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Unit Synopsis

How can you design a mixture for a certain purpose? For centuries, humans have undertaken this challenge. From the creation of medicines, paints, and building materials, to the development of cleaning products, adhesives, and foods, mixtures have proven to be essential to life as we know it. By mixing ingredients together, it’s possible to create a mixture that takes on some of the properties of its ingredients. In this unit, students take on the role of glue engineers and use engineering design practices to create a glue for use at their school, which serves as the design problem for the unit. They conduct hands-on investigations to observe properties of a variety of possible glue ingredients and learn how certain materials respond to heating and cooling; they engage in digital card sorts to apply their understanding of how properties of ingredients affect properties of mixtures; and they search for useful information about each ingredient in the unit’s reference book. Over the course of the unit, students conduct tests that yield quantifiable results, graph their data, analyze and interpret results, and then use that evidence to iteratively design a series of glue mixtures, each one better than the one before. By the end of the unit, students are able to speak knowledgeably about their choices and argue for how a particular glue mixture best meets their design goals, with evidence from a variety of sources.

Amplify Unit Level 3D Statement

Students investigate and then analyze and interpret data to determine different properties of materials (patterns, cause and effect). Students use what they learn to **argue for the design** of a **glue mixture with a combination of desired properties** that make it best suited for classroom use (**cause and effect**).

Key: Targeted 3D Learning Objectives

Science and Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

***Reference your Scope and Sequence on Curriculum Corner to create your Long-Term Plan to determine your time frame for teaching the unit.**

Depending on your Long-Term Plan, you could have 1-3 flex days during the unit. Flex Days are recommended:

- After a Critical Juncture in lessons 1.9, 2.2 and 3.5
- Campus based activities day
- Review centers for the End of Unit Exam

DISCIPLINARY LITERACY

In science, disciplinary literacy is synonymous with the science and engineering practices (SEPs). The SEPs are the context through which all science concepts should be taught. In the lessons, you will find the Science and Engineering practices icons when the SEPs are being explicitly used by students. The two focus SEPs for this unit are Designing Solutions and Engaging in Argument from Evidence.

Focus on Disciplinary Literacy



Practice 1



Asking Questions
Defining Problems

Practice 2



Developing and Using Models

Practice 3



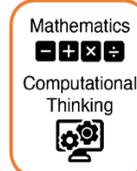
Planning and Carrying Out Investigations

Practice 4



Analyzing and Interpreting Data

Practice 5



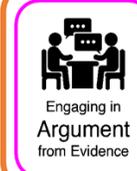
Mathematics
Computational Thinking

Practice 6



Constructing Explanations
Designing Solutions

Practice 7



Engaging in Argument from Evidence

Practice 8



Obtaining, Evaluating, and Communicating Information

UNIT 1: ADVANCED TEACHER PREPARATION

Step	Action	Resource
1	Internalize the unit by following steps on the Unit Internalization Protocol	Unit Internalization Protocol Curriculum Corner > State > Early Childhood > Grade > Instructional Resources
	Watch the Unit Overview Video/ TIPS	Grade 2 Unit 2 Overview Video
	Review the visual flow of the unit	Coherence Flowchart
	Gain science background knowledge and identify student and teacher preconceptions	Amplify Science Background Knowledge
2	Prepare for each day of instruction by following the Lesson Internalization Protocol for each lesson	Lesson Internalization Protocol Curriculum Corner > State > Early Childhood > Grade > Instructional Resources

PROGRESS BUILD

Below describes the way in which students' explanations of the central phenomenon should develop and deepen over the course of this unit.

