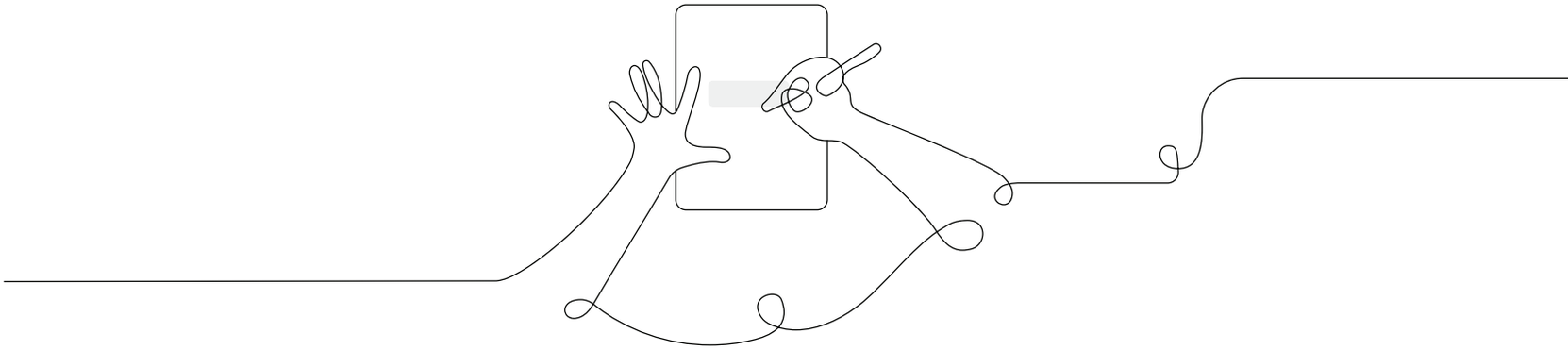
Amplify Science

Participant Notebook

Deep-dive and Strengthening Workshop
Modeling Matter

Grade 5



Welcome to the workshop

This Participant Notebook will serve as a resource during today's workshop.

Modeling Matter
Grade 5

Amplify Science

Unit-specific workshop agenda

Introductions

Framing the day

- Reflecting on our teaching
- Scenario challenge

Experiencing the unit

- Framing with a coherence lens
- Modeling Matter instructional sequence and embedded reflection

The story of the unit

- Key concepts and explanations
- Progression of ideas
- Progress Build and End-of-Unit Assessment

Targeted small group work time:

- Deepening content understanding and addressing preconceptions
- Exploring the Modeling Matter Simulation
- Formative assessment and differentiation
- Preparing to teach

Closing

- Questions
- Survey

Demo account for your workshop:

URL: **learning.amplify.com** (Log in with Amplify)

Temporary account: _____**@tryamplify.net**

Password: **AmplifyNumber1**

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Notes

Notes

Reflecting on Amplify Science implementation

1. What was a positive moment from teaching your first unit(s)? What was particularly effective in your classroom?

2. What was a challenge you experienced in your first unit(s)? What was an "aha" moment you had while planning or teaching that helped you overcome that challenge?

3. Amplify Science uses a multimodal approach — students **do**, **talk**, **read**, **write**, and **visualize** as they construct explanations of phenomena. Describe a time when the multimodal approach helped a particular student or students in your classroom.

Self-assessment: How comfortable are you teaching Amplify Science?

Directions:

After each group shares the solution to their scenario, rank your comfort level with the scenario's category using the statements along the top of the table.

Scenario	I am starting to understand this	I can do this (with a little help)	I've got this! I feel confident	I can teach this to a peer
Scenario 1 Using program resources to deepen content knowledge and find information to answer content questions				
Scenario 2 Using formative assessment to inform instruction				
Scenario 3 Analyzing student work on the End-of-Unit Assessment				
Scenario 4 Understanding the 3-D nature of standards in the unit				
Scenario 5 Understanding how ideas build across a chapter and unit				
Scenario 6 Preparing to teach a lesson				

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.

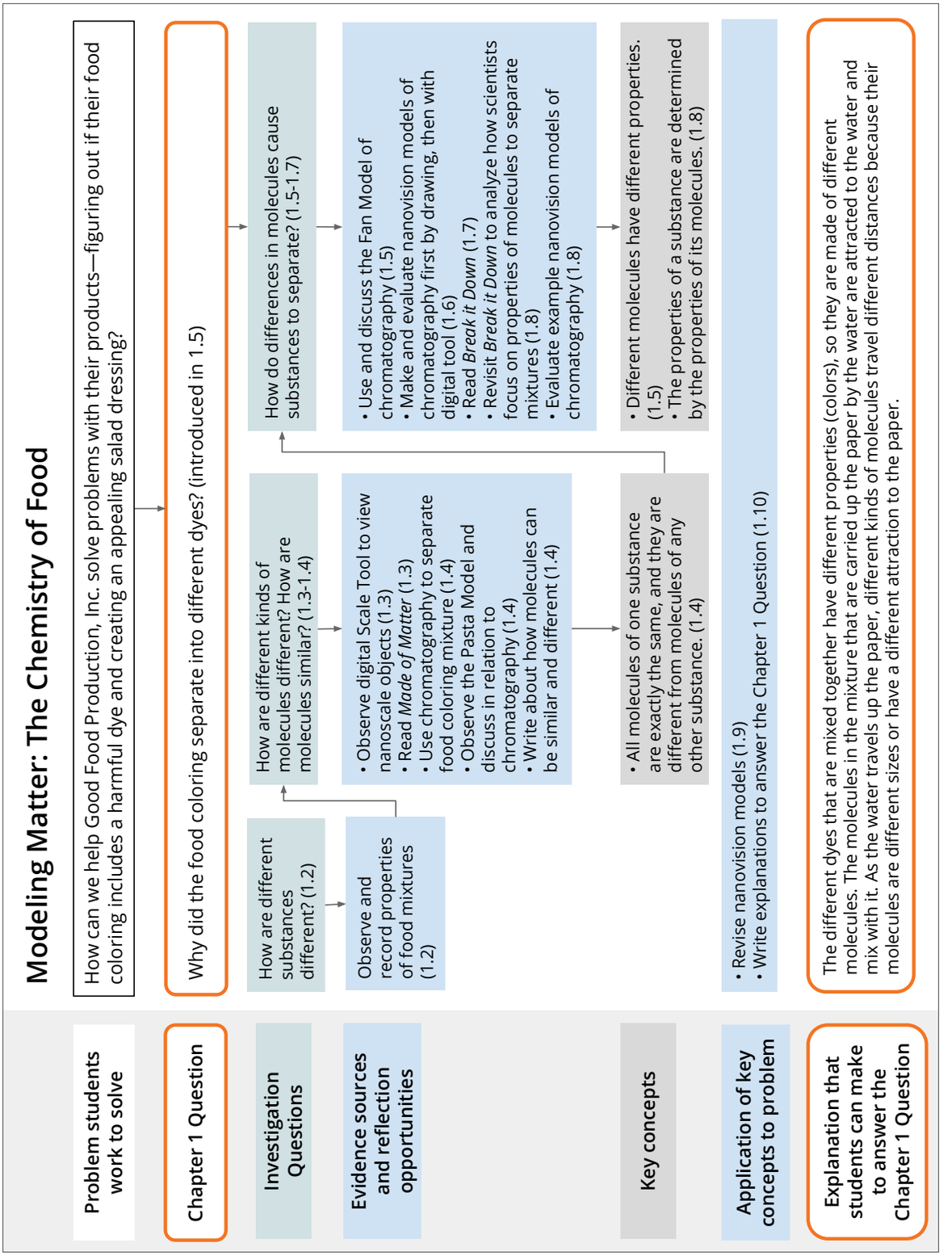
How they figure it out: Students get hands-on experience with solids that dissolve and solids that do not dissolve. They then explore the phenomenon of a solid dissolving at the nanoscale in the *Modeling Matter* Simulation. Students create their own diagram models and write scientific explanations of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

