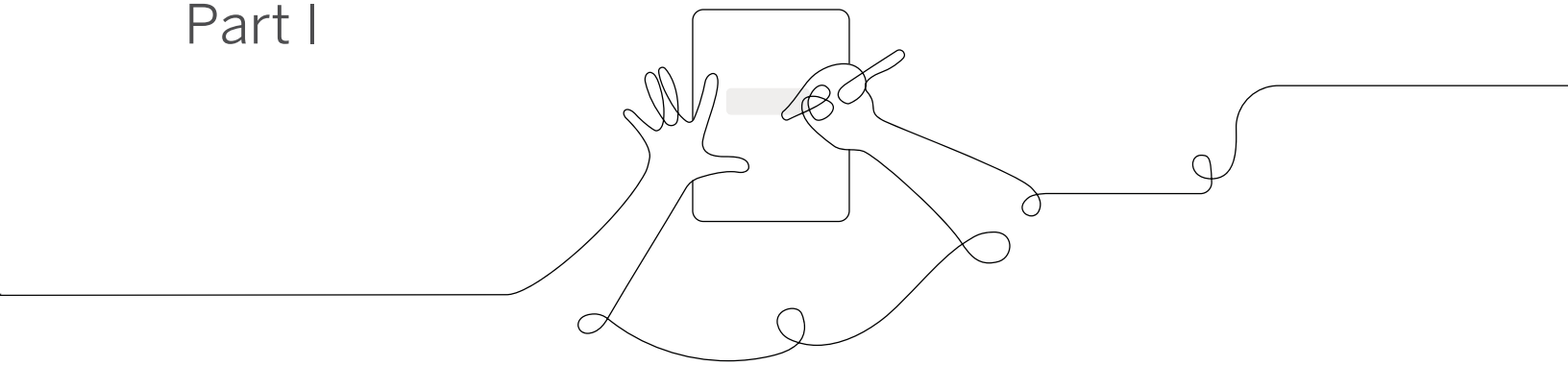
AmplifyScience

Participant Notebook

Grade 2: Properties of Materials
Guided Unit Internalization with @Home Resources
Part I



Unit Guide resources

Once a unit is selected, select **JUMP DOWN TO UNIT GUIDE** in order to access all unit-level resources in an Amplify Science unit.

Planning for the unit

Unit Overview	Describes what's in each unit, the rationale, and how students learn across chapters
Unit Map	Provides an overview of what students figure out in each chapter, and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Getting Ready to Teach	Provides tips for effectively preparing to teach and teaching the unit in your classroom
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit
Standards at a Glance	Lists Next Generation Science Standards (NGSS) (Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts), Common Core State Standards for English Language Arts, and Common Core State Standards for Mathematics

Teacher references

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
Standards and Goals	Lists NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and CCSS (English Language Arts and Mathematics) in the unit, explains how the standards are reached
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science Assessment System, identifies each 3-D assessment opportunity in the unit
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Books in This Unit	Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	Outlines functionality of digital tools and how students use them (in grades 2-5)

Printable resources

Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	Glossary of unit vocabulary in multiple languages
Print Materials (8.5" x 11")	Digital compilation of printed cards (i.e. vocabulary cards, student card sets) provided in the kit
Print Materials (11" x 17")	Digital compilation of printed Unit Question, Chapter Questions, and Key Concepts provided in the kit

Unit Map

How can we design a glue mixture that is better than what the school uses now?

As glue engineers, students are challenged to create a glue for use at their school that meets a set of design goals. Students present an evidence-based argument stating why their glue mixture would solve their school's need for a better glue.

Chapter 1: How can you make a sticky glue?

Students figure out: Glue is a mixture of several ingredients such as flour, water, and cornstarch, and depending on the properties of those ingredients and how they are combined, you can create different glues. Some glues might be stickier or stronger than others. By understanding materials and observing and testing different recipes, you can choose the ingredients that provide the properties you are seeking.

How they figure it out: To set context, students gather evidence about materials and their properties by reading a book about everyday things and what they are made of. They investigate the properties of two mystery glues and make scientific arguments about whether they are the same or different glues. The class goes on to observe and test possible glue ingredients for their sticky properties, graph test data, and search for information about ingredients in the unit's reference book. Using all the gathered evidence, students plan, make, and test their own glue recipes.

Chapter 2: Can heating a substance (and returning it to its original temperature) make a better glue?

Students figure out: When water is heated and returned to room temperature, the properties go back to the way they were, but the properties of some other materials change after heating and going back to room temperature. For example, when a mixture of cornstarch and water is heated and then returned to room temperature, it has different properties than it had before.

How they figure it out: Students investigate how heating a substance may help them make a better glue by conducting tests to determine the properties of possible glue ingredients before and after heating. This supports them in determining cause-and-effect relationships.

Chapter 3: What ingredients can be used to make a glue that is sticky and strong?

Students figure out: Sometimes, the properties of glue are a combination of the properties of the substances that make up that glue, such as a flour-water combination. Ingredients can be combined to create different glues that have different properties. For example, baking soda, which is smooth, and flour, which is sticky, can be combined to make smooth and sticky glue.

How they figure it out: Students are inspired by reading a book that shows the design process in action. They decide that the glue they create for the school should have an additional design criteria—the property of strength—a key and useful feature for its intended purpose at the school. Students set about testing evidence-based plans that include the best ingredients for a strong glue mixture. By the end of the chapter, student teams make and test a second glue recipe.

