STEMscopes NGSS 3D
K-12 SCIENCE

Properties of Materials

2nd Grade Sample Lesson

www.stemscopes.com/science

Scope (Unit) Properties of Materials

Explore (Lesson) Inquiry Investigation - Soak It In!

The following pages introduce lesson resources that guide you through the STEMscopes NGSS 2nd grade lesson. This sample lesson does not include all the elements and features of our digital and print science curriculum.

Resource List:

The following resources, as well as additional Scope resources not listed, can be found in the digital curriculum *2nd Grade Scope, Properties of Materials.*

Home

- Standards Alignment
- Sample Lesson Plan
- Teacher Background
- CCC and SEP Scoring Rubric
- Answer Keys
- Materials List

Engage

- Investigative Phenomena – Introductory activity that facilitates a connection between the content and real-world phenomena and encourages students to ask why or how something happens.
- Graphic Organizer – Students fill this in as they work through the elements of this Scope.
- Accessing Prior Knowledge – A brief probing activity to gauge students' prior knowledge before engaging in the inquiry process.
- Hook – An engaging activity that includes instructor preparation, supplemental resources, and ready-made handouts for students.

Explore

- Explore 1: Inquiry Investigation – This sample lesson.
- Explore 2: Scientific Investigation
- Explore 3: Engineering Solution

Explain

- Picture Vocabulary – Key terms explained through pictures and by definition.
- Linking Literacy – Strategies to help students comprehend difficult informational text.
- Science Rock – A musical/video software platform where students can sing and learn from standards-based science songs.
- STEMscopedia – Reference materials that include parent connections, career connections, technology, and science news.
- Communicative Science – A class activity in which students use different forms of communication to discuss scientific topics connected to the content of this Scope.
- Concept Review Game – An interactive game that helps students review important concepts.
- Content Connections Video – A short video that supports student understanding of the content.
- Simulation Practice – A ready-made interactive experience to support students' understanding of the science concept.

Elaborate

- Math Connections
- Reading Science
- Career Connections
- Scientist Spotlight
- Simulation Practice

Evaluate

- Claim-Evidence-Reasoning
- Open-Ended Response Assessment
- Multiple Choice Assessment

Intervention

- Guided Practice
- Independent Practice
- Concept Attainment Quiz

Acceleration

- Extensions
- Science Art
- Books on Topic
- Project-Based Learning

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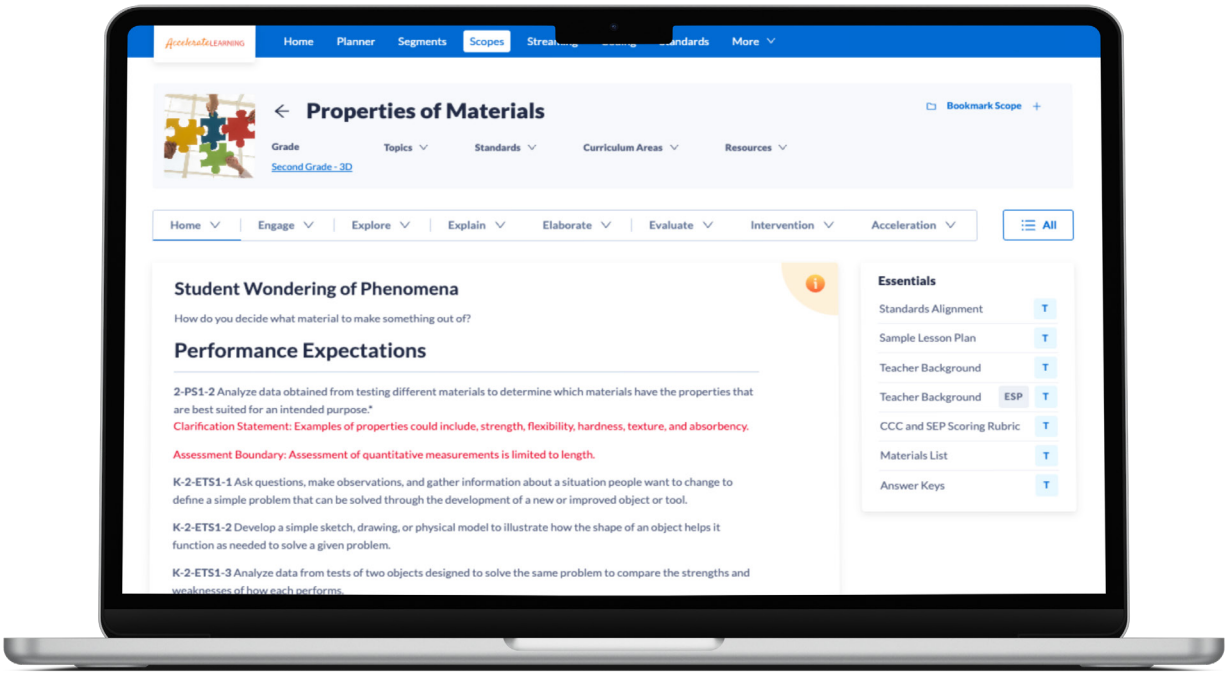
Scope (Unit) Overview

