

Hands-On Plus! Student-Driven Learning with the Smithsonian

Grades K-5

Yes, that Smithsonian Institution

"Increase and diffusion of knowledge" – James Smithson











Smithsonian Science Education Center

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The Smithsonian Science Education Center (SSEC) is transforming K-12 Education Through ScienceTM in collaboration with communities across the globe.



Session Overview

Our goals

- Introduce you to Smithsonian Science for the Classroom
- Highlight different "types" of hands-on learning
- Give a taste of content progression across grade bands
- Grade 2 and Grade 5 Activities
 - Properties of materials
 - Modeling particles that are too small to see



Life Science	Earth and Space Science	Physical Science	Engineering Design
	Kinder	garten	
What Do Plants and Animals Need to Live?	How Can We Be Ready for the Weather?	How Can We Change an Object's Motion?	How Can We Stay Cool in the Sun?
K-LS1-1•K-ESS2-2•K-ESS3-1• K-ESS3-3	K-ESS2-1 • K-ESS3-2 • K-PS3-1	K-PS2-1 • K-PS2-2 • K-2-ETS1-3	K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • K-PS3-1 • K-PS3-2
	Gra	de 1	
How Do Living Things Stay Safe and Grow?	How Can We Predict When the Sky Will Be Dark?	How Can We Light Our Way in the Dark?	How Can We Send a Message Using Sound?
1-LS1-1•1-LS1-2•1-LS3-1• K-2-ETS1-1	1-ESS1-1 • 1-ESS1-2 • 1-PS4-2	1-PS4-2•1-PS4-3•1-LS1-1• K-2-ETS1-1	K-2-ETS1-1 • K-2-ETS1-2 • K-2-ETS1-3 • 1-PS4-1 • 1-PS4-4
	Gra	de 2	
How Can We Find the Best Place for a Plant to Grow?	What Can Maps Tell Us About Land and Water on Earth?	How Can We Change Solids and Liquids?	How Can We Stop Soil From Washing Away?
2-LS2-1•2-LS2-2•2-LS4-1• K-2-ETS1-1	2-ESS2-2 • 2-ESS2-3 • 2-PS1-1	2-PS1-1•2-PS1-2•2-PS1-3• 2-PS1-4•K-2-ETS1-1	K-2-ETS1-1•K-2-ETS1-2• K-2-ETS1-3•2-ESS1-1•2-ESS2-1
	Gra		
What Explains Similarities and Differences Between Organisms?	How Do Weather and Climate Affect Our Lives?	How Can We Predict Patterns of Motion?	How Can We Protect Animals When Their Habitat Changes?
3-L51-1•3-L53-1•3-L53-2• 3-L54-2•3-E552-2	3-ESS2-1+3-ESS2-2+3-ESS3-1+ 3-5-ETS1-1	3-P52-1•3-P52-2•3-P52-3• 3-P52-4•3-5-ET51-1	3-5-ETS1-1•3-5-ETS1-2• 3-5-ETS1-3•3-LS2-1• 3-LS4-1•3-LS4-3•3-LS4-4
	Gra	de 4	
How Can Animals Use Their Senses to Communicate?	What Is Our Evidence That We Live on a Changing Earth?	How Does Motion Energy Change in a Collision?	How Can We Provide Energy to People's Homes?
4-LS1-1 • 4-LS1-2 • 4-PS4-2 • 4-PS4-3 • 3-5-ETS1-1	4-ESS1-1+4-ESS2-1+4-ESS2-2+ 4-ESS3-2+4-PS4-1+3-5-ETS1-1	4-PS3-1•4-PS3-2•4-PS3-3• 4-LS1-1•3-5-ETS1-1	3-5-ETS1-1•3-5-ETS1-2• 3-5-ETS1-3•4-PS3-2• 4-PS3-4•4-ESS3-1
Grade 5			
How Can We Predict Change in Ecosystems?	How Can We Use the Sky to Navigate?	How Can We Identify Materials Based on Their Properties?	How Can We Provide Freshwater to Those in Need?
5-LS1-1 • 5-LS2-1 • 5-PS1-1 • 5-PS3-1	5-ESS1-1+5-ESS1-2+5-PS2-1+ 3-5-ETS1-1	5-PS1-1•5-PS1-2•5-PS1-3• 5-PS1-4•5-LS1-1	3-5-ETS1-1+3-5-ETS1-2+ 3-5-ETS1-3+5-ESS2-1+ 5-ESS2-2+5-ESS3-1

Grades 2 & 5 Physical Science





HOW CAN WE CHANGE SOLIDS AND LIQUIDS?



















PHYSICAL SCIENCE

TEACHER GUIDE





HOW CAN WE **IDENTIFY MATERIALS BASED** ON THEIR PROPERTIES?





















PHYSICAL SCIENCE

How Can We Sort Gemstones?