Properties of Materials Progress Build	
In the <i>Properties of Materials</i> unit, students will learn to design a mixture with desired properties for a specific purpose.	
Prior knowledge (preconceptions): It is expected that students will have a basic familiarity with the idea that stuff is made from other stuff (chocolate milk is made from milk and chocolate sauce; a desk is made of wood and metal; a toy is made of metal and plastic).	
Level 1	
Different materials have different properties.	Materials are the stuff that makes up everything. Materials have properties. These properties are observable things such as color, texture, smell, and taste. Different materials have different properties
Level 2	
Mixtures have different properties, depending on their ingredients.	Materials are the stuff that makes up everything. Materials have properties. These properties are observable things such as color, texture, smell, and taste. Different materials have different properties. Sometimes a material is made of a combination of other materials; we call this combination a mixture, and we call the materials that make it up substances. Some mixtures have different properties, depending on their ingredients.
Level 3	
Heating or cooling a substance can change it to a new substance.	Materials are the stuff that makes up everything. Materials have properties. These properties are observable things such as color, texture, smell, and taste. Different materials have different properties. Sometimes a material is made of a combination of other materials; we call this combination a mixture, and we call the materials that make up substances. Some mixtures have different properties, depending on their ingredients. Properties of substances can change when they are heated or cooled. Some substances change into a different substance when they are heated or cooled, so they have different properties when they return to their original temperature. Other substances remain the same, so they have the same properties when they return to their original temperature.
Level 4	
A mixture may have a combination of the properties of its ingredients.	Materials are the stuff that makes up everything. Materials have properties. These properties are observable things such as color, texture, smell, and taste. Different materials have different properties. Sometimes a material is made of a combination of other materials; we call this combination a mixture, and we call the materials that make up substances. Some mixtures have different properties, depending on their ingredients. Properties of substances can change when they are heated or cooled. Some substances change into a different substance when they are heated or cooled, so they have different properties when they return to their original temperature. Other substances remain the same, so they have the same properties when they return to their original temperature. The properties of a mixture may be a combination of the properties of the ingredients. Therefore, by combining certain substances, the resulting mixture will have certain properties.

CONTENT STANDARDS

Below are the standards **taught** and **assessed** in this unit.

Standards	
Next Generation Science Standards (NGSS)	
<u>Focal Performance Expectations</u>	
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [<i>Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.</i>]	
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. [<i>Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.</i>] [<i>Assessment Boundary: Assessment of quantitative measurements is limited to length.</i>]	
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. [<i>Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.</i>]	
2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [<i>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.</i>]	
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..	
Texas Alignment (TEKS)	
1.6.C demonstrate and explain that a whole object is a system made of organized parts such as a toy that can be taken apart and put back together.	
1.8.A investigate and describe applications of heat in everyday life such as cooking food or using a clothes dryer; and	
1.8.B describe how some changes caused by heat may be reversed such as melting butter and other changes cannot be reversed such as cooking an egg or baking a cake.	
2.6.A classify matter by observable physical properties, including texture, flexibility, and relative temperature, and identify whether a material is a solid or liquid;	
2.6.B conduct a descriptive investigation to explain how physical properties can be changed through processes such as cutting, folding, sanding, melting, or freezing; and	
2.6.C demonstrate that small units such as building blocks can be combined or reassembled to form new objects for different purposes and explain the materials chosen based on their physical properties.	
Ohio Alignment (Ohio's Learning Standards)	Florida Alignment (NGSSS)
K.PS.1: Objects and materials can be sorted and described by their properties. Objects can be sorted and described by the properties of the materials from which they are made. Some of the properties can include color, size and texture.	2.P.8.1 Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets.
1.PS.1: Properties of objects and materials can change.	2.P.9.1 Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration.

ROADMAP

Below is the recommended sequence of instruction for this unit.

At a Glance Unit 2: Properties of Materials								
Day	Lesson	Date	Day	Lesson	Date	Day	Lesson	Date
1	1.1		16	1.9 B*		31	3.4	
2	1.2		17	Optional Flex Day		32	3.5 A*	
3	1.3 A		18	2.1 A		33	3.5 B*	
4	1.3 B		19	2.1 B		34	Optional Flex Day	
5	1.4 A		20	2.2 A		35	4.1 A	
6	1.4 B		21	2.2 B*		36	4.1 B	
7	1.5 A		22	Optional Flex Day		37	4.2 A	
8	1.5 B		23	2.3		38	4.2 B	
9	1.6 A		24	2.4 A		39	4.3	
10	1.6 B		25	2.4 B		40	Review	
11	1.7 A		26	3.1		41	Review	
12	1.7 B		27	3.2 A		42	4.4 A	
13	1.8 A		28	3.2 B		43	4.4 B	
14	1.8 B		29	3.3 A		44	4.4 C	
15	1.9 A		30	3.3B				
<p>* Critical Juncture in lesson</p> <p>Formative Checks: Each lesson includes a formative check to gauge student progress, using varied, differentiated methods. Examples include: anecdotal records, oral and written explanations with evidence, illustrations with labels, physical models, presentations. Notice that we are moving away from exit tickets and multiple-choice questions. As you review responses, you will need to look for patterns of strength and areas that the teacher needs to make adjustments and provide more support.</p>						 <ul style="list-style-type: none"> • See Scope and Sequence for Scanning Deadline, Link • Allow 5 business days BEFORE the scanning deadline for grading responses and entering grades. 		