

LESSON

Property Investigators

Grade Level: 2
Duration: 60 min

Students will investigate and analyze the properties of a set of items to determine which materials are best suited for different tasks.



Outline

Frame the Activity	5 min total
Activate Prior Knowledge	5 min
Materials Investigation	55 min total
Observations	20 min
Class Hypotheses	10 min
Testing	15 min
Share Out	5 min
Debrief	5 min

Grade Level: 2

Duration: 60 min

Concepts/Skills

Observation, hypotheses, materials, properties

Objectives

Students will:

- Describe and classify a set of objects.
- Analyze and test a set of objects to determine which is suitable for a particular function, based on its properties.



Lab Connection:

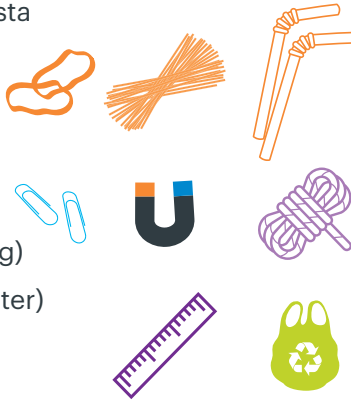
Make it Matter

Materials and Preparation

Materials

Property Testing (1 set per team)

- 3-4 pieces thick spaghetti or other long pasta
- 2 plastic or paper drinking straws
- 8 paper clips (standard size)
- 2 rubber bands (standard size)
- 2 magnets (donut shape if available)
- 1 piece of twine or string (8" (20.32 cm) long)
- 4 metal washers (1-2" (2.54-5.08 cm) diameter)
- 1 ruler
- Optional:* 1 bag for holding material



Check out the [Explore Design Challenge Learning](#) page for tips on how to help learners become creative problem solvers. Here you can find a variety of Tech Tips, videos, and downloadable resources.

Preparation

1. Print the [Material Property Observations](#) and [Material Property Testing](#) handouts (1 per team).
2. Have the board or chart paper and markers available.
3. Optional: Recreate the chart from the [Material Property Observations](#) handout on the board or chart paper to record student observations.
4. Plan to have students work in teams of 3-4.



Lab Connection

If you took the [Make It Matter lab](#) at The Tech Interactive, plan to have students recall their experience at the beginning of the lesson.



Frame the Activity

Activate Prior Knowledge (10 min)

1. Start by holding up one of the materials. Ask students to pretend they need to describe the item to an alien. Since they are from another planet, just calling the item by its name won't be enough. What are other ways they could describe it?
 - Write down responses on the board or chart paper. Students responses may include:
 - Color
 - Shape
 - Strength
 - Size
 - Length
 - Flexibility

2. Let students know that these are all examples of the material's **properties**, or traits.
 - Note that they were able to describe the physical traits of the materials by practicing **observation**, or using their senses to gather information.
3. Have students imagine that they are building a bridge. Ask them **Guiding Questions** to consider why it would be important to them to understand the properties of the building materials.
 - *What kinds of materials would we need to build a bridge?*
 - *How do we make sure it will be strong and safe to use?*
 - *What could happen if we do not know the best materials to build with?*
4. Let students know that next they will have a chance to make some observations of different materials and think about how they might be used for different tasks.

Materials Investigation

Observations (20 min)

1. Put students into teams of 3-4.
2. Pass out one **Material Property Observations** handout to each group. Explain that they will investigate a set of materials and see what they can learn about the material's properties.
 - Make sure students are aware of the properties listed at the top of the handout. They will need to explore these properties for each of the materials they are given.
3. Once students understand the directions, pass out one set of materials to each group.
4. Support teams by walking around the classroom and answering questions students may have. If groups finish early, have them think about what they will share from their findings with the rest of the class.
5. Bring the class back together when all the groups are done or 15 minutes are up.