Task: Sort the gemstones in two different ways.







Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
PS1.A: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.	Planning and carrying out investigations Analyzing and interpreting data Engaging in argument from evidence	Scale, proportion, and quantity Patterns

NGSS Lead States, Next Generation Science Standards: For States, By States (Washington, DC: The National Academies Press, 2013).

How do scientists use shape and color?



Pages 11-12 from "Mineral Mystery" in Smithsonian Science Stories *Art in Science*

MINERAL MYSTERY

True Color

How do we tell minerals apart? We can know by their shape and color. Each mineral, or crystal, has a special shape. Minerals can be different colors. Looking at a mineral may not be enough. Pyrite and gold look the same. People would find pyrite and think it was gold! Pyrite is often called fool's gold. Pyrite (left) and gold (right) look similar.



Pyrite (left) makes a dark green line. Gold (right) makes a yellow line.

Scientists use a **streak test** to know a mineral's true color.

They rub minerals against a streak plate.

The color of the line is the true color of the mineral.

How Hard Is It?

Hardness also helps you tell minerals apart.

Scientists can test the hardness of a mineral.

They do this with a scratch test.



How do scientists use hardness?



Page 13 from "Mineral Mystery" in Smithsonian Science Stories *Art in Scienc*e

MINERAL MYSTERY

They use tools to do this test.

Tools can be nails and pennies.

Nails are harder than pennies.

The tools are used to try to scratch the objects.

The test tells which one is harder.

If the penny scratches your object, the penny is harder.

If the penny does not scratch your object, the object is harder.

You can do what the scientists do.

You can use these tools to solve your mineral mystery.

A penny will scratch a few minerals. A nail will scratch more.



How Can We Sort Objects by Hardness?





Notebook page 4 \times

Lesson 2 Activity Sheet		
Scratch Test		
Catt One he constation has a mensure		
soft. Can be scratched by a penny.		
Medium. Cannot be scratched by a penny. Can be scratched by a nall.		
\times \sim		
Hard. Cannot be scratched by a nall.		

Task: Sort the gemstones in **two** different ways.



Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
PS1.A: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.	Planning and carrying out investigations Analyzing and interpreting data Engaging in argument from evidence	Scale, proportion, and quantity Patterns

NGSS Lead States, Next Generation Science Standards: For States, By States (Washington, DC: The National Academies Press, 2013).

Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
PS1.A: Measurements of a variety of properties can be used to identify materials.	Planning and carrying out investigations Analyzing and interpreting data Engaging in argument from evidence	Scale, proportion, and quantity Patterns

NGSS Lead States, Next Generation Science Standards: For States, By States (Washington, DC: The National Academies Press, 2013).

How Can We Use Our Senses to Compare Materials?

Solids		
Sample Number Material		
1	Sugar	
2	Salt	
3	Cornstarch	
4	Baking Soda	



How Can We Use Our Senses to Compare Materials?

Observations of Sugar and Salt

Record your observations in the table.

Pg

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Property	1. Sugar	2. Salt	
Color			
Solid or liquid			
Texture (hard or soft)			
Crystal or powder			
Shape of pieces			
Movement when cup is shaken			
Sound when cup is shaken			
Smell			

Observations of Cornstarch and Baking Soda

Record your observations in the table.

Property	3. Cornstarch	4. Baking Soda
Color		
Solid or liquid		
Texture (hard or soft)		
Crystal or powder		
Shape of pieces		
Movement when cup is shaken		
Sound when cup is shaken		
Smell		

Pg

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Which solids can you identify by just using your senses?

How scientists make claims:

- Listen quietly to other people
- Ask questions politely
- Speak loudly and clearly
- Use evidence



Carolina Offers Free Resources to Support Teachers



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Evaluations: Share Your Thoughts

We are striving to make our workshops great!





Hands-On Plus! Student-Driven Learning with the Smithsonian

Grades K-5

What happens when materials are mixed with water?





What happens when materials are mixed with water?





What happens when materials are mixed with water?

Developing a Model

1. Draw an initial model to show what happened to the water when the dish of sugar water was left out.

Using a Model

Use your model to predict whether the weight of the dish of sugar water would be the same, more, or less after it was left out.



Draw a revised model to show what happened to the water when the dish of sugar water was left out.

Notebook pages 8 & 9



-🔕	Science and	
Disciplinary Core Ideas	Engineering Practices*	Crosscutting Concepts*
PS1.A: Matter of any type can be subdivided into	Developing and using models	Scale, proportion, and quantity
to see, but even then the matter still exists and can be detected by other	Constructing explanations	Energy and matter ¹
means. A model that shows gases that are made from matter particles that are		
too small to see and that are moving freely around in		
observations	NGSS Lead States Next Generation Sc	cience Standards: For States

1. NGSS Lead States, *Next Generation Science Standards: For States, By States* (Washington, DC: The National Academies Press, 2013).