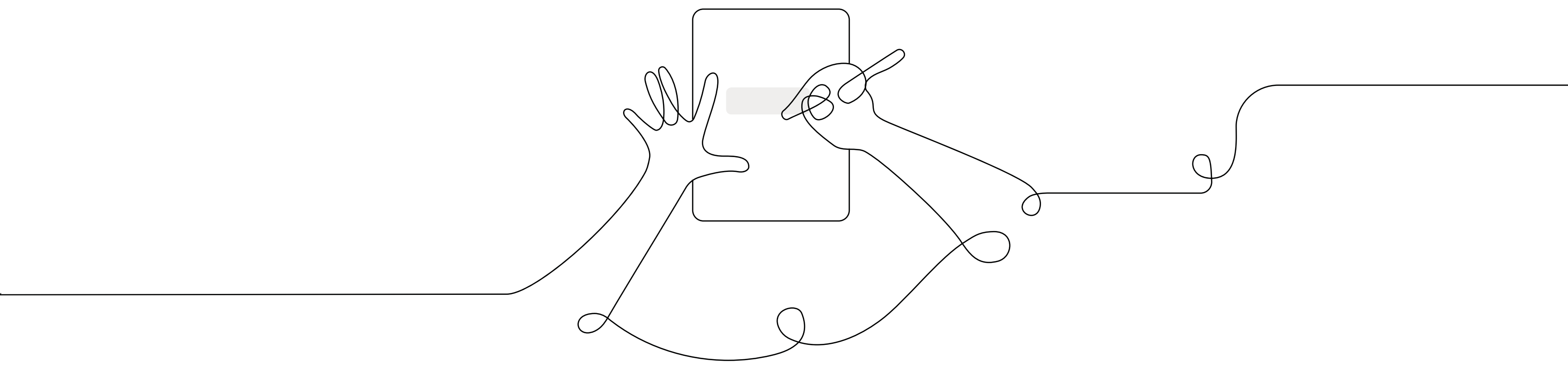
AmplifyScience

Participant Notebook

Grade 5: Modeling Matter
Guided Unit Internalization with @Home Resources



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

What happens when two substances are mixed together?

In the role of food scientists working for Good Food Production, Inc., students are introduced to the ideas that all matter is made of particles too small to see and that each different substance is made of particles (molecules) that are unique. Students are then challenged to solve two problems: One problem requires them to separate a mixture, and the other problem requires them to make unmixable substances mix. Students are challenged to use the particulate model of matter to explain their work to the president of the company. In so doing, students figure out that the properties of materials are related to the properties of the nanoparticles that make up those materials.

Chapter 1: Why did the food coloring separate into different dyes?

Students figure out: The different dyes that are mixed together have different properties (colors), so they are made of different molecules. The molecules in the mixture that are carried up the paper by the water are attracted to the water and mix with it. As the water travels up the paper, different kinds of molecules travel different distances because their molecules are different sizes or have a different attraction to the paper.

How they figure it out: Students conduct a chromatography test on the dye mixture and observe as it separates. The class explores and critiques a variety of physical models before creating their own models of what might be happening at the nanoscale. Students share, critique, and revise their diagram models and write scientific explanations.

Chapter 2: Why do some salad dressings have sediments, and others do not?

Students figure out: Salad dressings with sediments contain solids that are not soluble; salad dressings without sediments contain soluble solids. The molecules of water and the molecules of different solids are different from one another. When a solid dissolves in water (it is soluble), it means that the molecules of the solid are attracted to water molecules. When a solid does not dissolve in water, it means that the molecules of the solid are not attracted to water molecules.

How they figure it out: Students get hands-on experience with solids that dissolve and solids that do not dissolve. They then explore the phenomenon of a solid dissolving at the nanoscale in the *Modeling Matter* Simulation. Students create their own diagram models and write scientific explanations of dissolving.

Chapter 3: Why can salad-dressing ingredients separate again after being mixed?