Class Hypotheses (10 min)

1. Ask for groups to share what they observed about the material's properties.
 - *Optional:* Record observations on the pre-made chart on the board or chart paper.
2. Let the students know that they are now going to take what they have learned about the materials so far to decide which materials would be the best for four different tasks.
3. Write the material property testing questions on the board or chart paper.
 - What would be the best material to...
 - *Span across a distance of two desks (8 inches (20.32 cm) apart)?*
 - *Hold two washers for at least one minute?*
 - *Hold two washers and span a distance of eight inches?*
 - *Pick up five paper clips?*
4. As a class, ask students to call-out some **hypotheses**, or guesses, based on what they observed about the properties of the materials.
5. Let them know that they will have 15 minutes to test the materials and see if their hypotheses were correct.



Testing (15 min)

1. Have students get back in their teams. Pass out a [Material Property Testing](#) handout to each team.
2. Support teams by asking open-ended questions while teams investigate the material's properties.
 - *For each test, what properties are we looking for in the material?*
 - *Will all of the properties affect the material's ability to do the job? (e.g., color)*
 - *Could you put two or more materials together to do the job? Would putting them together change their properties?*
3. Bring the class back together when 15 minutes are up.



Share Solutions (5 min)

1. Go down to each question and ask for volunteers to share the results of their tests.
2. After a team shares, ask if any of the other team's tests lead them to a different answer.
 - Ask the class to consider why they may have come to different conclusions. Student responses may include:
 - The different materials are equally good for the job.
 - One team may have combined materials.
 - The teams had different ideas on which properties were most important for the job.



Debrief (5 min)

1. Follow up with some debrief questions, such as:
 - *Color was not an important property for these tests, but can you think of other jobs where the color might affect the ability to do the job?*
 - *Did any of the materials surprise you?*
 - *Why is it important to both make observations AND do actual testing?*



Career Connection: Chemical Technician

In the real world, conducting tests on matter is essential for quality control, or making sure products are safe for people. Chemical Technicians assist scientists with making qualitative or quantitative analyses of solids, liquids, or gaseous materials. They conduct laboratory tests on materials to develop or improve on consumer products, but also to ensure that these products adhere to safety regulations and have minimum environmental impact. Chemical Technician jobs usually require an associate's degree in chemical technology or applied science.

To learn more about a career as a Chemical Technician, check out the resources below.

- **Become an Expert:** Explore the ["American Chemical Society's Educational Resources,"](#) ACS website for videos, activities, games and other interactive content on the world of chemistry.
- **Try it:** Check out our [Tech at Home](#) chemistry activities! Mix your own colorful paints with [Cabbage Inks](#) or experiment with oxidizing compounds with Green Pennies.
- **Play it:** Enjoy learning more about molecules by playing a game? Try free online games that engage students in the scientific method, like ["The Meaning of Beep: Scientific Method,"](#) BrainPOP website, or ["Science Games,"](#) PBS Kids website.

Standards Connections

Next Generation Science Standards

Grade	Performance Expectation	Description
2	2-PS1-2	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
2	2-PS1-2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
Science and Engineering Practices		Asking Questions and Defining Problems Planning and Carrying Out Investigations Analyzing and Interpreting Data
Cross Cutting Concepts		Patterns Cause and Effect Structure and Function

Vocabulary

- **Classify:** Arrange items into groups based on similarities in physical characteristics
- **Hypothesis:** An educated guess based off evidence
- **Materials testing:** A testing process to determine the characteristics of items
- **Observation:** Practice of using one's senses to gather information
- **Properties:** Physical traits of an item (shape, size, strength, color, etc.)



Material Property Observations

Team Name(s):

Date:


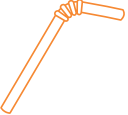



	Color	Size	Shape	Length	Strength	Flexibility
Pasta 						
Straw 						
String 						
Rubber band 						
Magnet 						
Paper clip 						



Material Property Testing

Team Name(s):

Date:

Matter Sample	Fit across 8-inch gap	Hold 2 washers	Hold 2 washers AND fit across 8-inch gap	Pick up 5 paper clips
Pasta 				
Straw 				
String 				
Rubber band 				
Magnet 				
Paper clip 