



Description This activity is meant to extend your students' knowledge of the topics covered in the Make it Matter lab at The Tech. Through this activity, your students will learn how to investigate and analyze the properties of a set of materials to determine which materials are best suited for given tasks.		
Grade Level 2	Student Outcomes Students will: <ul style="list-style-type: none"> 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. 	NGSS connections <ul style="list-style-type: none"> 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. 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.
Duration 45 minutes		

Materials	
<ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> 2 magnets (donut shape if available) 1 piece of twine or string (8" long) 4 metal washers (1-2" diameter) 1 ruler

Vocabulary
<p><i>Familiarity with these terms and concepts will enhance students' experience in the activity.</i></p> <ul style="list-style-type: none"> Classify: Arrange items into groups based on similarities in physical characteristics. Properties: Physical characteristics of an item (shape, size, strength, color, etc.). Materials testing: A testing process to determine the characteristics of items.

Introduction
 Knowing and understanding the properties of materials is a key skill for almost any job, especially engineers. Engineers need to know and understand the materials they work with so they can determine which materials will work best for the job at hand. For example, a civil engineer building a bridge needs to know which materials (like types of wood, metal, and cement) will make the strongest and safest bridge for people.

In this activity, students will do some simple materials analysis and testing to determine which materials are best suited for a list of given tasks.




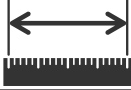









Procedure

1. Materials testing begins with making observations on a material's properties and analyzing those properties.
2. Review examples of observable properties of matter:
 - a. Color
 - b. Size
 - c. Shape
 - d. Strength
 - e. Length
 - f. Flexibility
3. Students will begin by making observations on the set of given materials and record their observations on the provided observation sheet.
 - a. Set of materials to analyze: Pasta, twine, drinking straw, paper clips, rubber bands, magnets.
 - b. 10-15 minutes should be plenty of time to make observations.
4. Review students' observations and create a class chart of observations (if desired). Some students or teams may have observed different properties that were not noticed by others!
5. After reviewing observations, introduce the jobs or tasks that the student teams will need to do using the materials.
 - a. Span across a distance of 8 inches (two desks 8 inches apart).
 - b. Hold two washers for at least 1 minute.
 - c. Hold two washers and span a distance of 8 inches (task a + task b).
 - d. Pick up 5 paper clips.
6. Using their previous observations, students should make hypotheses about which materials they think will be able to do these jobs. Hypotheses should only be based on the observations they made!
7. After everyone has developed their hypotheses, materials testing will begin! Let each team actually test out all of the materials to see which will do the best at each job.
8. Discussion questions during testing or after testing:
 - a. Some jobs could be done by multiple objects, but which one does the job best? Why? What properties make it the best?
 - b. Do all of the properties affect the material's ability to do the job? (Did color really affect the material's ability to do one of the jobs? Are there some jobs where the color might affect the ability to do the job?)
 - c. Can two materials be equally good at doing the job?
 - d. Are there situations where one material might work better than the other?
 - e. Can you put two or more materials together to do the job? Does putting two different materials together change the properties? (i.e., can two weak materials put together make a stronger material or vice versa?)
 - f. Did any of the materials surprise you? Did you think maybe they wouldn't be able to do a job but they did?
 - g. Is it important to make observations AND do actual testing? Why?
9. Review how well the materials tested and go over the above questions. Take student observations on the testing process — items may have performed differently than what they were expecting!




Observation Sheet-Properties

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



Observation Sheet-Testing

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 				