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Matter & Materials Curriculum Map

What is the world made of? Through hands-on activities and experiments, students will enjoy exploring the world around them as they practice science skills like observing and concluding.

Games like "Simon Says" bring the realm of atoms and particles to life, as well as demonstrating solids, liquids, and gases. Your classroom will buzz with curiosity as students learn to explain the magic of ice sculptures, gas-powered rockets, and invention.

This resource is arranged in the following sections, with each section building on the last: **Objects Have Parts; Materials and Properties; Materials and Function; Solids, Liquids, and Gases; and Working with Matter.**

Each section contains visual, kinesthetic, and auditory activities. Each section ends with an activity that may easily be used to assess learning of the material.

A vocabulary exercise is also included to ensure that terminology becomes familiar and understood. Students are encouraged to keep a glossary of terms that they do not understand or find particularly interesting.

The teacher notes are designed to provide you guidance with the materials needed, as well as provide some insight on what results to expect when the experiments are conducted.

Introduction Includes:

- At A Glance TM - List of Skills and Learning Expectations
- Teacher Rubric
- Student Rubric
- Introduction
- Materials List

Lesson Topics:

Objects Have Parts

In this section, students are introduced to the idea that complex objects have parts, and that understanding these parts helps us understand the object. In later sections, this concept will be useful for understanding matter and materials in general.

- Teacher Notes
 - **Student Activities**
 - **Put It Together**
 - **Looking for Parts**
- Answer Key

Materials

- Teacher Notes
- Student Activities
 - **Materials Are Everywhere:** Students are introduced to materials, and relate those materials to the objects around them. They learn to distinguish between an object and the material it is made from.
 - **What Materials Are Used Most?:** Students are introduced to materials, and relate those materials to the objects around them. They learn to distinguish between an object and the material it is made from.
 - **Shoe Scramble:** The main purpose of this activity is to teach students that labeling and sorting objects can be done in different ways.
 - **Man-Made or Natural?**
 - **Man-Made and Natural Tic Tac Toe Cards**
- Answer Key

Properties of Matter and Materials

In this section, students will explore the properties of various materials and objects. The emphasis will be on using their senses to do so.

- Teacher Notes
- **Student Activities**
 - **Paper is Amazing**
 - **Be a Materials Detective:** The purpose of the activity is to practice observing and describing.
 - **What Would You Like to Know?:** Students will practice the scientific method of developing and answering a question in the context of observing the properties of materials.
 - **Material Properties Worksheet**
 - **Use Your Senses:** This activity can be done individually, in small groups or as a whole class sitting in a circle with the teacher holding the bag and the student is asked to pull an object out of the bag, which is then passed around.
 - **The Right Material for the Job**
 - **Design a Box:** Students apply their knowledge of materials by building a box.
 - **Can You Bend It?**
 - **What Do You Know About Materials?**
- Answer Key

Solids, Liquids, and Gases

In this section, students will first learn to recognize the states of matter based on properties they can observe.

Teacher Notes

- **Student Activities**
 - **Solids:**
 - Solids hold their shape regardless of the container they are in (they are rigid), and can be hard. For example, a stone does not easily change shape. Different solids also have various properties, such as brittleness and tensile strength.
 - **What Is a Solid?**
 - **What Are Solids?**
 - **All Kinds of Solids**

- **Liquids:**

- Liquids have no shape of their own and take on the shape of the container they occupy. Some properties of liquids include viscosity, a measure of their 'thickness', which is a physical property related to how the molecules stick together. Molasses has a high viscosity, water a low viscosity.
 - **What Is a Liquid?**
 - **What Are Liquids?**
 - **Liquid Language**
 - **Comparing Liquids**

- **Gases:**

- Like liquids, gases have no shape of their own. The difference between liquids and gases is that when confined, gases expand to fill the container, whichever size it is. Gases can also be compressed. A lot of gases are colorless, but not all. Chlorine gas, for example, is yellowish-green. Gases do have mass, as per the definition of matter. You need a sensitive balance but you can weigh air.
 - **What Is a Gas?**
 - **What Are Gases?**
 - **Amazing Gases**

- **Solids, Liquids, and Gases**

- **What's At Home?**
- **Make A Magazine**
- **Molecules Can Move!**
- **Let's Pretend**

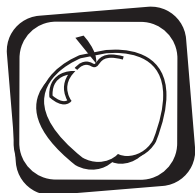
Working with Matter

- **Teacher Notes**
- **Student Activities**
 - The 13 student experiments and activities teach students that matter can change from one state to another when it is heated up or cooled down. Sometimes, in addition to mixing or not mixing, when two kinds of matter are combined they form new ingredients. This is called a chemical reaction. Some

experiments are suitable for a demonstration by the teacher or to be done in supervised groups.