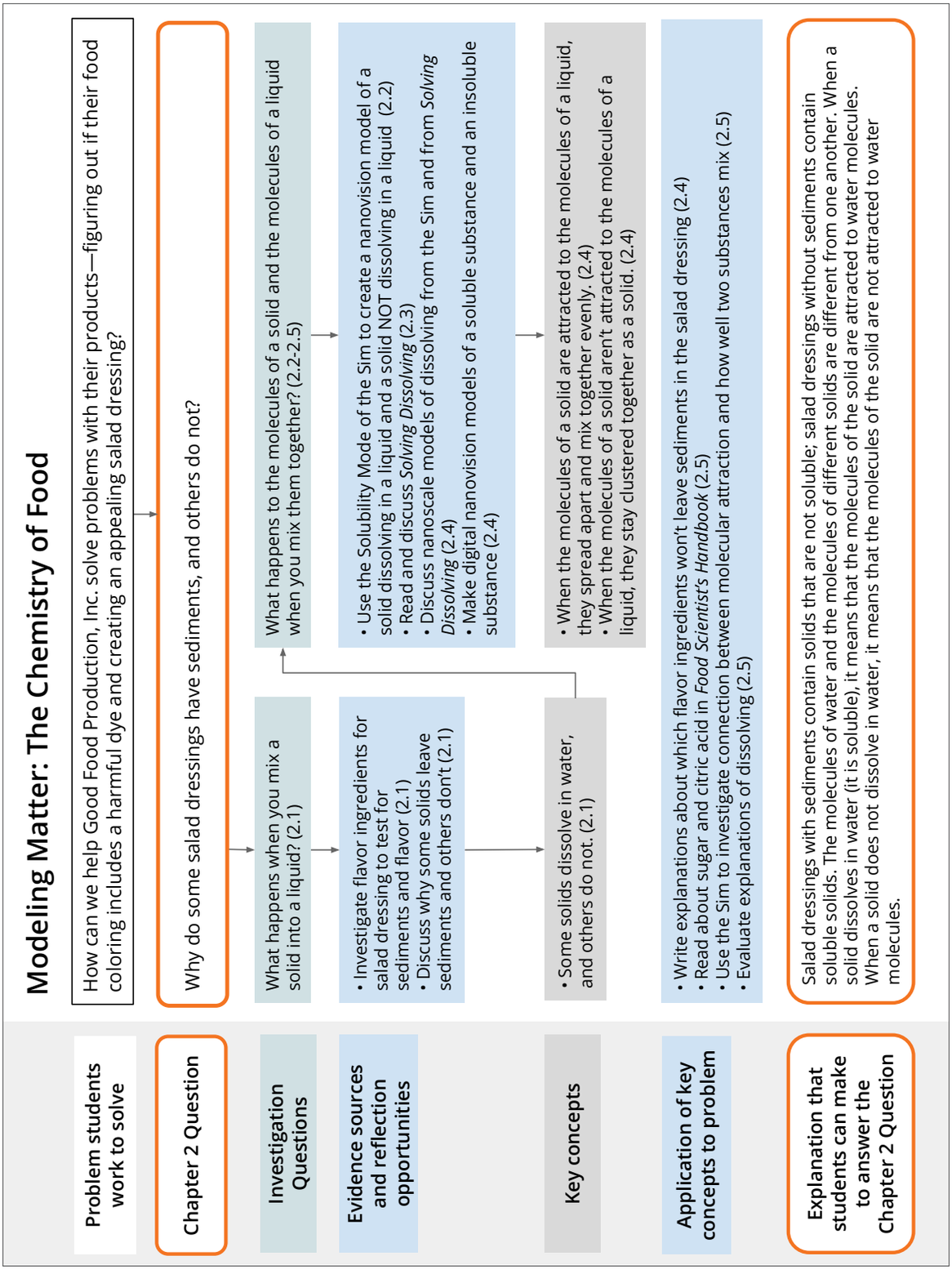
Chapter 3: Why can salad-dressing ingredients separate again after being mixed?

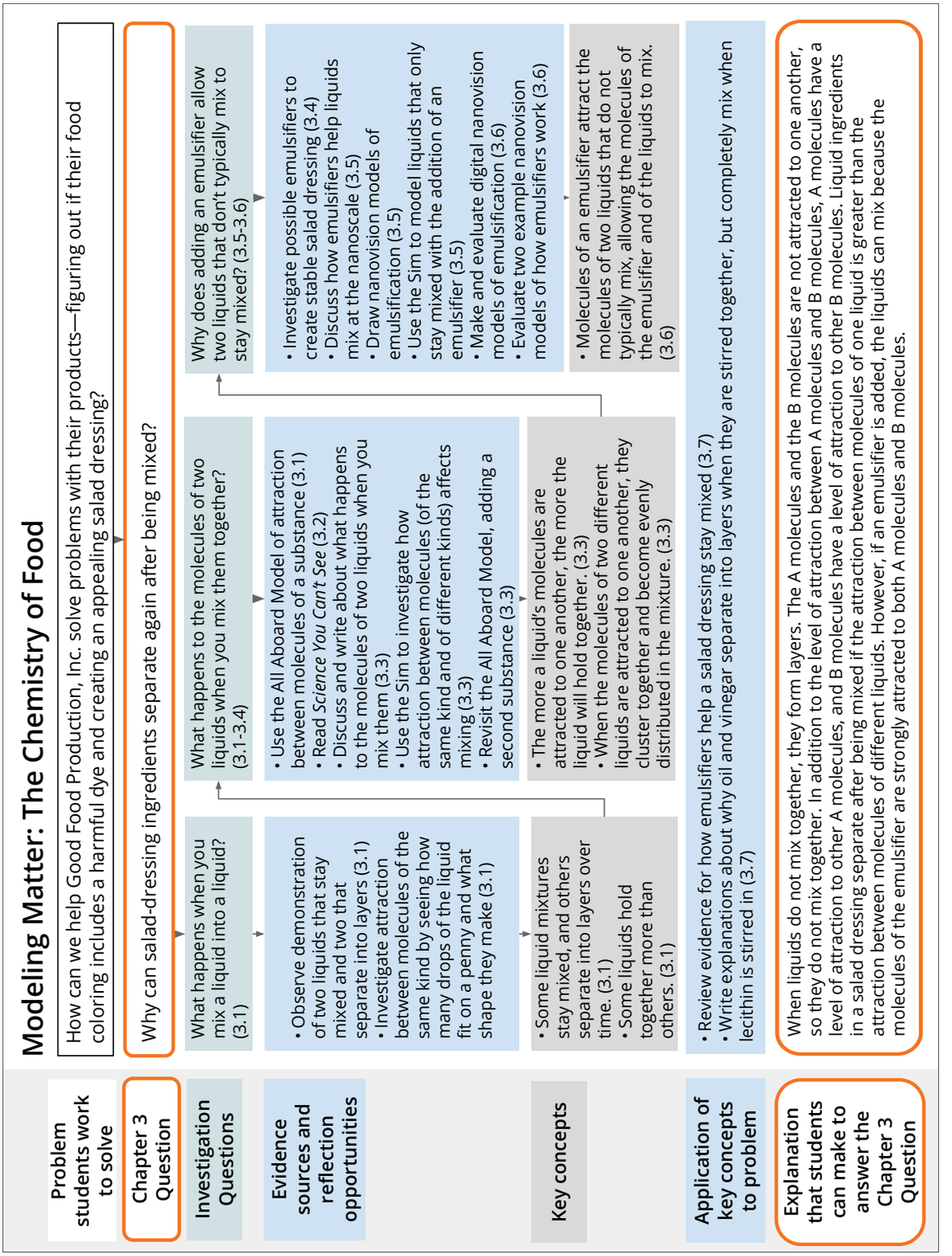
Students figure out: When liquids do not mix together, they form layers. The A molecules and the B molecules are not attracted to one another, so they do not mix together. In addition to the level of attraction between A molecules and B molecules, A molecules have a level of attraction to other A molecules, 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.

