Unit Two Properties and Changes of Matter

2nd Grade: Suggested Pacing: 5 weeks/ end of MP2

Unit Summary: In this unit of study, students demonstrate an understanding of observable properties of materials through analysis and classification and testing of different materials.

Vocabulary: classify, disassemble, gas, liquid, matter, properties, reversible, solid, temperature

Stage 1 – Desired Results (Also see Disciplinary Core Ideas below)

Performance Expectations: (PE) (Established Goals / Content Standards)

- **2-PS1-1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.**
  - Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.

- **2-PS1-2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the 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.

- **2-PS1-3: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.**
  ○ Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.

- **2-PS1-4: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.**
  ○ Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

- **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.**

Enduring Understandings:	**Essential Questions**
• Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. • Matter can be described and classified by its observable properties. • Different properties of materials make them	**How do the properties of materials determine their use?** *How can we sort objects into groups that have similar properties?* *Why are some materials better for a house than others?*

suited to different purposes. • Objects may break into smaller pieces and be put together into larger pieces or change shapes. • Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	*In what ways can an object made of a small set of pieces be disassembled and made into a new object?* *Can all changes caused by heating or cooling be reversed?*

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1) **Analyzing and Interpreting Data** Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to	**PS1.A: Structure and Properties of Matter** Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. • Matter can be described and classified by its observable properties. (2-PS1-1) • Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3) • A great variety of objects can be built up from a small set of pieces. (2-PS1-3) **PS1.B: Chemical Reactions** Heating or cooling a substance may cause changes that can be observed. • Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)	**Patterns** Patterns in the natural and human designed world can be observed. (2-PS1-1) **Cause and Effect** Events have causes that generate observable patterns. (2-PS1-4) • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) **Energy and Matter** Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3) --- **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

construct an evidence-based account for natural phenomena. (2-PS1-3) **Engaging in Argument from Evidence** Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). ● Construct an argument with evidence to support a claim. (2- PS1-4) ---------- **Connections to Nature of Science Science Models, Laws, Mechanisms, and Theories** ● Explain Natural Phenomena Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)		world. (2-PS1-2)

Stage 2 – Model Assessments	
Summative Performance Task(s): **Performance Task #1: (2-PS1-1)** Sort objects into groups according to their properties. Explain how groups were determined. **Performance Task #2: (2-PS1-3)** Design and create two different real world structures using the same building materials. Devise an argument supporting how the same materials are used for different purposes. **Performance Task #3: (2-PS1-4)** **Experiment example** Design two experiments to show how matter can change from one state to another. In one experiment, use a material (ex: chocolate, water) that demonstrates a reservable change and in the second experiment, use a material (ex: paper, egg) that demonstrates an irreversible change. Conclude with the	**Formative Evidence:** **How do the properties of materials determine their use?** *How can we sort objects into groups that have similar properties?* **Students who understand the concepts can:** ● Plan and conduct an investigation to describe and classify different kinds of material by their observable properties. Observations could include color, texture, hardness, and flexibility. *Why are some materials better for a house than others?* ***Students who understand the concepts can:***

expected results for each experiment. Defend your predictions. Mystery Science Assessments are available for both the end of each mystery and the end of each unit. **Audience:** ● I Get It Rubric ● A primary rubric that uses a combination of words and symbols to describe different levels of performance. ● ● Primary Science Rubric ● This rubric is appropriate for use with younger children. It shows how a seed develops, from being planted to becoming a flowering plant. Each growth level represents a different level of performance. ● ● Science Rubric ● The Exemplars Science Rubric is based on the following science standards: The National Research Council and the American Association for the Advancement of Science and New Standards. It includes four criteria: use of scientific tools, science reasoning and strategies, science concepts and use of data and communication. ● ● Science continuum Rubric ● This continuum was developed by an Exemplars workshop leader and task writer, Tracy Lavallee. It provides a framework for assessing the scientific thinking of young students.	● Analyze data from tests of an object or tool to determine if it works as intended. ● Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose. ● Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of each. *In what ways can an object made of a small set of pieces be disassembled and made into a new object?* **Students who understand the concepts are able to:** ● *Break objects into smaller pieces and put them together into larger pieces or change shapes.* *Can all changes caused by heating or cooling be reversed?* **Students who understand the concepts are able to:** ● Construct an argument with evidence that some changes caused by heating or cooling can be reversed, and some cannot. *(Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include: cooking an egg, heating paper)*