- **What's a Mixture?**
 - **Exploring Liquids**
 - **Goop!**
 - **Water Detectives**
 - **Ice Sculpture**
 - **Crayon Soup**
 - **Make It Rain**
 - **Heat Makes Molecules Move Faster**
 - **Let's Make Candy**
 - **Can We Change It Back?**
 - **Make a Gas Powered Rocket**
 - **Changing Matter Crossword Puzzle**
 - **Permanent Change or Not?**
- Answer Key

Matter Quiz and Answer Key



Properties of Matter and Materials

Teacher Notes

Property is another term for characteristic. It allows us to describe, compare and classify matter and materials. Describing materials is important, not just so we can communicate about it, but also so we can understand it, how it will interact, and how we might make use of it.

Properties of Matter

Here is a list of some physical properties of matter:

- color
- odor
- luster (shininess)
- hardness - how easily it can be scratched (e.g., diamond is very hard)
- density - a measure of how much matter is in a given space; mass divided by volume (e.g., granite is very dense, balsa wood is not)
- flammability

Properties of Material

Many of the properties of matter apply to materials, but not all. Wood, for example, is a mixture that cannot change state; wood does not have a melting point! A mixture of metals however, can have a melting point.

Mechanical properties refers to those physical properties that describe how the material responds to mechanical force applied to it. This is particularly important when describing building materials, so these terms are often used for materials such as metal and plastic.

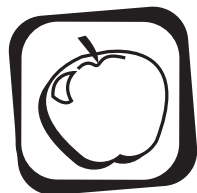
Here are some examples of mechanical properties:

- stiffness or plasticity (how easily it bends)
- toughness (how easily it cracks)
- elasticity (how easily it rebounds into previous shape)
- strength (how easily it breaks under force)

In this section, students will explore the properties of various materials and objects. The emphasis will be on using their senses to do so.

Be a Materials Detective

The teacher should have different materials available. Materials can be placed at stations and students rotated, or teams of students may each have a set of materials to investigate at their desks. Look for as many words from students as possible. The purpose of the activity is to practice observing and describing. Quantity is as important as quality of observations as this may be a skill that students are unfamiliar with practicing.



Properties of Matter and Materials (continued)

Teacher Notes

What Would You Like to Know?

Students will practice the scientific method of developing and answering a question in the context of observing the properties of materials. The teacher should have available a range of materials, enough for teams of students. It is important that for any one experiment, the materials selected are of similar size and shape. (Otherwise it will be size and shape that will be part of the test, not just materials.) Balls or flat paper-shaped objects are two examples of how to accomplish this. This activity will work with individual students or teams of up to four.

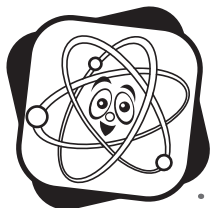
For example, to determine which material will float best, students should take materials of the same size and shape and time how quickly they sink to the bottom of a pail of water. To test sounds, students should tap each material with the same force. Students will need a balance to weigh materials. The essence of science is discovery. Students who are encouraged to think of their own questions will be highly motivated to find answers.

Use Your Senses

To prepare for this activity, place six or seven objects of different materials in a paper lunch bag. Suggestions for objects include: an envelope or small cardboard box, ping pong ball, ruler, hole punch, magnet, vitamin bottle, glass rod, foam cup, packing foam, stone, piece of cement, wood chip, glass paper weight, spoon, mitten, ball of wool, cotton ball, length of cotton string, and nylon rope. This activity can be done individually, in small groups or as a whole class sitting in a circle with the teacher holding the bag and the student is asked to pull an object out of the bag, which is then passed around. For this set up, you might want to have more objects in your bag.