Students figure out: When liquids do not mix together, they form layers. The A molecules and the B molecules are not attracted to one another, so they do not mix together. In addition to the level of attraction between A molecules and B molecules, A molecules have a level of attraction to other A molecules, and B molecules have a level of attraction to other B molecules. Liquid ingredients in a salad dressing separate after being mixed if the attraction between molecules of one liquid is greater than the attraction between molecules of different liquids. However, if an emulsifier is added, the liquids can mix because the molecules of the emulsifier are strongly attracted to both A molecules and B molecules.

How they figure it out: Students observe real liquids that don't mix, and then they use the Simulation to figure out what the phenomenon might look like at the nanoscale. Students create their own models of mixing and non-mixing liquids and write scientific explanations about the phenomenon. In order to try to get liquids to mix, students then experiment with food additives that act as emulsifiers, and some that do not. The Simulation enables them to explore and observe how emulsifiers work at the nanoscale and create their own models that explain how emulsifiers work.

Chapters at a Glance

Unit Question

What happens when two substances are mixed together? (1.2)

Chapter 1: Why did the food coloring separate into different dyes?

Chapter Question

Why did the food coloring separate into different dyes? (1.5)

Investigation Questions

- How are different substances different? (1.2)
- How are different kinds of molecules different? How are molecules similar? (1.3, 1.4)
- How do differences in molecules cause substances to separate? (1.5, 1.6, 1.7)

Key Concepts

- All molecules of one substance are exactly the same, and they are different from molecules of any other substance. (1.4)
- Different molecules have different properties. (1.5)
- The properties of a substance are determined by the properties of its molecules. (1.8)

Chapter 2: Why do some salad dressings have sediments, and others do not?

Chapter Question

Why do some salad dressings have sediments, and others do not? (2.1)

Investigation Questions

- What happens when you mix a solid into a liquid? (2.1)
- What happens to the molecules of a solid and the molecules of a liquid when you mix them together? (2.2, 2.3, 2.4, 2.5)

Key Concepts

- Some solids dissolve in water, and others do not. (2.1)

- When the molecules of a solid are attracted to the molecules of a liquid, they spread apart and mix together evenly. (2.4)
- When the molecules of a solid aren't attracted to the molecules of a liquid, they stay clustered together as a solid. (2.4)

Chapter 3: Why can salad-dressing ingredients separate again after being mixed?

Chapter Question

Why can salad-dressing ingredients separate again after being mixed? (3.1)

Investigation Questions

- What happens when you mix a liquid into a liquid? (3.1)
- What happens to the molecules of two liquids when you mix them together? (3.1, 3.2, 3.3, 3.4)
- Why does adding an emulsifier allow two liquids that don't typically mix to stay mixed? (3.5, 3.6)

Key Concepts

- Some liquid mixtures stay mixed, and others separate into layers over time. (3.1)
- Some liquids hold together more than others. (3.1)
- The more a liquid's molecules are attracted to one another, the more the liquid will hold together. (3.3)
- When the molecules of two different liquids are attracted to one another, they cluster together and become evenly distributed in the mixture. (3.3)
- Molecules of an emulsifier attract the molecules of two liquids that do not typically mix, allowing the molecules of the emulsifier and of the liquids to mix. (3.6)

Progress Build

A Progress Build describes the way in which students' explanations of the central phenomena 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 *Modeling Matter: The Chemistry of Food* 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 *Modeling Matter* unit, students will learn to construct scientific explanations that describe how nanoscale interactions account for observable phenomena: a food-coloring mixture separating through chromatography and a salad dressing stabilized with an emulsifier.

Prior knowledge (preconceptions): Students are likely to have encountered the idea that matter is made up of particles that are too small to see individually. Students will also likely recognize that there exist different materials that have different characteristics. While neither of these ideas are necessary for students to participate fully in the unit, having exposure to these ideas will prepare students well for what they will be learning.

