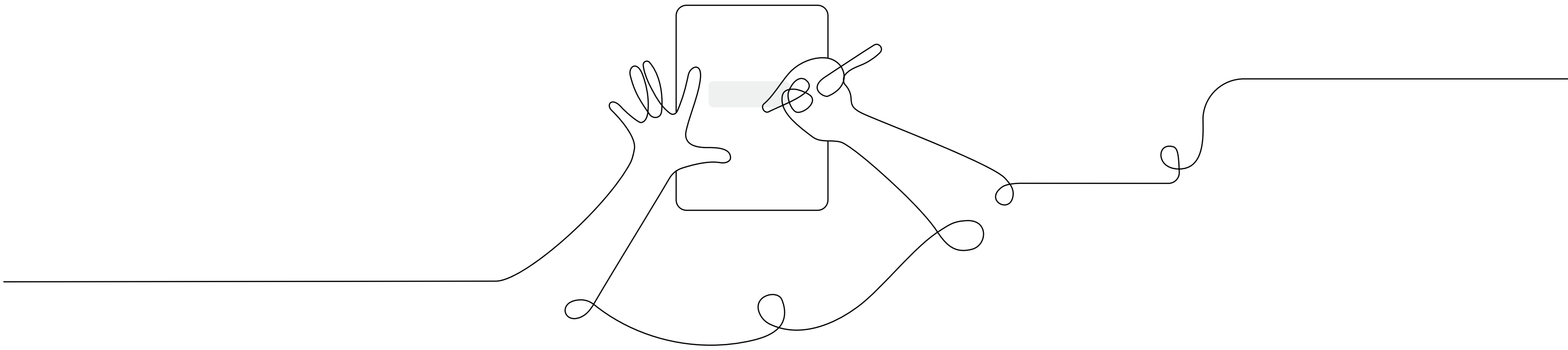
Amplify Science

Participant Notebook

Deep-dive and Strengthening Workshop
Pushes and Pulls

Grade K



Welcome to the workshop

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

Pushes and Pulls
Grade K

Amplify Science

Unit-specific workshop agenda

Introductions

Framing the day

- Reflecting on our teaching
- Scenario challenge

Experiencing the unit

- Framing with a coherence lens
- Pushes and Pulls 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
- Coherent instruction
- 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

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 few units? 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

How can we create a pinball machine for our class?

Students take on the role of pinball engineers as they investigate the effects of forces on the motion of an object. They test their own prototypes (models) of a pinball machine and use what they learn to contribute to the design of a class pinball machine. Over the course of the unit, students construct a foundational understanding of why things move in different ways.

Chapter 1: How do we make a pinball start to move?

Students figure out: To make our pinball start to move, we must exert a force on the pinball. We can use a rubber band launcher to exert a force on the pinball.

How they figure it out: Students investigate how to make objects in the classroom start to move. They talk about cause and effect, read a book that introduces key scientific language and use it to practice talking about forces and observed motion. Finally, students create models for testing their ideas about making the pinball start to move.

Chapter 2: How do we make a pinball move as far as we want?

Students figure out: To make our pinball go the distance we want, the rubber band launcher has to exert a strong force. To make it go a short distance, the rubber band launcher has to exert a gentle force. Attaching a shoelace to the rubber band launcher can help us adjust the force.

How they figure it out: Students investigate how to make a pinball move short or long distances by testing their ideas in the Box Models. They describe how the launcher can be used to exert gentle and strong forces to move a pinball different distances.

Chapter 3: How do we make a pinball move to a certain place?

Students figure out: To get the pinball moving in the direction we want (left or right), we must exert a force on the pinball in the direction that we want it to move.

How they figure it out: Students investigate how to control the pinball's direction of movement by controlling the direction of applied forces. They read to obtain information from a book on building with forces and use this language to talk about forces moving in a particular direction.

Chapter 4: How do we make a moving pinball change direction?

Students figure out: To make a moving pinball change direction, we have to exert another force on it, either from a moving object or from a still object in its path.

How they figure it out: Students investigate how to change the direction of a moving pinball. Ultimately, the class decides whether and how to add flippers, targets, and a bumper to the Class Pinball Machine and use Explanation Language Frames to help them discuss and write about how forces cause a moving object to change direction.

Chapter 5: How can we make the pinball machine do all the things we want it to do?

Students figure out: As pinball engineers, we plan, make, test, and modify our designs based on what we learn. In our pinball machine, forces from the rubber band launcher make the ball start moving in the direction and over the distance we want, and forces from blocks and flippers cause the pinball to change direction.

How they figure it out: Students create and then improve a pinball machine, first on their own in their Box Models and then in the Class Pinball Machine. Students draw their plans and write a mini-book to explain what they have learned.

Chapter 6: Where are forces around us?

Students figure out: There are strong and gentle forces in different directions all around us. We know a force has been exerted on an object whenever that object starts moving, changes direction, or stops moving.

How they figure it out: Students tour their school to identify evidence of forces. Then students read and discuss a book that shows forces at work in the world.

