from a teacher-chosen source needs help to follow safety procedures and rules	carries out the plan/ follows most of a simple procedure selects and uses common tools makes some relevant observations using senses records observations and measurements which may be incomplete identifies some relevant information from familiar sources needs occasional prompting to follow safety procedures and rules	carries out the plan/follows a simple procedure selects and uses some appropriate tools makes relevant observations using appropriate senses records observations and measurements accurately identifies relevant information from sources of the same type follows most safety procedures and rules	carries out the plan/ follows a simple procedure, making adjustments as necessary selects and uses all appropriate tools makes relevant, detailed observations using appropriate senses records observations and measurements accurately in a variety of ways identifies relevant information from a variety of sources follows all safety procedures and rules and explains why they are needed

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Inquiry Process Rubric (Continued)

	Level 1	Level 2	Level 3	Level 4
ANALYZING AND INTERPRETING	sequences or groups materials and objects based on simple teacher-chosen attributes describes what happened with prompting, identifies some new questions but they may not be about this inquiry	sequences or groups materials and objects based on a few simple attributes draws a simple conclusion based on observations, but may not link conclusion to the initial question identifies some simple new questions on the topic of this inquiry	sequences or groups materials and objects based on multiple attributes draws a conclusion based on observations which link to the initial question identifies some new questions on the topic of this inquiry that could be investigated	accurately sequences or groups materials and objects based on multiple attributes draws a conclusion based on observations and states if it supports or refutes their prediction identifies new questions on the topic of this inquiry and suggests how they could be investigated
COMMUNICATING AND TEAMWORK	willingly asks for help and accepts help from other group members understands some scientific terminology but rarely uses it with prompting, describes the result and some of the procedures with prompting, asks some questions related to new learnings	makes suggestions to group members as to what should be done understands simple scientific terminology, but does not always use it correctly communicates basic information about the result and most of the procedures asks some questions related to new learnings, but may not fully understand the information	communicates with group members, sometimes with problems usually uses scientific terminology appropriately communicates most of the information about the result and procedures asks some questions in order to understand new learnings	communicates and works effectively with group members consistently uses scientific terminology appropriately accurately communicates the information about the result and procedures asks clarifying questions in order to fully understand new learnings

My Design

Name: _____

The problem:

My solution and my plan:

How I will test my solution:

How my solution worked:

How I will share my solution and what I learned:

Student Self-Assessment of Design Process

Name: _____

Rating Scale  = Great  = Good  = Needs to be better

Step 1			
I identified the problem.			
I chose a solution and made a plan.			
Step 2			
I built my solution.			
Step 3			
I tested my solution.			
I evaluated my solution.			
Step 4			
I shared my solution and what I learned.			

Teacher Assessment of Design Process

Name: _____ Date: _____

	1	2	3	4
Initiating and Planning				
• identifies a problem to be solved				
• thinks of a possible solution to the problem and makes a simple plan				
• selects and uses materials				
Performing and Recording				
• carries out the plan/follows a simple procedure				
• uses appropriate tools				
• makes and records observations and measurements				
• constructs a prototype				
• follows safety procedures and rules				
Analyzing and Interpreting				
• proposes an answer to the initial problem				
• compares and evaluates personally-constructed objects				
• poses new questions that arise from what was learned				
Communicating and Teamwork				
• communicates while exploring and investigating				
• communicates using scientific terminology				
• communicates procedure and result				
• responds to ideas and actions of others in constructing their own understanding				

Comments:

Design Process Rubric

	Level 1	Level 2	Level 3	Level 4
INITIATING AND PLANNING	works on a problem set by the teacher or group suggests a solution to the problem and, with prompting, offers ideas about procedure with prompting, identifies some materials which could be used to carry out the plan	identifies a problem to solve, but it may not be practical suggests a solution to the problem and makes a simple plan identifies some materials which could be used to carry out the plan	identifies a practical problem to solve suggests several possible solutions to the problem and chooses one; makes a simple plan selects and uses appropriate materials to carry out the plan	identifies a practical problem to solve and gives some criteria for solving it suggests several possible solutions to the problem that address the criteria; chooses the best solution and makes a simple plan selects and uses appropriate materials to carry out the plan and explains reasons for choice
PERFORMING AND RECORDING	with prompting, carries out the plan/follows a simple procedure with prompting, uses some appropriate tools with assistance constructs a prototype but does not follow the plan needs help to follow safety procedures and rules makes simple observations using senses; with prompting, records observations and measurements	carries out the plan/follows most of a simple procedure selects and uses common tools constructs a prototype according to the plan, but the device may not be usable needs occasional prompting to follow safety procedures and rules makes some relevant observations using senses; records observations and measurements which may be incomplete	carries out the plan/follows a simple procedure selects and uses some appropriate tools constructs a usable prototype according to the plan follows most safety procedures and rules makes relevant observations using appropriate senses; records observations and measurements accurately	carries out the plan/follows a simple procedure, making adjustments as necessary selects and uses all appropriate tools constructs a usable prototype according to the plan with modifications for improvement follows all safety procedures and rules and explains why they are needed makes relevant, detailed observations using appropriate senses; records observations and measurements accurately in a variety of ways

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Design Process Rubric (Continued)

	Level 1	Level 2	Level 3	Level 4
ANALYZING AND INTERPRETING	with prompting, says whether or not a solution works with prompting, makes simple suggestions for changes to improve the device/solution with prompting, identifies some new questions but they may not be on the same topic	says whether a solution works in terms of some simple criteria suggests some practical changes to improve the device/solution identifies some new questions on the same topic	evaluates and explains the effectiveness of a solution in terms of simple criteria suggests and makes practical changes to improve the device/solution identifies some new questions that arise from the solution	evaluates and explains the effectiveness of a solution in terms of a broad range of criteria makes effective changes to improve the device/solution identifies new questions that arise from the solution and suggests how they could be solved
COMMUNICATING AND TEAMWORK	willingly asks for help and accepts help from other group members understands some scientific terminology but rarely uses it with prompting, describes the solution and some of the procedures with prompting, asks some questions related to the solution	makes suggestions to group members as to what should be done understands simple scientific terminology, but does not always use it correctly communicates basic information about the solution and most of the procedures asks some questions related to the solution, but may not fully understand the information	communicates with group members, sometimes with problems usually uses scientific terminology appropriately communicates most of the information about the solution and procedures asks some questions in order to understand the solution	communicates and works effectively with group members consistently uses scientific terminology appropriately accurately communicates the information about the solution and procedures asks clarifying questions in order to fully understand the solution

Additional Resources

Non-fiction Books

- Canada Recycles* (Canada Close Up series) by Peter Cook and Laura Suzuki (Scholastic Canada Ltd., 2012)
- Canada's Natural Resources* (Canada Close Up series) by Carrie Gleason (Scholastic Canada Ltd., 2012)
- Funky Junk* (Kids Can Do It series) by Renée Schwarz (Kids Can Press, 2003)
- The Inuit Thought of It: Amazing Arctic Innovations* by Alooook Ipellie with David MacDonald (Annick Press, 2007)
- Invention* (Eyewitness series) (Dorling Kindersley, 2013)
- The New Jumbo Book of Easy Crafts* by Judy Ann Sadler; illustrated by Caroline Price (Kids Can Press, 2009)
- The Jumbo Book of Paper Crafts* by Amanda Lewis; illustrated by Jane Kurisu (Kids Can Press, 2002)
- Make Your Own Inuksuk* by Mary Wallace (Owlkids, 2004)
- Our Earth: How Kids are Saving the Planet* by Janet Wilson (Second Story Press, 2010)
- Recycling Things to make and do* by Emily Bone and Leonie Pratt; designed and illustrated by Josephine Thompson (Usborne Books, 2012)
- Sorting through Spring* by Lizann Flatt; illustrated by Ashley Barron (Owlkids, 2013)
- Transformed: How Everyday Things Are Made* by Bill Slavin (Kids Can Press, 2005)