Modeling Matter Coherence Flowchart







AmplifyScience

Modeling Matter:

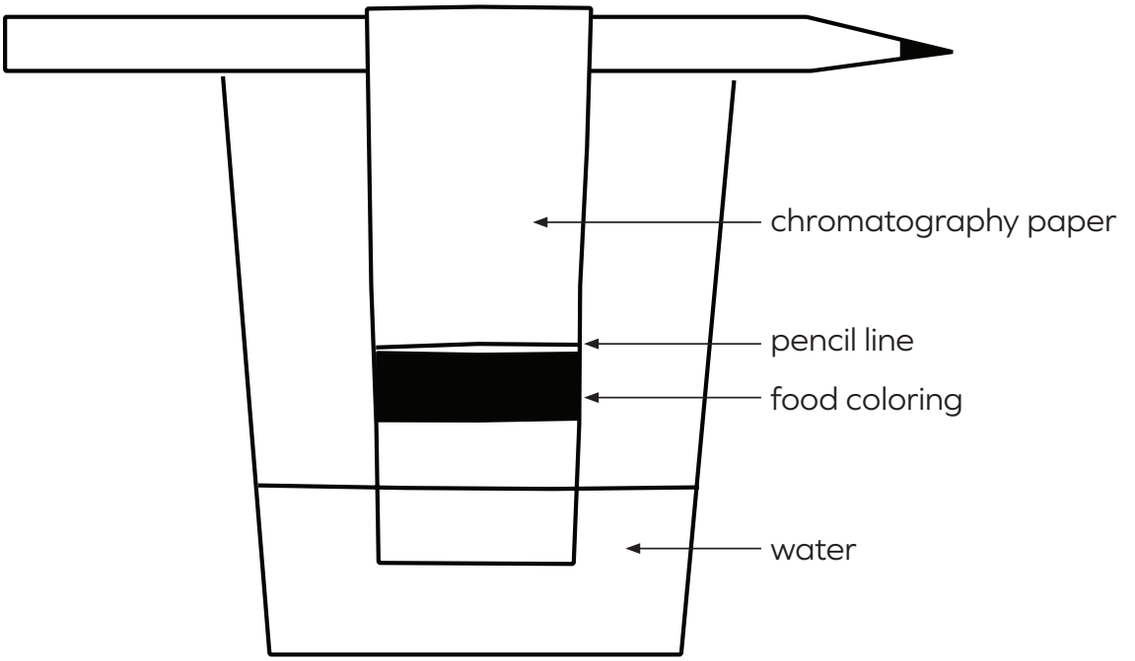
The Chemistry of Food

Investigation Notebook

Name: _____ Date: _____

Using Chromatography to Separate a Mixture

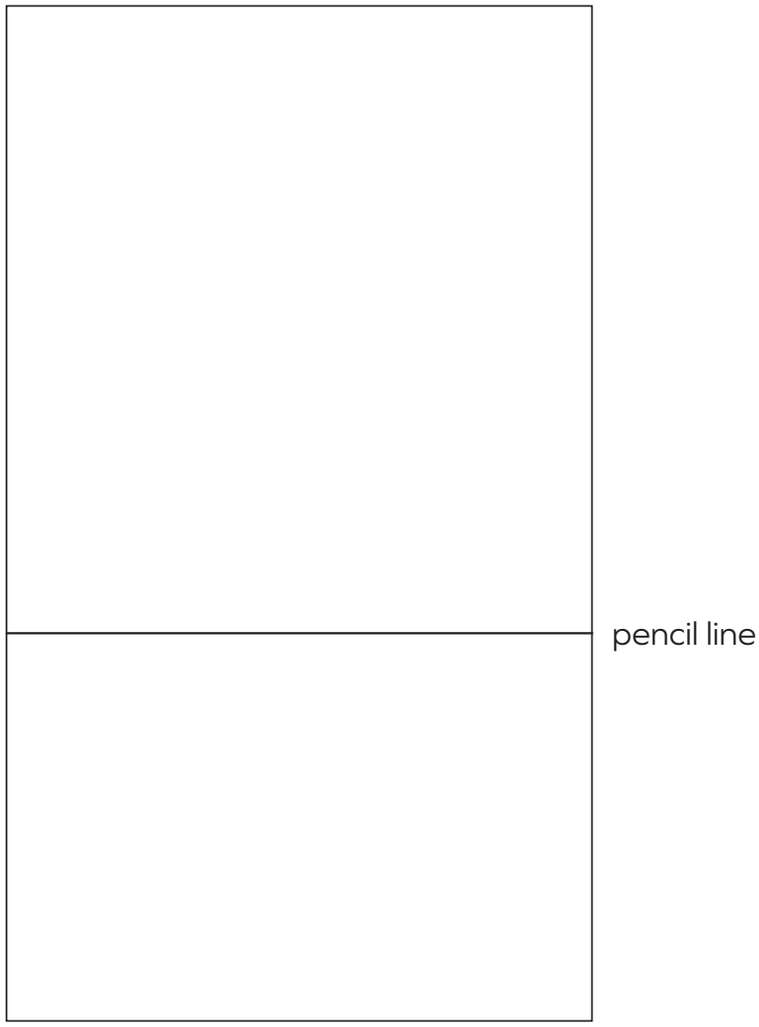
1. **Draw a pencil line.** On the paper strip, draw a pencil line along the top edge of the food coloring.
2. **Attach the paper strip so it hangs in the water, but the food coloring is still above the water.** Tape the top of the paper strip to a pencil. The bottom of the paper strip should just touch the water in the cup, and the food coloring should remain above the water.
3. **Start the chromatography test by hanging the paper strip in the water.** Place the pencil across the top of the cup.



Name: _____ Date: _____

Nanovision Model of Chromatography

1. Draw what you think happened with the water molecules and the molecules in the food-coloring dyes during chromatography.
2. Include a key that will help another scientist understand your model.
3. Label the parts of your model.
4. Use arrows if needed.



Name: _____ Date: _____

Getting Ready to Read:
Break It Down: How Scientists Separate Mixtures

1. Before reading the book *Break It Down*, read the sentences below.
2. If you agree with the sentence, write an "A" on the line before the sentence.
3. If you disagree with the sentence, write a "D" on the line before the sentence.
4. After you read the book, see if your ideas have changed. Be ready to explain your thinking.