Scope (Unit) Properties of Materials



Student Wondering of Phenomena

How do you decide what material to make something out of?

Performance Expectations

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.
Clarification Statement: Examples of properties could include strength, flexibility, hardness, texture, and absorbency.
Assessment Boundary: Assessment of quantitative measurements is limited to length.

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Scope (Unit) Overview

Scope (Unit) Properties of Materials

Three-Dimensional Focus

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Analyzing and Interpreting Data Analyze data from tests of an object or tool to determine if it works as intended. (2-PS2-2)	PS1.A (2): Structure and Properties of Matter Different properties are suited to different purposes	Cause and Effect Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science on Society and the Natural World Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Properties of Materials

Explore 1: Inquiry Investigation - Soak It In!

Everyday Phenomena

Why are some types of paper towels stronger and more absorbent than others?

Description

(CCC) Students observe the strength and absorbency of two different types of paper towels.

Materials

Printed Material

1 Soak It In! (per student)
1 Student CER (per student)

Reusable

200 Pennies (per group)
2 100 mL Graduated cylinders (per group)
200 mL Water (per group)
1 Plastic or metal tray (per group)
1 Basic calculator (per group) *Only if students are not yet able to subtract from 100
1 Pen or pencil (per group)

Consumable

1 Sheet of Brand A paper towels (per group)
1 Sheet of Brand B paper towels (per group)

Preparation

- Distribute the tray, graduated cylinders, water, and one sheet of each brand of paper towel to each group.
- Make sure that at least one of the paper towels is an inexpensive, single-ply brand.

STEMcoach in Action

Cooperative learning involves more than students working together on a lab or field project. It requires teachers to structure cooperative interdependence among the students, holds students individually accountable, and enables students to experience face-to-face academic interaction with peers. It also fosters interpersonal and small-group social skills. For further information regarding Establishing Cooperative Learning, please click the provided link.
Site

Procedure and Facilitation Points

As students work through the activity, look for teachable moments to introduce students to the following vocabulary terms. Try to point out examples of the terms as students are working so that they can connect the meaning of the word with their experiences. Encourage students to use the following words as they record and discuss their findings.

- **Intended purpose**: what something is supposed to be used for
- **Materials**: equipment and supplies for doing or making something
- **Pieces**: parts of a whole
- **Properties**: a single part of the way something is
- **Purpose**: the reason something is made
- **Set**: a group of things that go together

Place students in groups of three or four. Read the driving questions to the class.

