Unit 2: Solids and Liquids

Content Area: **Science**
Course(s): **Science**
Time Period: **Marking Period 2**
Length: **10 Weeks**
Status: **Published**

Unit Overview

This module provides grade 2 students with physical sciences core ideas dealing with matter and its interactions and engineering design. The experiences help students to develop an understanding about how materials are similar and different from one another and how the properties of materials relate to their use. Throughout the module, students engage in science and engineering practices. They will collect data to answer questions and to define problems

in order to develop solutions. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns, cause and effect, scale and proportion. And also, gain a working knowledge of quantity, systems system and models such as energy and matter, structure, function, stability and change.

Standards

Disciplinary Core Ideas (DCI's)

2-PS1-1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
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.
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.
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.
2-PS1-4	Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
2-ESS1-1	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
2-ESS2-1	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
2-ESS2-2	Develop a model to represent the shapes and kinds of land and bodies of water in an area.

2-ESS2-3	Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Crosscutting Concepts (CC's)

	Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
CCC.1.1	children recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
CCC.2.1	students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.
CCC.3.1	students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects. They use standard units to measure length.
	Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
CCC.4.1	students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.
	Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
CCC.5.1	students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.
	The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
CCC.6.1	students observe the shape and stability of structures of natural and designed objects are related to their function(s).
CCC.7.1	students observe some things stay the same while other things change, and things may change slowly or rapidly.
SCI.K-2.2.2	Simple tests can be designed to gather evidence to support or refute student ideas about causes.
SCI.K-2.4.2	Systems in the natural and designed world have parts that work together.
SCI.K-2.7.2	Things may change slowly or rapidly.

Science and Engineering Practices (SEP's)

SEP.1	Asking Questions and Defining Problems
SEP.2	Developing and Using Models
SEP.3	Planning and Carrying Out Investigations
SEP.4	Analyzing and Interpreting Data
SEP.5	Using Mathematics and Computational Thinking
SEP.6	Constructing Explanations and Designing Solutions
SEP.7	Engaging in Argument from Evidence
SEP.8	Obtaining, Evaluating, and Communicating Information

Essential Questions

Investigation 1: Solids

- How can solid objects be described?
- What are solid objects made of?
- Can two or more objects have the same property?
- What are the properties of successful towers?
- Are there solid objects outdoors?

Investigation 2: Liquids

- How are liquids different from each other?
- How can liquids be described?
- How do liquids change in containers?
- Where are liquids outdoors?

Investigation 3: Bits and Pieces

- Are these materials solid or liquid?
- How can mixtures of particles be separated?
- How do particles of solids move in bottles?
- What is a general rule for using screens to separate a mixture of small objects?
- Are there little pieces of solid material outdoors?

Investigation 4: Solids, Liquids, and Water

- What happens when solids are mixed with water?
- What happens when liquids are mixed with water?
- Is toothpaste solid or liquid?
- How do properties of materials change when they are heated or cooled?
- What happens when you mix water with solid plant material collected outdoors?

Application of Knowledge: Students will know that...

- Solid and liquids are each a state of matter
- Solids and liquids are described and identified by their properties
- Solids and liquids can be human-made
- Solids and liquids can occur in the natural world
- Some solids and liquids are affected by being mixed with water
- Some solids and liquids can be changed by temperature

Application of Skills: Students will be able to...

- analyze and interpret data based on observations of solids and liquids
- ask questions based on observations of solids and liquids
- communicate with peers using precise vocabulary of solids and liquids
- develop and use models and or the actual object to identify common features and differences
- engage in peer conversations that are based on evidence learned about solids and liquids
- plan and carry out investigations on solids and liquids
- use counting and numbers to identify and describe patterns in the natural and human-made world

Assessments

Investigation 1: Solids

- Formative Assessment: Science notebook entry, Performance assessment
- Benchmark Assessment: Survey, Investigation 1 I-Check

Investigation 2: Liquids

- Formative Assessment: Science notebook entry, Response sheet, Performance assessment
- Benchmark Assessment: Investigation 2 I-Check

Investigation 3: Bits and Pieces

- Formative Assessment: Science notebook entries, Performance assessment
- Benchmark Assessment: Investigation 3 I-Check

Investigation 4: Solids, liquids and water

- Formative Assessment: Science notebook entry, Performance assessment
- Benchmark Assessment: Investigation 4 I-Check

Suggested Activities

Investigation 1: Solids

Part 1: Solid Objects

- Focus Question: How can solid objects be described?
- Students will identify and describe the three states of matter. Students will observe different solids and develop vocabulary to communicate their thinking about those properties.
- Plan and carry out investigation
- Science notebook entry

Part 2: Solid Materials

- Focus Question: What are solid objects made of?
- Students will observe similar objects to determine their materials.
- Plan and carry out investigation