_____ Most things are mixtures.

_____ Chromatography is the only way to separate a mixture of different kinds of molecules.

_____ One way that scientists separate some mixtures is to spin the mixtures very fast.

_____ Air is a mixture.

_____ Scientists use the properties of molecules to separate mixtures.

Name: _____ Date: _____

Making Inferences in *Break It Down: How Scientists Separate Mixtures*

Record in the table below as you read *Break It Down*. Use the images, captions, and text in the book to help you make inferences

Section in book	**Make an inference to answer a question**	**What helped you make the inference?** • what you already know • which image, caption, or text? (Include page.)
Break It Down to Solve Problems: pages 10–11	In ocean water, are water molecules attracted to the atoms that make up salt? Yes No	
Break It Down to Save Lives: pages 12–15	Are there different kinds of molecules in blood? Yes No	
Break It Down to Uncover the Past: pages 16–21	Are the different molecules in goat meat, lentils, honey, wine, and olive oil all the same size? Yes No	
Mixtures and Properties: pages 22–23	What properties of molecules might you be able to use to separate pollution from other substances? Answer:	

Name: _____ Date: _____

Reading Reflection:
Break It Down: How Scientists Separate Mixtures

If you were a scientist trying to separate pollution molecules from the air, how might you do it? (This question appears on page 23 of *Break It Down*.)

_____

_____

_____

_____

_____

_____

Make a drawing to explain your ideas. Label your drawing.

Name: _____ Date: _____

Color-Changing Model

1. Read the explanation for this model below and review the diagram of the model on the next page.
2. Turn to pages 28–29, Evaluating Chromatography Models, and discuss each question with your partner.
   - On page 28, circle **Yes** or **No** for each question to indicate if it does or does not explain what you observed in chromatography and what you know about molecules.

What happened to the dye and water molecules during chromatography?

The water molecules were attracted to the paper molecules, so the water molecules climbed up the paper.

As they passed through the food-coloring mixture, the water molecules bumped into the dye molecules, and the water molecules changed to the same colors as the dye molecules. The colored water molecules kept traveling up the paper.

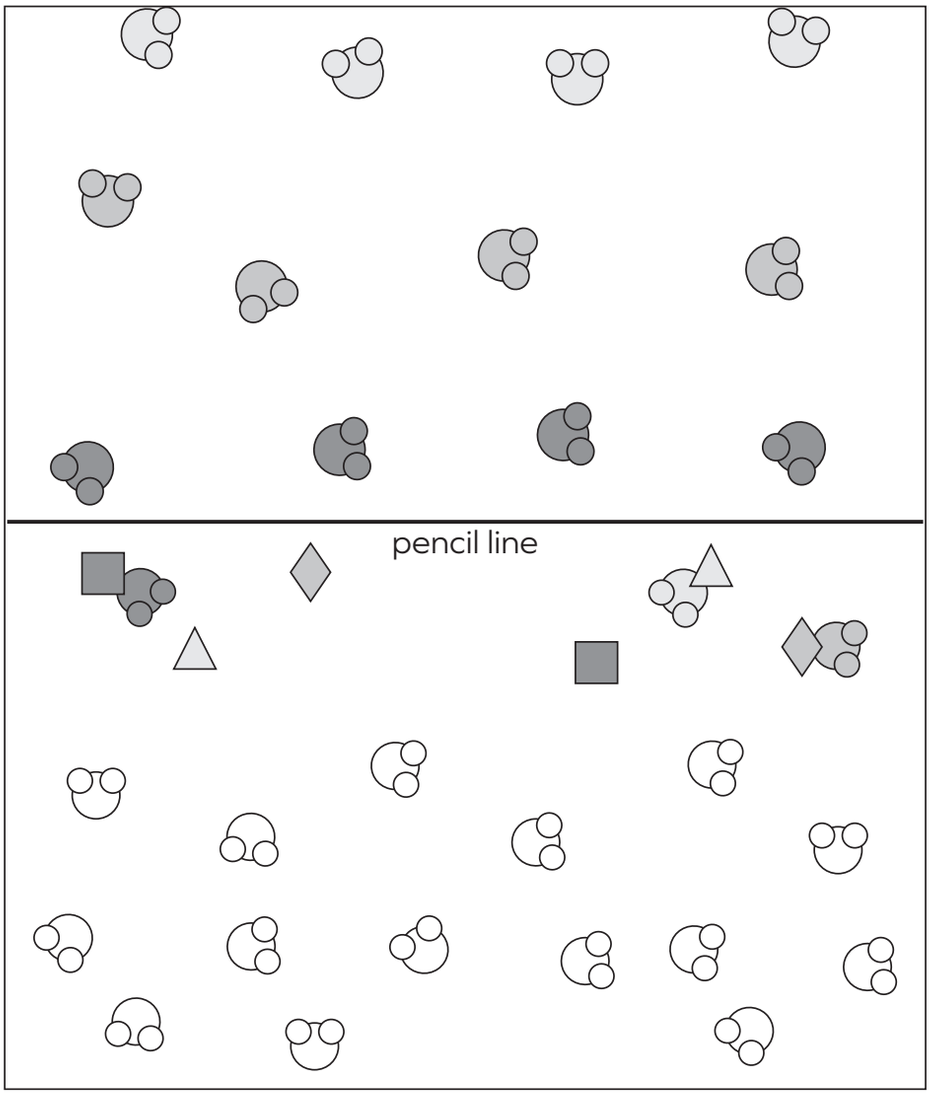
The blue water molecules are the lightest, so they went the farthest. The red water molecules are the heaviest, so they did not go as far.

Name: _____ Date: _____

Color-Changing Model (continued)

Key

water molecule	yellow dye molecule
blue dye molecule	red dye molecule



Name: _____ Date: _____

Growing Model

1. Read the explanation for this model below and review the diagram of the model on the next page.
2. Turn to pages 28–29, Evaluating Chromatography Models, and discuss each question with your partner.
   - On page 29, circle **Yes** or **No** for each question to indicate if it does or does not explain what you observed in chromatography and what you know about molecules.

What happened to the dye and water molecules during chromatography?

The water molecules were attracted to the paper molecules, so the water molecules climbed up the paper.

As the water molecules passed through the food coloring, they attached to the dye molecules and made the dye molecules grow, so the dye traveled up the paper.