Part I

1. Students should pour 100 mL of water into each graduated cylinder.
2. Use a pen or pencil to mark an A on the Brand A paper towel and a B on the Brand B paper towel to avoid confusion.
3. Students will fold each paper towel in four sections (half, then half again, making four sections).
4. Have students place paper towel A in one graduated cylinder of water and paper towel B in the other graduated cylinder of water.
5. Have students pull the paper towels back out of the graduated cylinders and hold them above the graduated cylinders for a few seconds until they are only lightly dripping or not dripping at all.
6. Students should place both paper towels in the tray.
7. Tell students to look at how much water is left in each graduated cylinder and write down the measurement by reading the number that is closest to the bottom curve of the waterline. Next, subtract the amount of water left from 100. This number is the amount of water absorbed, or left, in the paper towel. **Note**: If students are not ready to subtract from 100, the class can complete this activity as a whole group and model the subtraction. Alternatively, you can pass out a 100 chart for additional support with the subtraction, or you can provide a calculator.
8. Have them record this amount in the data table.

Part II

1. Have two students from each group pick up paper towel A and unfold it.
2. Have the two students both hold a corner of the paper towel with their hands, so they are holding the four corners.
3. Another student should start to add one penny at a time to the center of the paper towel, placing them on top of each other or close to each other until the paper towel tears. Note: if the pennies are spread out, then it will not tear or will take more pennies.
4. Once paper towel A tears, students should record how many pennies it held before it tore. If the towel does not tear with 200 pennies on it, then students should record "200+."
5. Have students repeat with paper towel B.
6. Instruct students to complete the CER.

7. Discuss:
    - **(SEP)** Which paper towel was the most absorbent, or held the most water? Brand A
    - **(SEP)** How did you know? There wasn't as much water left in the beaker after we put brand A in the beaker.
    - **(SEP)** Which towel was the strongest? Brand B
    - Strength and absorbency are two physical properties that we can observe to help us decide which material would be best for a certain job. If you needed to clean up a lot of liquid, which brand would you choose? Brand A
    - If you needed to scrub your stove, which brand would you choose? Brand B
8. Add new learning to the Graphic Organizer.

Connection to the Investigative Phenomena

Once students have completed the activity, have them refer to the Investigative Phenomena question, anchor their learning, and revise their thinking.

Language Acquisition Strategies

Compare and Contrast

After the students have had time to explore through the paper towel investigation, provide them with compare and contrast frames to organize the new knowledge they have received from the lesson. Remind students to compare the results of the paper towels..

Compare Sentence Stem: _ is similar to __ in that both __.

Contrast Sentence Stem: _ is different from _ in that __.

After they write the sentence stems to compare the paper towel brands, have them walk to their A and B partners so they can read their sentence stems to each other. After they have had time to share with their partners, bring the class back together. Pick the student with the shortest hair or the student born in February to read his or her compare sentence stem out loud to the whole class. Then move on to the contrast sentence stem by picking another student.

Properties

Explore

Explore Lesson

Name: _____ Date: _____

Soak It In!

Our Driving Questions

Which paper towel brand is the most absorbent? Which is the strongest?

What We Need

200 Pennies
2 Graduated cylinders
200 mL Water
1 Tray
1 Sheet of Brand A paper towels
1 Sheet of Brand B paper towels

Procedure

Part I

1. Pour 100 mL of water into each graduated cylinder.
2. Use a pen or pencil to mark an *A* on the Brand A paper towel and a *B* on the Brand B paper towel to avoid confusion.
3. Fold each paper towel in four sections (half, then half again, making four sections).
4. Place paper towel A in one graduated cylinder of water and paper towel B in the other.
5. Pull the paper towels back out of the graduated cylinders and hold them above the graduated cylinders for a few seconds until they are only lightly dripping or not dripping at all.
6. Place both paper towels in the tray.
7. Look at how much water is left in each graduated cylinder and write down the measurement by reading the number that is closest to the bottom curve of the waterline. Next, subtract the amount of water left from 100. This number is the amount of water absorbed by, or held in, in the paper towel.
8. Record this amount in the data table.