Stage 3 – Learning Plan
Suggested Resources for Planning: **Mystery Science: Material Magic** *Properties and Phases of Matter*: **Mystery Lessons 1-5** "Optional Extras" are extensions to each Mystery. We recommend you use them during your unit or to extend the length of each unit. They include an informational text reading that builds on the Mystery's topic, assessments, and suggestions for supplemental activities.

Mystery 1: Why do we wear clothes?

Standard:2-PS1-1, 2-PS1-2, K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3
Target:

- I can plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- I can analyze data obtained from testing different materials and determine which materials have the properties best suited for the intended purpose.
- I can ask questions, make observations, and gather information about a situation people want to change, develop possible solutions through the development of a new or improved object or tool, and choose the best design solution.
- I can develop a simple sketch, drawing, or model to illustrate how an object can solve a given problem.
- I can analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of each.

Videos:
Bill Nye Properties of Matter
Matter Compilation: Crash Course Kids

The Wonder of Science- Matter and Materials
ReadWorks.org *States of Matter*
Reading AZ

Epic Books:

- **https://www.getepic.com/app/** ***(Free book website/resource)***

Mystery 2: Can you really fry an egg on a sidewalk?

Standard:2-PS1-1, 2-PS1-2
Target:

- I can plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- I can analyze data obtained from testing different materials and determine which materials have the properties best suited for the intended purpose.

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Mystery 3: Why are so many toys made out of plastic?

Standard:2-PS1-1, 2-PS1-2, 2-PS1-4
Target:

- I can plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- I can analyze data obtained from testing different materials and determine which materials have the properties best suited for the intended purpose.
- I can construct an argument with evidence that some changes caused by heating and cooling can be

reversed and some cannot.

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Mystery 4: What materials might be invented in the future?

Standard: 2-PS1-1, 2-PS1-2, K-2-ETS1-1, K-2-ETS1-2
Target:

- I can plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- I can analyze data obtained from testing different materials and determine which materials have the properties best suited for the intended purpose.
- I can ask questions, make observations, and gather information about a situation people want to change, develop possible solutions through the development of a new or improved object or tool, and choose the best design solution.
- I can develop a simple sketch, drawing, or model to illustrate how an object can solve a given problem.

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Mystery 5: Could you build a house out of paper?

Standard: 2-PS1-2, 2-PS1-3, K-2-ETS1-2, K-2-ETS1-3
Target:

- I can ask questions, make observations, and gather information about a situation people want to change, develop possible solutions through the development of a new or improved object or tool, and choose the best design solution.
- I can develop a simple sketch, drawing, or model to illustrate how an object can solve a given problem.

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Books:
Read Aloud(s)

What Are Atoms? by Lisa Trumbauer
What Is Matter? by Don L. Curry
Wax to Crayons by Inez Snyder
Amazing Materials by Sally Hewitt
What's the Matter in Mr. Whiskers' Room? by Michael Elsohn Ross
Change It! Solids, liquids, gases and you by Adrienne Mason
What is the World Make Of? All about solids, liquids, and gases by Kathleen Weidner Zoehfeld
Solids, Liquids, and Gases by The Ontario Science Centre

Videos:
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Brain Pop Jr.
https://jr.brainpop.com/science/matter/changingstatesofmatter/
https://jr.brainpop.com/science/matter/physicalandchemicalchanges/