Design a Box

Students apply their knowledge of materials by building a box. This activity works well in groups, but it is flexible enough to allow for individual work, too. Enough supplies for the class should be arranged in one place, on the teacher's desk or a side counter. Students should be allowed to choose their own materials and the teacher can pass them out to limit the quantity taken per group (it doesn't have to be a large box!). Examples of materials to provide include: tissue paper, photocopy paper, foam sheets, tinfoil, plastic wrap, thin cardboard, thick cardboard, and styrofoam. Glue, staplers, and scissors should be on hand. A group discussion following the activity about how well the various materials worked and what problems teams had would be valuable.



Name: _____

Paper Is Amazing

Paper is a material. It is used to make objects like cards, envelopes, and boxes. Different kinds of paper work better for different kinds of objects. Paper is amazing!

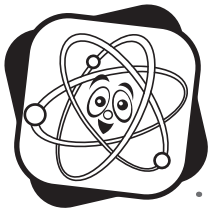


- four different kinds of paper
- scissors



1. Line up the different kinds of paper.
2. Put a number on each kind of paper.
3. Try to predict which paper will be hardest to fold, cut, and rip. Record your answer on your worksheet.
4. Pick up each paper. Fold it, cut it, rip it. Is it easy 😊, a little hard 😐, or really hard ☹️ ? Circle the face in the worksheet chart.
5. Were your guesses correct? Complete your worksheet.





Name: _____

Paper Is Amazing

Worksheet



Which paper will be easiest to fold? _____
 Which paper will be easiest to cut? _____
 Which paper will be easiest to rip? _____



Is it easy 😊, a little hard 😐, or really hard ☹️?
 Circle the face.

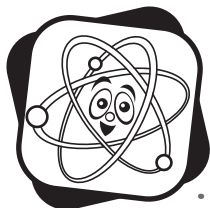
	PAPER 1	PAPER 2	PAPER 3	PAPER 4
Fold	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️
Cut	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️
Rip	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️	😊 😐 ☹️



Were your predictions correct? _____

Which paper would you use to make a strong box?

Which paper would you use to wrap a present?



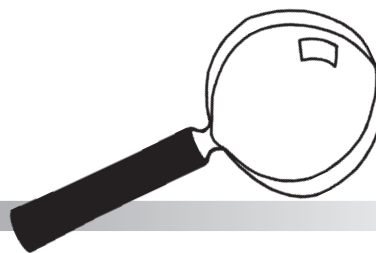
Name: _____

Be A Materials Detective

Some materials are smooth. Some materials are bumpy. What do you see when you look up close at different materials?

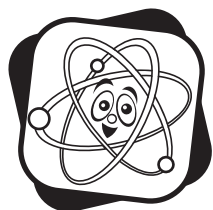


- a magnifying glass
- objects from your classroom



1. Find an object that is made of each material on the list.
2. Look closely at it with your magnifying glass.
3. Draw a picture of what you see.

Material	Object	What You See	Material	Object	What You See
glass			metal		
paper			wood		
plastic			stone		



What Would You Like to Know?

Teacher Directed Activity

In this experiment, the class will choose a question about materials. What would you like to know? Here are some examples of questions you can ask:

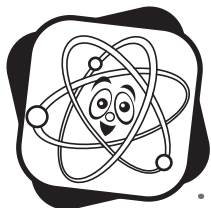
- Which materials float?
- What do materials sound like when they are tapped?
- How much do different materials weigh?
- OR think of your own question!



- different materials



1. What is your question? Record your question on your worksheet.
2. What instruments do you need to answer your question? Write them down on your worksheet.
3. Record your plan on your worksheet.
4. Try to predict the answer to your question.
5. Carry out your experiment. Record your observations.
6. What is the answer to your question? Was your prediction correct?



What Would You Like to Know?

Name: _____

Worksheet

This is our question: _____

The materials we need are: _____

Our plan is: _____



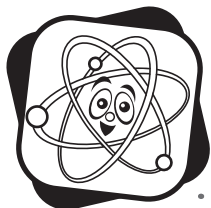
What will be the answer to your question?