Explore

Part II

1. Pick up paper towel A and unfold it.
2. Two students should each hold a corner of the paper towel with their hands, so they are holding the four corners.
3. Add one penny at a time to the center of each paper towel, placing them on top of each other or close to each other, until the paper towel tears.
4. Once paper towel A tears, record how many pennies it held before it tore. If the towel does not tear with 200 pennies on it, then record "200+."
5. Repeat with paper towel B.

Paper Towel Brand	Water Absorbed	Number of Pennies Held
A		
B		

Which paper towel was the most absorbent, or held the most water? How did you know?

_____

_____

Which towel was the strongest? How did you know?

_____

_____

Strength and absorbency are two physical properties we can observe that can help us decide which materials would be best for a certain job. If you needed to clean up a large amount of liquid, which brand would you choose?

_____

If you needed to scrub your stove, which brand would you choose?

Explore

Name: _____ Date: _____

Soak It In!
Claim-Evidence-Reasoning

Prompt
Write a scientific explanation to support which paper towel is best for scrubbing a rough surface.

Claim:

_____

_____

_____

Evidence:

_____

_____

_____

_____

_____

Points Awarded	2	1	0
Claim	Student makes an accurate and complete claim.	Student makes a claim that is inaccurate or incomplete.	Student does not make a claim.
Evidence	Student provides more than two accurate pieces of evidence.	Student provides one or two accurate pieces of evidence.	Student gives no response or provides a response that is off topic.

Name: _____ Date: _____

Soak It In!
Claim-Evidence-Reasoning

Prompt
Write a scientific explanation to support which paper towel is best for scrubbing a rough surface.

Claim:

Brand B is best for scrubbing a rough surface.

Evidence:

To scrub something, you need a strong paper towel.

Brand B held 138 pennies.

Brand A only held 51 pennies.

Points Awarded	2	1	0
Claim	Student makes an accurate and complete claim.	Student makes a claim that is inaccurate or incomplete.	Student does not make a claim.
Evidence	Student provides more than two accurate pieces of evidence.	Student provides one or two accurate pieces of evidence.	Student gives no response or provides a response that is off topic.