- Read: Solid Objects and Materials
- Video: Clothing and Building Materials
- Science notebook entry

Part 3: Group Solid Objects

- Focus Question: Can two or more objects have the same property?
- Students will sort objects according to properties.
- Plan and carry out investigation
- Performance Assessment

Part 4: Construct with Solids

- Focus Question: What are the properties of successful towers?
- Students will construct structures.
- Develop and use models
- Plan and carry out investigation
- Read: Towers
- Read: Bridges
- Video: Properties of Materials
- Performance Assessment

Part 5: Outdoor Solids

- Focus Question: Are there solid objects outdoors?
- Students will sort objects into two groups of natural and human-made.
- Plan and carry out investigation
- Benchmark Assessment: Investigation 1 l-Check

Investigation 2: Liquids

Part 1: Liquids in Bottles

- Focus Question: How are liquids different from each other?
- Students will observe different liquids to develop the concept of liquid.
- Plan and carry out investigation
- Performance Assessment

Part 2: Properties of Liquids

- Focus Question: How can liquids be described?
- Students will use descriptive language to develop precise vocabulary for the properties of a liquid.
- Video: All about Properties of Matter
- Science notebook entry

Part 3: Liquid Level

- Focus Question: How do liquids change in containers?
- Students will measure and record liquids in different containers.
- Plan and carry out investigation
- Read: Liquids

- Online Activity: Falling Bottle Puzzle
- Science notebook entry

Part 4: Puddles

- Focus Question: Where are liquids outdoors?
- Students will construct a puddle and observe its properties.
- Plan and carry out investigation
- Benchmark Assessment: Investigation 2 i-Check

Investigation 3: Bits and Pieces

Part 1: Solids in Containers

- Focus Question: Are these materials solid or liquid?
- Students will investigate different solids.
- Plan and carry out investigation
- Science notebook entry

Part 2: Separating Soup Mix

- Focus Question: How can mixtures of particles be separated?
- Students will sort and separate solids using screens.
- Plan and carry out investigation
- Performance Assessment

Part 3: Solids in Bottles

- Focus Question: How do particles of solids move in bottles?
- Students will observe and compare how solids will look, sound and move in bottles.
- Plan and carry out investigation
- Performance Assessment

Part 4: Beads and Screens

- Focus Question: What is a general rule for using screens to separate a mixture of small objects?
- Students will investigate using screens to separate sizes of solids.
- Develop and use models
- Read: Pouring
- Science notebook entry

Part 5: Spills

- Focus Question: Are there little pieces of solid material outdoors?
- Students will observe and record data of solids in the natural world.
- Plan and carry out investigation
- Read: Comparing solids and liquids
- Benchmark Assessment: Investigation 3 i-Check

Investigation 4: Solids, liquids and water

Part 1: Solids and Water

- Focus Question: What happens when solids are mixed with water?
- Students will investigate and record data of mixtures made of water and familiar solids.
- Plan and carry out investigation
- Science notebook entry

Part 2: Liquids and Water

- Focus Question: What happens when liquids are mixed with water?
- Students will investigate and record data of mixtures made of water and familiar liquids.
- Plan and carry out investigation
- Read: Mix It Up
- Science notebook entry

Part 3: Toothpaste Investigation

- Focus Question: Is toothpaste a solid or a liquid?
- Students will apply their knowledge of solids and liquids to toothpaste.
- Plan and carry out investigation
- Performance Assessment

Part 4: Changing Properties

- Focus Question: How do properties of materials change when they are heated or cooled?
- Students will investigate how temperature can effect solids and liquids.
- Plan and carry out investigation
- Read: Heating and Cooling
- Read: Is Change Reversible
- Video: Solids and Liquids
- Online Activity: Change It
- Science notebook entry

Part 5: Tea Time:

- Focus Question: What happens when you mix water with solid plant material collected outdoors?
- Students will investigate and record solids and liquids in the natural world.
- Plan and carry out investigation
- Benchmark Assessment: Investigation 4 i-Check

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments

    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments
- Content specific modifications may include:
    - Provide multiple means of representation. Give learners various ways to acquire information and knowledge. (ex. leveled books, i-Pads, magazines)
    - Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know. (ex. drawings, dictation)
    - Provide multiple means of engagement. Help learners get interested, be challenged and stay motivated.