Progress Build Level 1: Observable properties result from molecular properties.

All matter is made up of particles too small to see—atoms connected together to form molecules. If two pure substances have different observable properties (in the same conditions), they are made of different molecules.

Progress Build Level 2: Mixing is a result of attraction between molecules of different substances.

All matter is made up of particles too small to see—atoms connected together to form molecules. If two pure substances have different observable properties (in the same conditions), they are made of different molecules. **The molecules of one substance can be attracted to the molecules of another substance. Different pairings of molecules have stronger or weaker attractions to one another. When the molecules of one substance are strongly attracted to the molecules of a second substance, the molecules mix together, and one substance dissolves into, or mixes with, the other.**

Progress Build Level 3: Separation is a result of the attraction between molecules of the same substance.

All matter is made up of particles too small to see—atoms connected together to form molecules. If two pure substances have different observable properties (in the same conditions), they are made of different molecules. The molecules of one substance can be attracted to molecules of another substance. Different pairings of molecules have stronger or weaker attractions to one another. When the molecules of one substance are strongly attracted to the molecules of a second substance, the molecules mix together, and one substance dissolves into, or mixes with, the other. **The molecules of a substance can be more strongly or less strongly attracted to other molecules of their own kind. If the molecules of a substance are more strongly attracted to their own kind of molecule than to the molecules of another substance, the two substances will separate. However, when a third substance with molecules that are strongly attracted to the molecules of both of the separated substances is added, all three substances can mix.**

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-level internalization

Chapter Question:	
What key concepts do students construct in this chapter?	**How do students apply the key concepts to answer the Chapter Question? To solve the phenomenon?**

Part 3: Lesson-level Internalization

Day ____________

Minutes for science: ____________ **Instructional format:** ☐ Asynchronous ☐ Synchronous	**Minutes for science:** _____________ **Instructional format:** ☐ Asynchronous ☐ Synchronous

Lesson or part of lesson:
 	
Mode of instruction:
❏ Preview
❏ Review
❏ Teach full lesson live
❏ Teach using synchronous suggestions
❏ Students work independently using:
    ❏ @Home Packet
    ❏ @Home Slides and @Home Student Sheets
    ❏ @Home Videos
	Lesson or part of lesson:
	
	Mode of instruction:
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Students will...	**Teacher will...**	**Students will...**	**Teacher will...**

<table>
<tr>
<td rowspan="2">Look at the Students will columns. What are students working in the lesson(s) that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn’t a work product listed above, do you want to add one? Make notes below.</td>
<td colspan="2">Some Types of Written Work in Amplify Science</td>
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<td colspan="2">• Daily written reflections
• Homework tasks
• Investigation notebook pages
• Written explanations (typically at the end of Chapter)
• Diagrams
• Recording pages for Sim uses, investigations, etc</td>
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<td>• Plain paper and pencil (videos include prompts for setup)
• (6-8) Student platform
• Investigation Notebook
• Record video or audio file describing work/answering prompt
• Teacher-created digital format (Google Classroom, etc)</td>
<td>• Take a picture with a smartphone and email or text to teacher
• Through teacher-created digital format
• During in-school time (hybrid model) or lunch/materials pick-up times
• (6-8) Hand-in button on student platform</td>
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<td colspan="3">How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)</td>
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Day ____________

Minutes for science: ____________

Instructional format:

- [ ] Asynchronous
- [ ] Synchronous

Lesson or part of lesson:

Mode of instruction:

- ❏ Preview
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- ❏ Teach full lesson live
- ❏ Teach using synchronous suggestions
- ❏ Students work independently using:
  - ❏ @Home Packet
  - ❏ @Home Slides and @Home Student Sheets
  - ❏ @Home Videos

Students will...	**Teacher will...**

Minutes for science: _____________

Instructional format:

- [ ] Asynchronous
- [ ] Synchronous

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Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

@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