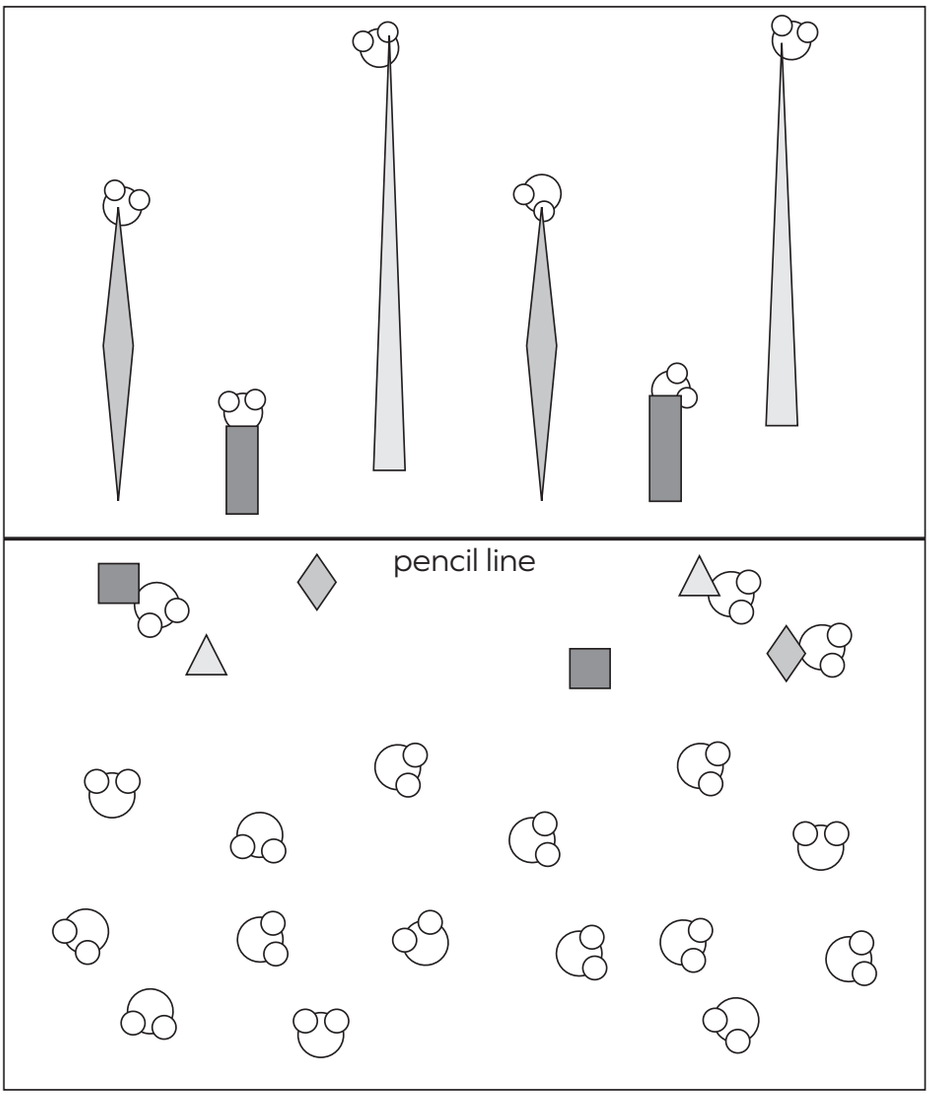
The molecules of blue dye grew the most, so they went the highest. The molecules of red dye grew less, so they did not go as high.

Name: _____ Date: _____

Growing Model (continued)

Key

water molecule	yellow dye molecule
blue dye molecule	red dye molecule



Name: _____ Date: _____

Attraction Model

1. Read the explanation for this model below and review the diagram of the model on the next page.
2. Turn to pages 28–29, Evaluating Chromatography Models, and discuss each question with your partner.
   - On page 29, circle **Yes** or **No** for each question to indicate if it does or does not explain what you observed in chromatography and what you know about molecules.

What happened to the dye and water molecules during chromatography?

The water molecules were attracted to the paper molecules, so the water molecules climbed up the paper.

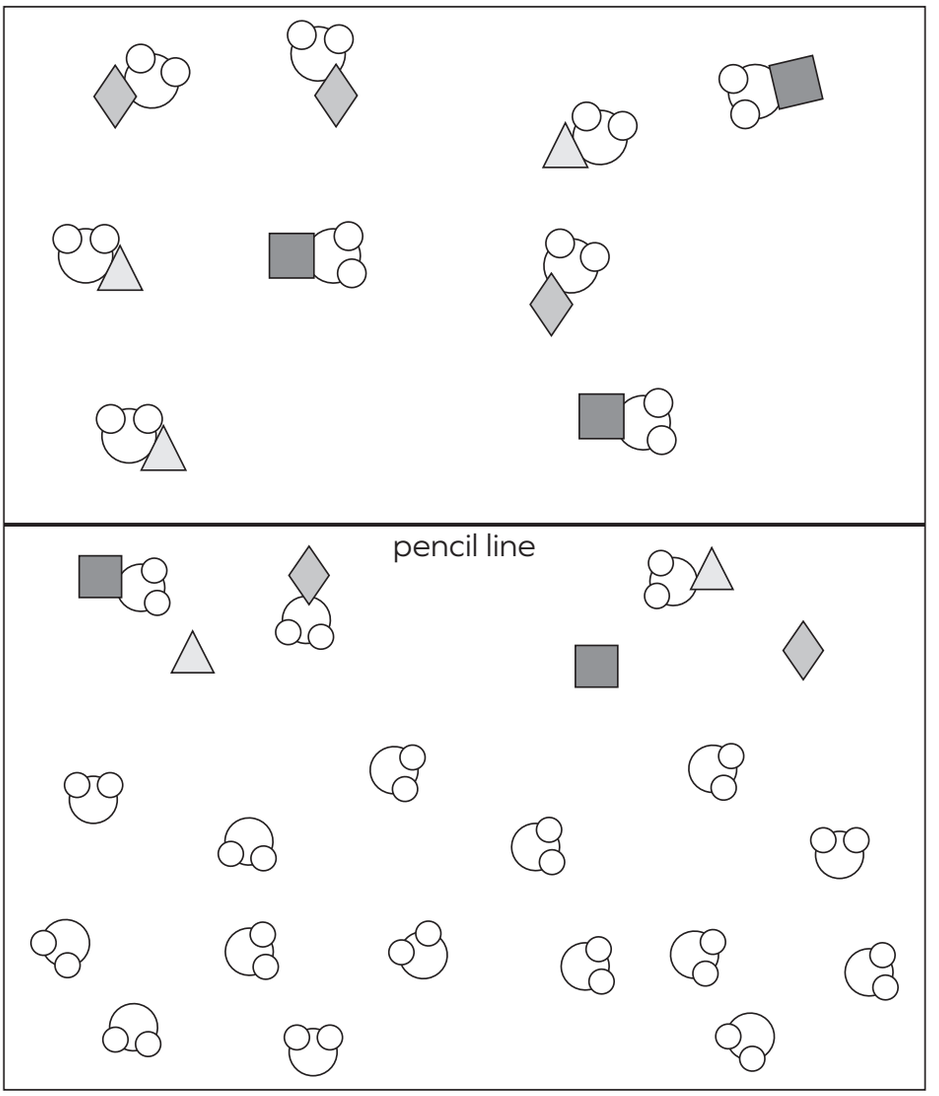
The dye molecules were also attracted to the water molecules. Since they were attracted to the water molecules, the dye molecules got carried up the paper. At some point, the dye molecules were more attracted to the paper molecules than to the water molecules, so they stopped moving up.

Name: _____ Date: _____

Attraction Model (continued)

Key

water molecule	yellow dye molecule
blue dye molecule	red dye molecule



Name: _____ Date: _____

Evaluating Chromatography Models

1. Evaluate the three models on pages 22–27.
2. In the table for each model, circle **Yes** or **No** to indicate if the model explains or does not explain what you observed in chromatography and what you know about molecules.

Everything we know about molecules:

Statement A: All molecules of one substance are exactly the same, and they are different from molecules of any other substance.

Statement B: The properties of the molecules of a substance do not change.