Draw a picture of what happened during your experiment:



Was your prediction correct? _____



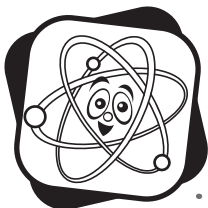
Name: _____

Material Properties

Some materials are hard and smooth. Some are soft and flexible. Materials have different properties. Hard, smooth, soft, and flexible are different properties. How many properties can you find?

bouncy shiny flexible smooth hard soft rough
heavy sticky pliable stiff rigid waterproof

p	s	w	w	g	u	u	g	q	x	o	h	t
l	s	z	z	a	c	z	j	x	u	k	e	c
i	c	z	d	q	t	v	c	r	j	a	a	s
a	s	t	i	f	f	e	e	s	o	b	v	l
b	k	m	r	e	w	w	r	t	v	u	y	x
l	u	b	f	i	f	j	f	p	z	g	g	v
e	p	o	l	s	g	q	e	d	r	d	o	h
q	j	u	e	b	h	i	f	l	m	o	x	y
z	n	n	x	m	h	i	d	y	r	k	o	x
k	v	c	i	s	a	l	n	e	y	q	m	f
i	n	y	b	o	r	u	t	y	i	i	t	c
z	x	m	l	f	d	d	s	t	i	c	k	y
v	v	s	e	t	b	s	m	o	o	t	h	x



Name: _____

Use Your Senses

How can you describe materials? Use as many senses as you can - but not taste!

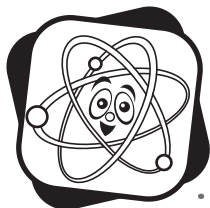


- different materials in a bag



1. Pull something out of the bag. Use as many senses as you can to explore it.
2. In the first column, write down as many words as you can to describe it.
3. In the second column, write down the name of the material.

Description	What material is it?



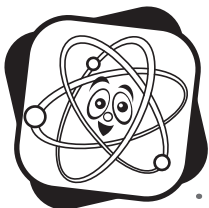
The Right Material for the Job

You can make a toy plane out of paper. What would happen if you made a toy plane out of stone? Draw a picture.

Toy planes are made of light materials.

Draw a picture of what would happen if clothes were made out of wood.

Clothes are made out of flexible materials!
We must choose the right material for the job.



Design a Box

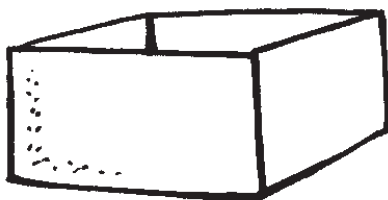
You know a lot about materials. Use what you know to make a box to keep something special safe.

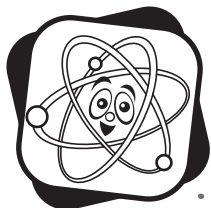


- materials of your choice
- glue, fasteners, and paperclips
- scissors
- a partner



1. Choose the materials to make your box. Explain your choices on the worksheet.
2. Make a plan for making the box. Write down the steps of your plan on your worksheet.
3. Gather your materials and build your box.
4. Draw a picture of your finished box and answer the questions on your worksheet.





Name: _____

Design a Box

Worksheet

The materials I will use are:

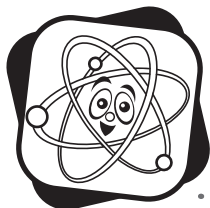
_____ because _____
_____ because _____
_____ because _____

My plan for making the box is:

1. _____
2. _____
3. _____

Draw a picture of your box.

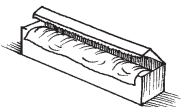
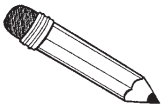
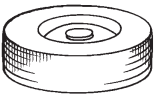
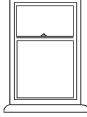
Does the box have the same properties as the materials you used to build it? _____

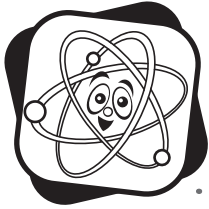


Name: _____

Can You Bend It?

In this chart, name the material used to make each object. Beside each material, put a check mark to tell if it is hard like a rock, or flexible like a sock.

Object		Material	Hard?	Flexible?
Grocery Bag				
Plastic Wrap				
Log				
Pencil				
Eraser				
Tire				
Car				
T-Shirt				
Mug				
Window				



What Do You Know About Materials?

Name: _____

Worksheet

Answer each question with a complete sentence.

1. Which material is both hard and flexible?

2. Why is it better to have flexible plastic for a grocery bag?

3. Why should the top of your desk be hard?

4. Color the objects. Circle the things that are flexible.