Picture Books

- Alphabetter* by Dan Bar-el; illustrated by Graham Ross (Orca Book Publishers, 2007)
- Amos's Sweater* by Janet Lunn; illustrated by Kim Lafave (Groundwood Books, 2007)
- Art's Supplies* by Chris Tougas (Orca Book Publishers, 2008)
- Forestry A-Z* by Kathleen Cook Waldron and Ann Walsh; illustrated by Bob Warick (Orca Book Publishers, 2008)
- I is for Inuksuk: An Arctic Celebration* by Mary Wallace (Maple Tree, 2009)
- Ice Harbor Mittens* by Robin Hansen; illustrated by Jamie Hogan (Down East Press, 2011)
- I Spy Mystery: A Book of Picture Riddles* by Jean Marzollo; photographs by Walter Wick (Scholastic, 2005)
- I Spy School Days: A Book of Picture Riddles* by Jean Marzollo; photographs by Walter Wick (Scholastic, 1996)
- Little Lamb, Have You Any Wool?* by Isabel Minhós Martins; illustrated by Yara Kono (Owlkids, 2012)

Many Hands: A Penobscot Indian Story by Angeli Perrow; illustrated by Heather Austin (Down East Books, 2012)

My Think-a-ma-Jink by Dave Whamond (Owlkids, 2009)

Sandy's Incredible Shrinking Footprint by Carole Carpenter and Femida Handy; illustrated by Adrianna Steele-Card (Second Story Press, 2010)

The Most Magnificent Thing by Ashley Spires (Kids Can Press, 2014)

The Polar Bear in the Rock: Two Windows on the World by Derek Wilton; illustrated by Cynthia Colosimo (Labrador Institute of Memorial University, 2010)

The Sharing Circle: Stories About First Nations Culture by Theresa Meuse; illustrated by Arthur Stevens (Nimbus Publishing, 2003)

There's a Hole in my Bucket sung by the Topp Twins; illustrated by Jenny Cooper (Scholastic Canada Ltd., 2012)

The 3 Little Pigs by Marie-Louise Gay (Groundwood Books, 2004)

Up Above and Down Below by Paloma Valdivia (Owlkids, 2012)

Where's My Hockey Sweater? by Gilles Tibo; illustrated by Bruno St-Aubin (Scholastic Canada Ltd., 2005)

Websites for Students

BBC: School Science ClipsClips – Grouping and Changing Materials
http://www.bbc.co.uk/schools/scienceclips/ages/6_7/grouping_materials_fs.shtml

BBC: School Science Clips – Sorting and Using Materials
http://www.bbc.co.uk/schools/scienceclips/ages/5_6/sorting_using_materials_fs.shtml

Websites for Teachers

European Space Agency: Materials Science in Space
<http://www.spaceflight.esa.int/users/materials/introduction/materials/materials.html>

Institute of Making: Materials Library
<http://www.instituteofmaking.org.uk/materials-library>

Strange Matter: What Is Materials Science
<http://www.strangematterexhibit.com>

Dear parents and caregivers,

We are about to start an exciting new unit in science where we will be exploring objects and materials. Your child will be developing an understanding of the characteristics and properties of different objects and materials and their uses through a variety of hands-on activities.

As you are using objects and materials at home, you can talk to your child about the characteristics, the uses, or why you chose that object or material over another.

At the end of the unit, the children will demonstrate their learning by designing and building a useful object. Be sure to check them out when they go on display!

To ensure a wide range of experiences and make connections between this topic and your child's world, he/she may choose to bring one or more personal items to school for exploration during in-class activities. These items will be returned home once explorations are completed. To determine whether the item(s) is appropriate please contact me, your child's teacher.

Sincerely,