Color-Changing Model

1. Does the model explain how the water traveled up the paper?	Yes	No
2. Does the model explain how the colors moved up the paper?	Yes	No
3. Does the model explain why some colors went higher?	Yes	No
4. Does the model fit with everything we know about molecules? If not, with which statement(s) does it conflict? Statement _____	Yes	No

Name: _____ Date: _____

Evaluating Chromatography Models (continued)

Growing Model

1. Does the model explain how the water traveled up the paper?	Yes	No
2. Does the model explain how the colors moved up the paper?	Yes	No
3. Does the model explain why some colors went higher?	Yes	No
4. Does the model fit with everything we know about molecules? If not, with which statement(s) does it conflict? Statement _____	Yes	No

Attraction Model

1. Does the model explain how the water traveled up the paper?	Yes	No
2. Does the model explain how the colors moved up the paper?	Yes	No
3. Does the model explain why some colors went higher?	Yes	No
4. Does the model fit with everything we know about molecules? If not, with which statement(s) does it conflict? Statement _____	Yes	No

Connecting key concepts to chapter explanations

Modeling Matter

Directions:

1. For each chapter, read the key concepts, then the explanation.
2. With a partner, discuss how the key concepts connect to the explanation.
3. Make annotations about the connections.

Ch	Key concepts	Explanation
1	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)	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.
2	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)	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.
3	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)	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.

Reflecting on the progression of ideas

Directions:

Part 1: Reflecting on the progression

1. Using the key concepts and explanations, reflect on how ideas build throughout the unit.
2. With your group, discuss the following questions:
   - Which ideas are revisited over multiple chapters?
   - What new ideas are added in each chapter?
3. Make notes about the progression of ideas in the space below.

Part 2: Creating a visual

1. With your group, use the provided materials to create a visual to represent your ideas. You can use words or pictures, or a mix of both. The following questions may help you plan your visual:
   - How can you represent the new information that is added throughout the progression?
   - How can you represent foundational ideas that are revisited throughout the unit?

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.**

Progress Build and End-of-Unit Assessment

Modeling Matter

Directions:

1. Read through the End-of-Unit Assessment.
2. Use the table on the next page to describe your ideas about what a student at each level of the Progress Build would write as their final explanation (seen below) on this assessment.

Name: _____ Date: _____

End-of-Unit Writing:
Explaining Emulsifiers in Salad Dressing

1. Write a scientific explanation that answers the question below.
2. Your explanation should include:
   - a **topic sentence** that answers the question.
   - supporting sentences that tell **what happens** and **why**.
3. Your audience is the president of Good Food Production, Inc.

Question: Why do the oil and vinegar separate into layers when they are stirred together, but completely mix when lecithin is stirred in?

Summary of Progress Build level*	Describe how a student would answer the question
1: Observable properties result from molecular properties.	
2: Mixing is a result of attraction between molecules of different substances.	
3: Separation is a result of the attraction between molecules of the same substance.	

*For a more detailed description of each Progress Build level, refer to the Modeling Matter Progress Build in your Participant Notebook, or digitally in the Unit Guide.

Self-inventory: Choosing an area of focus

Directions:

Use the statements to help guide your areas of strength and support.

Statements		I don't	I try	I do
i. Understanding of content	1) I can identify my own gaps in content knowledge before teaching a unit.			
	2) I can explain what students will learn and how they will learn throughout the unit.			
	3) I can explain how students will demonstrate understanding of science content along the Progress Build.			
ii. Coherence	4) I can identify the variety of modalities students engage in to collect evidence from multiple sources.			
	5) I support students in my class, through my instruction and classroom setup, to understand how the activities they engage in help them answer questions and solve the unit problem.			
	6) I can pace activities to move students towards meeting the goal(s) of the lesson.			
iii. Formative assessment and differentiation	7) I use Amplify Science assessments to monitor students' progress along the Progress Build.			
	8) I utilize differentiation information in the Lesson Brief to plan for lesson modifications.			
	9) I adjust instruction in response to learners' needs, styles, and interests.			
iv. Preparing to teach a lesson	10) I use the Materials and Preparation tab in the Lesson Brief as I am planning and preparing for my lessons.			
	11) I know how to access student-facing resources to plan my lessons and how to display them for students during instruction (Investigation Notebook pages; additional copymasters, digital resources).			
	12) I can identify common student challenges and prepare to address those challenges.			

Targeted small group work time

i. Deepening content understanding and addressing preconceptions
ii. Exploring the Modeling Matter Simulation
iii. Formative assessment and differentiation
iv. Preparing to teach

Deepening content understanding and addressing preconceptions

Goal: Deepen understanding of unit content as it relates to student alternative conceptions. Plan to leverage your deep content understanding to address student preconceptions during the unit.

Step 1: Getting ready

Self-reflection: You've engaged with your unit's content deeply during today's workshop. Use the space below to record any new science concepts you learned today, and to list any questions you still have related to the concepts you've worked with today.

Anticipating student need: Thinking about the concepts students will learn in this unit, reflect on what you think will be particularly challenging or confusing for students. Consider what preconceptions or alternate conceptions you think students might have related to this content, and ideas you think are particularly abstract or complex. Use the space below to record your ideas.

Step 2: Deepening understanding of unit content

Why develop content understanding?

Teachers who have a deep understanding of the content they're teaching are more effective at addressing student preconceptions and alternate conceptions, and effectively support student learning with accurate explanations and precise language (Brown & Borko, 1992; Cohen, 1988; Roth, Anderson, & Smith, 1986).

Directions:

1. Locate the Science Background document in your unit's Unit Guide.
2. Read the document. If you'd like, you can assign different sections to different members of the group, and have group members summarize their section to the group.
3. Use the space below to make notes.

Step 3: Reflecting on student alternate conceptions

How do I find information about preconceptions and alternate conceptions?*

The Assessment Guide that accompanies the Pre-Unit Assessment lists common student preconceptions related to your unit's content. This information was gathered through review of academic literature, cognitive labs with students, and field tests of the units. Note in the Amplify Science program, "preconceptions" and "alternate conceptions" are used interchangeably.

*In some units, there is also information about preconceptions in the Science Background document.

Directions:

1. Navigate to your unit's Pre-Unit Assessment lesson (Lesson 1.1).
2. Download the Assessment Guide from Digital Resources. Read this document.
3. Focus on the "Common preconceptions, contrasted with accepted science understandings" section at the end of the document. Reflect on which preconceptions seem most relevant to you and your students.
4. List 2-3 of these preconceptions in Table 1 below. Then, go back to the Science Background document. Use the space in the table to record ideas from the science background that address the preconceptions you chose.

Table 1: Reflecting on student alternate conceptions

Preconception (from Assessment Guide)	Information from science background that addresses the preconception

Step 4: Planning to teach

Now what do I do?

Having a strong content understanding is an important first step to tackling preconceptions and alternate conceptions in your students. Planning for moments in the unit where students might get confused is a helpful next step.

Directions:

1. Select one of the preconceptions you listed on Table 1 to focus more deeply on.
2. Use your unit's Coherence Flowchart to find an activity in the unit where student learning seems to relate to the preconception.
   Tip: Investigation Questions and key concepts may help you locate an activity.
3. In the Teacher's Guide, navigate to this activity's lesson. Read the lesson.
4. Use the space below to make notes about what you'll listen for during the lesson, and how you might support students holding that preconception to gather evidence that refines their understanding.
5. If you have extra time, find another lesson related to the preconception you chose, and complete the next row of Table 2.