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher
- Content specific vocabulary important for ELL students to understand include:
    - **Investigation 1: Solids**
        - argument, bend, build, ceramic, claim, color, curve, cylinder, engineer, evidence, fabric, flat, flexible, gas, group, grouping, hard, human-made, leather, liquid, material, matter, metal, natural, object, observe, paper, plastic, poi nty, properties, property, rigid, rough, rubber, shape, smooth, soft, solid, sort, straight, te xture, tower, wood
    - **Investigation 2: Liquids**
        - bubble, colorless, dish soap, fabric softener, flow, foam, gravity, hand soap, has color, level, oil, pour, prediction, puddle, shake, starch, surface, syrup, thick, thin, transl ucent, transparent, viscous
    - **Investigation 3: Bits and Pieces**
        - cornmeal, different, funnel, grain l, argest, lima bean, mix, mixture, model, mung bean, particle, pile, pinto bean, powder, rice, scoop, screen, separate, size, smallest
    - **Investigation 4: Solids, Liquids, and Water**
        - bigger, change, cold, crystal, dark, disappear, dissolve, evaporate, float, freeze, heat, hot , layer, melt, reversible, sink

Differentiation to extend learning for gifted students may include:

- Integrate language arts instruction to enhance science learning
- Label diagrams, pictures and science notebook recordings.
- Utilize the Math extension problems and Science extensions provided in Foss Teacher Manual

Integrated/Cross-Disciplinary Instruction

When reading scientific texts, students need to be able to gain content knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students read purposefully and listen attentively to gain scientific expertise. The interdisciplinary approach to literacy is backed by extensive research establishing the need students to be proficient in reading complex informational text independently in a variety of content areas.

Examples:

- Read "Everything Matters" in the FOSS Science Stories book and explain how different solids have different purposes.
- After reading Solids and Liquids in the FOSS Science Stories book, use other texts to identify and describe solids and liquids and their properties.Distinguish between information provided by pictures or other illustrations and information provided by the words in a text – use the glossary as well as the stories.
- Use the illustrations and details in the science text to describe its key ideas. (e.g. Read Solids and Liquids in the Solid and Liquids Science Stories. Reflect on the text by making a T-chart. Using information from the text and other resources list the properties of solids on one side of he chart and the proprieties of liquids on the other. Compare and contrast the properties.)
- With prompting and support, read functional texts including history/social studies, science, and technical texts, appropriately complex for grade 2 (e.g., describe how to know if something is a mixture and experiments to conduct to find out)

Writing is a key means for students to express what they know about a subject. Science notebooks are critical and essential components of science learning whereby students record observations, data, visual representations, and thinking about their learning. They are excellent tools for formative assessment purposes.

Examples:

- Write an informative/explanatory booklet titled "How Engineers Design and Make Useful Objects"
- Explain through writing and scientific illustrations how evaporation helps separate a mixture
- Participate in shared research and writing projects (e.g. gather information on how ice cream is made and how the changes in matter happen)
- Using pictures and captions show how you separated your mixture of solid objects and compare it to how you separated your mixture of liquids
- Compose a letter to a design engineer, explaining how you created your tower from solid objects. Explain what objects you used to create the structure, how you kept it all together, how tall it was, and how sturdy it was.

LA.RL.2.1	Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
LA.RI.2.4	Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.
LA.RI.2.5	Know and use various text features (e.g., captions, bold print, subheadings, glossaries,

	indexes, electronic menus, icons) to locate key facts or information in a text efficiently.
LA.RI.2.6	Identify the main purpose of a text, including what the author wants to answer, explain, or describe.
LA.RI.2.7	Explain how specific illustrations and images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
LA.W.2.2	Write informative/explanatory texts in which they introduce a topic, use evidence-based facts and definitions to develop points, and provide a conclusion.
LA.W.2.7	Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
LA.W.2.8	Recall information from experiences or gather information from provided sources to answer a question.
LA.SL.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.

Resources

www.FOSSweb.om - Teacher-user account

Investigation 1:

- **Science Resources Book**
- “Everything Matters”
- “Solid Objects and Materials”
- “Towers”
- "Bridges"
- **Videos**
- *Clothing and Building Materials*
- *Properties of Materials*

Investigation 2:

- **Science Resources Book**
- “Liquids"
- **Videos**
- *All about Properties of Matter*
- **Online Activity**
- “Falling Bottle Puzzle”

Investigation 3:

- **Science Resources Book**
- “Pouring”
- “Comparing Solids and Liquids”

Investigation 4:

- **Science Resources Book**
- "Mix it Up"
- "Heating and Cooling"
- "Is Change Reversible?"
- **Videos**
- *Solids and Liquids*
- **Online Activity**
- "Change It!"

Student Solids and Liquids Center Activities and More

- **All About Solids, Liquids & Gases Video**
- **Real World Science: Matter: Solids, Liquids and Gases Video**
- **Bill Nye: Phases of Matter Video**
- **Peep: The Incredible Shrinking Duck Video**
- **Peep: The Winter of Quack's Discontent Video**
- **Characteristics of Materials**
- **Solids & Liquids**
- **How Can Matter Be Measured?**
- **Gases Around Us**
- **Changing States of Matter**
- **Water Lifecycle**
- **What Happens During the Water Cycle?**
- **What is Steam?**

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.