Chapter 4: What is the glue recipe that best meets our design goals?

Students figure out: It will typically take multiple design cycles to find the exact glue recipe (mixture) that meets the design goals. By designing and testing mixtures that include ingredients with the desired properties, glue engineers can identify the best result and successfully meet their design goals. Students will have evidence to support each design goal, and that will inform their design arguments for the best recipe.

How they figure it out: After evaluating the second glue recipe, students plan, make, and iteratively test additional glue mixtures. By immediately analyzing their results and applying their understanding of the effects of specific glue ingredients, students are able to modify their designs. Students are able to speak knowledgeably about their choices and argue for how a particular glue mixture is best at meeting the design goals by the end of the unit.

Progress Build

A Progress Build describes the way in which students' explanations of the central phenomenon should develop and deepen over the course of a unit. It is an important tool in understanding the design of the unit and in supporting students' learning. A Progress Build organizes the sequence of instruction, defines the focus of the assessments, and grounds inferences about students' understanding of the content, specifically at each of the Critical Juncture assessments found throughout the unit. A Critical Juncture is the differentiated instruction designed to address specific gaps in students' understanding. This document will serve as an overview of the *Properties of Materials* Progress Build. Since the Progress Build is an increasingly complex yet integrated explanation, we represent it below by including the new ideas for each level in bold.

In the *Properties of Materials* 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).

Progress Build 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.

Progress Build 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.**

Progress Build 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 it 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.**

Progress Build 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 it 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.**

Chapters at a Glance

Unit Question

How can you design a mixture for a certain purpose?

Chapter 1: How can you make a sticky glue?

Chapter Question

How can you make a sticky glue?

Investigation Questions

- What can be noticed about different materials? (1.2, 1.3)
- How can you tell if substances are different? (1.4)
- How can the properties of a mixture change? (1.5, 1.6, 1.7)
- Which ingredients should we use (or not use) in our glue? (1.8, 1.9)

Key Concepts

- Properties include how materials smell, look, taste, feel, and sound. (1.2)
- Different materials have different properties. (1.3)
- You can tell if materials and substances are different by observing their properties. (1.3)
- You can tell if materials and substances are different by observing their properties or by testing them. (1.4)
- Properties of mixtures can change when other ingredients are added. (1.5)
- Properties of substances are the same whether you have a small amount or a large amount. (1.7)
- Engineers test their designs to find out whether they meet their design goals. (1.7)

Chapter 2: Can heating an ingredient make a better glue?

Chapter Question

Can heating a substance (and returning it to its original temperature) make a better glue?

Investigation Questions

- What can happen after a substance has been heated or cooled and returns to its original temperature? (2.1, 2.2)

Key Concepts

- When a substance is heated or cooled, its properties can change. (2.1)
- Some substances change back to the way they were before they were heated or cooled. (2.2)
- If a substance doesn't change back to the way it was, it has become a different substance. (2.2)

Chapter 3: What ingredients can be used to make a glue that is sticky and strong?

Chapter Question

- What ingredients can be used to make a glue that is sticky and strong?

Investigation Questions

- How can mixtures be designed to have certain properties? (3.2, 3.3, 3.4, 3.5)

Key Concepts

- Mixtures may have a combination of the properties of their ingredients. (3.2)
- Mixtures may have some of the properties of their ingredients. (3.4)
- Mixtures can be designed for certain purposes by using ingredients with certain properties. (3.4)

Chapter 4: What is the glue recipe that best meets our design goals?

Chapter Question

What is the glue recipe that best meets our design goals?

Guided Unit Internalization Planner

Part 1: Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?

Unit Question:

Student role:

By the end of the unit, students figure out ...

What science ideas do students need to figure out in order to explain the phenomenon?

Part 2: Chapter internalization

Complete the tables below using information in the Lesson Overview Compilation.

	Chapter 1	Chapter 2
This chapter mostly focuses on…		
Important science concepts students learn include…		

	Chapter 3	Chapter 4
This chapter mostly focuses on…		
Important science concepts students learn include…		

Part 3: Key routines and activities

As the presenter talks through the unit, use this table to make space about key routines and activities.

Key routine or activity	Notes

@Home Resources Scavenger Hunt

Directions: Use this scavenger hunt to practice navigating the Program Hub and decide which @Home Resources best supports your current instructional needs.

Part 1: @Home Units Task	**Notes**
Navigate to the @Home Unit resources. ● Select Remote learning: Amplify Science @Home ● Select Grade-level resources → Grade-level → Unit	
How long is each @Home lesson? Hint: Teacher Overview	
Which types of activities are recommended for synchronous and in-person learning? Hint: Teacher Overview	
How many @Home lessons are in Chapter 1 of your unit? Hint: Teacher Overview	
In which lesson is your unit's phenomenon introduced? Hint: Teacher Overview	
How does the @Home Packet for Lesson 1 differ from the @Home Slides for that same lesson? Hint: Student Materials	
When would you use @Home Student Sheets? Hint: Teacher Overview	
How does the @Home Family Overview support caregivers? Hint: Family Overview	

Part 2: @Home Videos Task	**Notes**
Navigate to the @Home Unit resources. ● Select Remote learning: Amplify Science @Home ● Select Grade-level resources → Grade-level → Unit ● Scroll down to the @Home Video Playlist ● Select the lesson in which the problem or phenomenon is introduced	
Describe the phenomenon (or observable event, something that students can see or experience) in your unit.	

Notes