Table 2: Planning to teach

Preconception:		
Lesson	**What you'll listen for**	**How you might support students**

Exploring the Modeling Matter Simulation

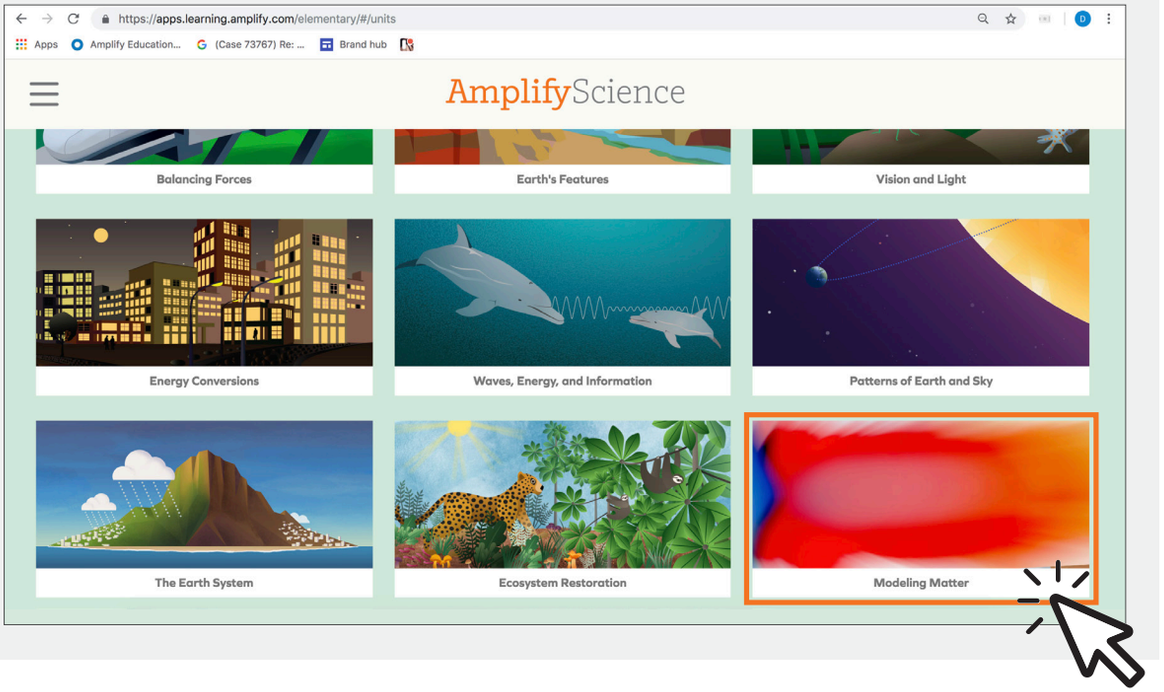
Goal: Become familiar with the Modeling Matter Simulation, and use the Sim to gain insight into student learning throughout the unit.

1. **You'll work on a Sim activity from Lesson 2.2. To prepare, read the excerpt from the Chapter 2 Overview, below:**

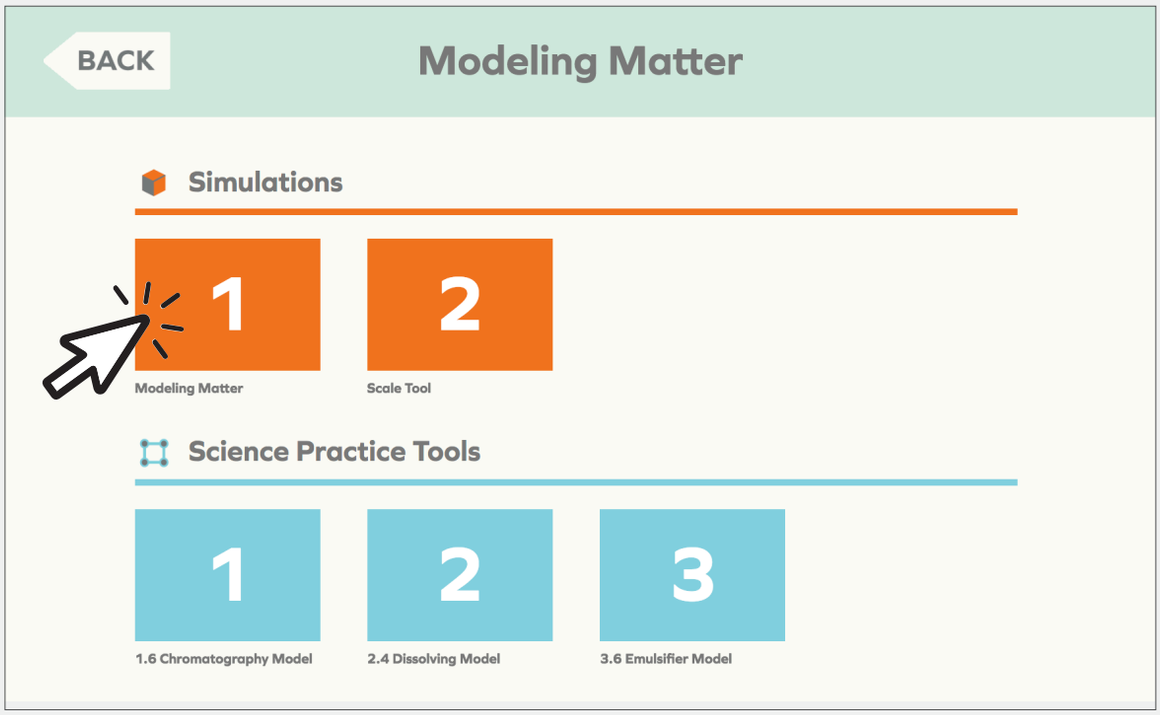
   In Chapter 2, students are introduced to a new problem: creating a new salad dressing with a flavor, texture, and appearance that appeals to consumers. They begin by figuring out how to make a salad dressing without sediments. As they do, they are challenged to use their understanding of the particulate nature of matter and of the properties of molecules to explain why some solids dissolve, and others do not. The class investigates dissolving by working to answer these two questions: "What happens when you mix a solid into a liquid?" and "What happens to the molecules of a solid and a liquid when you mix them together?"

2. **Navigate to the Modeling Matter Simulation:**

Navigate to the Student Apps Page: apps.learning.amplify.com/elementary.
Scroll to find Modeling Matter and click on it.



Click the orange box 1 at the top of the page, below Simulations.



3. With a partner, explore the Sim for about ten minutes by working through Steps 1 and 2 on page 40 of the Modeling Matter Investigation Notebook (the last page of this packet). After exploring, discuss the questions below.
   - **After selecting molecules, what do you need to click to see the molecules interacting?**
   - **Did you see black outlines forming around clusters of molecules?**
     - **a.** When? Around which molecules?
     - **b.** What do you think these outlines signify?
4. Once you've discussed the questions, work on Step 3 of the notebook page with your partner.
5. When everyone in the group is finished, turn to page 11 in your Participant Notebook (Modeling Matter Coherence Flowchart, Chapter 2). Find the Sim activity you just worked on in the Coherence Flowchart. Then, discuss the questions below as a group:
   - What Investigation Question are students working to answer with this Sim activity?
   - What key concept or key concepts does this activity help students figure out?
   - How does this activity help students answer the Investigation Question?
6. If you finish before your colleagues, you can:
   - Read the Apps in this Unit teacher reference (in the Unit Guide), or
   - Explore Emulsifier* Mode in the Sim. Click the Global Navigation button (≡) at the top left of the screen, and select Emulsifier.