Picture Vocabulary

Properties of Materials

Picture Vocabulary

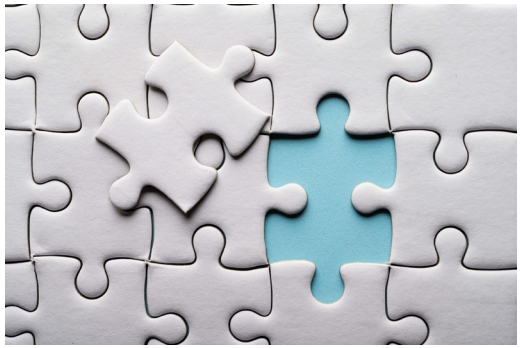
Intended Purpose

What something is supposed to be used for

Materials

Equipment and supplies for doing or making things

Pieces



Parts of a whole

Property

A single part of the way something is

Purpose

The reason that something is made

Set

A group of things that go together

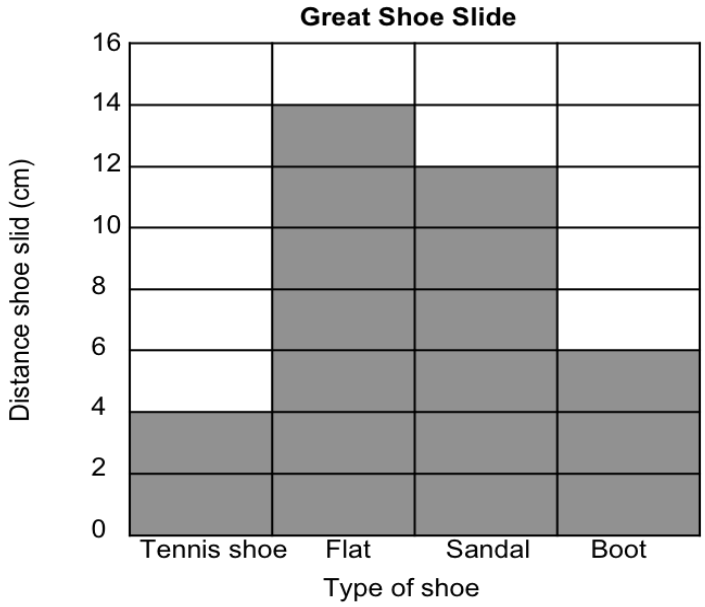
Math Connections

Math Connections

Name: _____ Date: _____

The bar graph below shows the distance each shoe slid across the floor in the Great Shoe Slide.

Use the graph to answer questions 1–3.



1. Which type of shoe slid the farthest distance?

   _____

2. How many centimeters farther did the flat slide than the tennis shoe?

   _____ - _____ = _____

3. What was the combined distance the boot and sandal slid?

   _____ + _____ = _____

Math Connections

4. Your teacher purchased the following numbers of items for the Super Soles project. Create a pictograph, using the information provided.

The Super Soles Project

Items	Number
Cotton balls	100
Wooden skewers	60
Scissors	40
Water bottles	20

Title: _____

Each ■ equals 10.

5. What was the total number of cotton balls and water bottles?

_____ + _____ = _____

6. What is the difference between the numbers of wooden skewers and scissors?

_____ - _____ = _____

Claim-Evidence-Reasoning

Prope

CER Assessment

Name: _____ Date: ____

Scenario

You have always wanted your own trampoline in your backyard, and now you
is coming true! You got permission to go online and pick out a special trampoline just for you and your family. You start to think about what your new trampoline will be like. You love how trampolines bounce you high into the air and how two or three people can be jumping at the same time. You go online and choose a round frame. Now it is time to choose the inside fabric. You research the fabrics and find the following information.

Material Option	Flexible	Strong	Weather Resistant
A	No	No	Yes
B	Yes	No	No
C	Yes	Yes	Yes
D	Yes	Yes	No

Prompt

Write a scientific explanation for which material would be best for your trampoline.

Claim:

_____

_____

_____

Evidence:

_____

_____

_____

_____

_____

Claim-Evidence-Reasoning

Properties of Materials CER

Rubric for Writing a Scientific Explanation

Points Awarded	2	1	0
Claim	Makes an accurate and complete claim.	Makes a claim that is inaccurate or incomplete.	Does not make a claim.
Evidence	Provides more than two accurate pieces of evidence.	Provides one or two accurate pieces of evidence.	Gives no response or response is off topic.

Claim-Evidence-Reasoning

Name: _____ Date: _____

Scenario

You have always wanted your own trampoline in your backyard, and now your dream is coming true! You got permission to go online and pick out a special trampoline just for you and your family. You start to think about what your new trampoline will be like. You love how trampolines bounce you high into the air and how two or three people can be jumping at the same time. You go online and choose a round frame. Now it is time to choose the inside fabric. You research the fabrics and find the following information.

Material Option	Flexible	Strong	Weather Resistant
A	No	No	Yes
B	Yes	No	No
C	Yes	Yes	Yes
D	Yes	Yes	No

Prompt

Write a scientific explanation for which material would be best for your trampoline.

Claim:

Material C would be the best for my trampoline.

Evidence:

Material C is flexible, strong, and weather resistant.
Material D is flexible and strong but not weather resistant.
Material A is weather resistant but not flexible or strong.
Material B is flexible but not strong or weather resistant.

Claim-Evidence-Reasoning

Properties of Materials CER

Rubric for Writing a Scientific Explanation

Points Awarded	2	1	0
Claim	Makes an accurate and complete claim.	Makes a claim that is inaccurate or incomplete.	Does not make a claim.
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