*In Chapter 3, students work to figure out how to create a salad dressing that does not separate into layers. They ultimately propose adding an emulsifier, a substance that allows two liquids that don't normally mix to mix and stay mixed.

Name: _____ Date: _____

Exploring the *Modeling Matter* Simulation

Go to the Simulation and select the Solubility mode.

1. Things to try

- Try out different combinations of two molecules in the dish.
- Try stirring different amounts of molecules and at different speeds.
- Try pausing the Simulation to make observations and then pressing PLAY.
- Try placing just one molecule in the dish.

2. Partner discussion questions

- What do you observe happening to the molecules in the dish?
- How are different molecules different from one another?
- How are different combinations of molecules different from one another?
- Use the slider to replay the run after the time runs out. How is the mixture different at the beginning, in the middle, and at the end?

3. Challenge

What combination of molecules could be a model of a solid dissolving in a liquid?

_____

What combination of molecules could be a model of a solid NOT dissolving in a liquid?

_____

Formative assessment and differentiation

Modeling Matter

Goal: Examine embedded formative assessment opportunities in order to plan for differentiated instruction.

Step 1: How do we assess learning?

In Amplify Science, students can demonstrate what they've learned through embedded formative assessments (e.g., On-the-Fly Assessments, Critical Juncture Assessments, Student Self-Assessments). These assessments represent the most opportune moments for a glimpse into students' developing conceptual understanding and their facility with the practices.

First, let's analyze an embedded assessment opportunity we experienced earlier in the day. During our Modeling Matter deep dive sequence, you created nanovision models of how the food coloring mixture separates into dyes through chromatography by drawing.

- Navigate to Modeling Matter → Chapter 1 → Lesson 1.6 → Activity 2
- Select Embedded Formative Assessment
- Select On-the-Fly Assessment 5: Modeling Nanoscale Objects
- Read the Look for and Now what? sections and then complete the table below.

Modeling Matter Lesson 1.6, Activity 2	
Which disciplinary core ideas, science and engineering practices, and/or crosscutting concepts are being assessed?	
What data can be collected from this assessment opportunity?	
How could you collect data?	
What will this formative assessment opportunity tell you about student understanding?	

Step 2: Reflecting on differentiated instruction

Based on student responses to embedded formative assessments, you may need to differentiate instruction in the next activity or lesson. Differentiated instruction is a powerful classroom practice that recognizes that students bring a wide variety of skills, talents, and needs to their daily learning. When you differentiate instruction, it enables you to address varying degrees of proficiency and skill while also meeting identifiable differences in learning styles and interests. There are various ways to differentiate instruction—what you teach, how you teach, and/or how students demonstrate their learning.

How do you currently respond to students' needs, styles, or interests in your classroom?

Step 3a: Determine strategies to differentiate instruction

First, let's read about the variety of differentiation strategies which are embedded in the Amplify Science curriculum. Follow the steps below to access the Program Guide:

- Navigate to the Science Program Guide using the Global Navigation Bar.
- Select Access and Equity.
- Choose Differentiation Strategies.
- Explore the description and associated strategies for the student groups listed.
- Use the space below to record strategies you could use to differentiate instruction for each group of students.

Student population	Strategies for support
English learners	
Students with disabilities	
Standard English learners	
Girls and young women	
Advanced learners and gifted learners	
Students living in poverty, foster children and youth, and migrant students	

Step 3b: Review Lesson Brief

Navigate to the 1.6 Lesson Brief and select the drop-down arrow to expand the Differentiation section. Read the Embedded Supports for Diverse Learners. Are there any additional strategies noted in this brief that you would like to capture in the table above?

Step 4: Preparing to differentiate

Now it's time to draft a plan to implement differentiated instruction.

What is one strategy you just reviewed and/or recorded which you feel most comfortable implementing after the next embedded formative assessment opportunity?

How will you prepare your students for the implementation of this new strategy?
(Ex: Expected student behavior for group work, step-by-step directions)

How will you prepare your classroom for the implementation of this new strategy?
(Ex: Classroom arrangement, organizing materials)

Preparing to teach

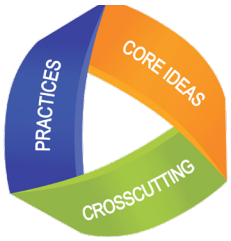
Directions:

1. Navigate to the Chapter 1 landing page in the Teacher's Guide and read the Chapter Overview.
2. Navigate to Lesson 1.1 and use the table below to guide your planning.

Consider	Read
Lesson Purpose • What is the purpose of the lesson? • How do the activities in this lesson fit together to support students in achieving this purpose?	**Lesson Brief:** • Overview • Standards
Preparing • What materials do you need to prepare? • Is there anything you will need to project? • Will students need digital devices? • Are there partner or grouping structures you need to plan for? • Are there activities you need to practice before showing students? • Are there space considerations to think about (e.g., outside observation, projections, whole-group floor space)? • Are there documents in Digital Resources that you need to review (e.g., Assessment Guide)?	**Lesson Brief:** • Materials and Preparation • Unplugged • Digital Resources
Timing • How will teaching this lesson fit into your class schedule? • Will you need to break the lesson into activities over several days? **Teaching the Lesson** • Are there specific steps you have questions about? • What challenges might you encounter in teaching this lesson, and how might you address these challenges?	**Lesson Brief:** • Lesson at a Glance **Instructional Guide:** • Step-by-Step tab • Teacher Support tab
Supports and Challenges • What might be challenging for your students? • What additional supports can you plan for individual students?	**Lesson Brief:** • Differentiation **Instructional Guide:** • Teacher Support tab

**If you have additional time, continue planning with Lesson 1.2.*

Three dimensions of NYSSLS reference



3-D learning engages students in using scientific and engineering practices and applying crosscutting concepts as tools to develop understanding of and solve challenging problems related to disciplinary core ideas.

Science and Engineering Practices

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

Disciplinary Core Ideas

Earth and Space Sciences:
ESS1: Earth's Place in the Universe
ESS2: Earth's Systems
ESS3: Earth and Human Activity

Life Sciences:
LS1: From Molecules to Organisms
LS2: Ecosystems
LS3: Heredity
LS4: Biological Evolution

Physical Sciences:
PS1: Matter and its Interactions
PS2: Motion and Stability
PS3: Energy
PS4: Waves and their Applications

Engineering, Technology and the Applications of Science:
ETS1: Engineering Design
ETS2: Links among Engineering Technology, Science and Society

Crosscutting Concepts

1. **Patterns**
2. **Cause and Effect**
3. **Scale, Proportion, and Quantity**
4. **Systems and System Models**
5. **Energy and Matter**
6. **Structure and Function**
7. **Stability and Change**

Amplify Support

Program Guide

Glean additional insight into the program's structure, intent, philosophies, supports, and flexibility.
my.amplify.com/programguide

Amplify Help

Find lots of advice and answers from the Amplify team.
my.amplify.com/help

Customer care

Seek information specific to enrollment and rosters, technical support, materials and kits, and teaching support, weekdays 7AM-7PM EST.

800-823-1969

scihelp@amplify.com

Amplify Chat

When contacting customer care, be sure to:

- Identify yourself as an Amplify Science user.
- Note the unit you are teaching.
- Note the type of device you are using (Chromebook, iPad, Windows laptop, etc.).
- Note the web browser you are using (Chrome or Safari).
- Include a screenshot of the problem, if possible.
- Cc: your district or site IT contact.

Notes

Notes

Notes