Pushes and Pulls Coherence Flowchart

Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How can we create a pinball machine for our class?
Chapter 1 Question	How do we make a pinball start to move?
Investigation Question	What makes an object start to move? (1.1-1.4)
Evidence sources and reflection opportunities	• Investigate how to make objects start to move in a classroom Movement Hunt (1.1) • Investigate making an object start to move in full-class Rugball routine (1.2) • Use recognizable images of objects moving to visualize movement (1.2) • Practice using cause and effect to explain everyday scenarios (1.2) • Read *Talking About Forces* (1.2) • Investigate how to make an object move by exerting a force on it using Forces Investigation materials (1.3) • Use Explanation Language Frame to explain forces and movement in Forces Investigation (1.3)
Key concepts	• An object starts to move when another object exerts a force on it. (1.3) • Forces happen between two objects. (1.3)
Application of key concepts to problem	• Design launchers to make a pinball start to move in individual student Box Models (1.4) • Diagram Box Model launcher design (1.4) • Add a launcher to make the pinball start to move in Class Pinball Machine (1.5) • Shared Writing to explain the Chapter 1 Question (1.5) • Revisit *Talking About Forces* to use Explanation Language Frame to explain how objects move in the text (1.5)
Explanation that students can make to answer the Chapter 1 Question	To make our pinball start to move, we must exert a force on the pinball. We can use a rubber band launcher to exert a force on the pinball.

Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How can we create a pinball machine for our class?
Chapter 2 Question	How do we make a pinball move as far as we want?
Investigation Question	What makes an object move shorter or longer distances? (2.1-2.3)
Evidence sources and reflection opportunities	• Engage in Embodied Forces Routine to practice moving short and long distances (2.1) • Investigate how to make a tennis ball move a short distance and a long distance in partners (2.1) • Investigate making an object move short and long distances in full-class Rugball routine (2.1) • Read *Forces in Ball Games* to find out about strong and gentle forces in sports (2.2) • Practice exerting strong and gentle forces in full-class Rugball routine (2.2) • Sort images of objects moving based on the strength of the force exerted (2.2) • Use Explanation Language Frame to explain forces exerted in images from the sort (2.2)
Key concepts	• An object moves a long distance when a strong force is exerted on it. (2.2) • An object moves a short distance when a gentle force is exerted on it. (2.2)
Application of key concepts to problem	• Add shoelaces to student Box Models to control the strength of the forces the launchers exert (2.3) • Diagram modified Box Model launcher designs (2.3) • Modify Class Pinball Machine launcher (2.3) • Shared Writing to explain the Chapter 2 Question (2.3)
Explanation that students can make to answer the Chapter 2 Question	To make our pinball go the distance we want, the rubber band launcher has to exert a strong force. To make it go a short distance, the rubber band launcher has to exert a gentle force. Attaching a shoelace to the rubber band launcher can help us adjust the force.

Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How can we create a pinball machine for our class?	
Chapter 3 Question	How do we make a pinball move to a certain place?	
Investigation Questions	What makes an object start moving in a certain direction? (3.1-3.2)	What makes an object move to a certain place? (3.3-3.5)
Evidence sources and reflection opportunities	• Investigate how to make a tennis ball move in different directions in small groups (3.1) • Investigate making an object move in different directions in full-class Rugball routine (3.1) • Use images in *Building with Forces* to visualize making objects move in different directions (3.1) • Read *Building with Forces* (3.2) • Use Explanation Language Frame to explain movement in images from *Building with Forces* (3.2) • Use shoelaces in student Box Models to control the direction of the force the launcher exerts (3.2)	• Investigate how to make a tennis ball move to a target in partners (3.3) • Investigate making an object move to a certain place in full-class Rugball routine (3.3) • Predict direction and strength of force required to hit a target, and then test predictions (3.3) • Use Explanation Language Frame to explain how to move an object to a certain place (3.4)
Key concepts	• An object starts to move in the same direction as the force that starts the motion. (3.2)	• Every force has a strength—gentle or strong—and a direction. (3.3) • Every force has a strength—gentle or strong—and a direction, which makes the object move a certain distance and direction. (3.4)
Application of key concepts to problem	• Control direction and strength exerted by the launcher to move a pinball to a target in student Box Models (3.4) • Diagram how to move the pinball to a target in student Box Models (3.4) • Make the pinball move to a target in Class Pinball Machine (3.5) • Shared Writing to explain the Chapter 3 Question (3.5) • Revisit *Forces in Ball Games* to explain how objects move to a specific place (3.5)	
Explanation that students can make to answer the Chapter 3 Question	To get the pinball moving in the direction we want (left or right), we must exert a force on the pinball in the direction that we want it to move.	

Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How can we create a pinball machine for our class?
Chapter 4 Question	How do we make a moving pinball change direction?
Investigation Question	What can make a moving object change direction? (4.1-4.2)
Evidence sources and reflection opportunities	• Investigate how to make a moving tennis ball change direction in partners (4.1) • Investigate making a moving object change direction in full-class Rugball routine (4.1) • Engage in Embodied Forces Routine to practice changing direction (4.1) • Read about moving objects changing direction in *Forces in Ball Games* (4.2) • Use Explanation Language Frame to explain how the moving Rugball, and moving balls in *Forces in Ball Games*, change direction (4.2)
Key concepts	• A moving object changes direction when another moving object exerts a force on it. (4.2) • A moving object changes direction when a still object in its way exerts a force on it. (4.2)
Application of key concepts to problem	• Add flippers and bumpers to student Box Models to change a moving pinball's direction (4.3) • Diagram modified Box Model launcher design (4.3) • Modify Class Pinball Machine to add flippers and bumpers (4.3) • Shared Writing to explain the Chapter 4 Question (4.3)
Explanation that students can make to answer the Chapter 4 Question	To make a moving pinball change direction, we have to exert another force on it, either from a moving object or from a still object in its path.

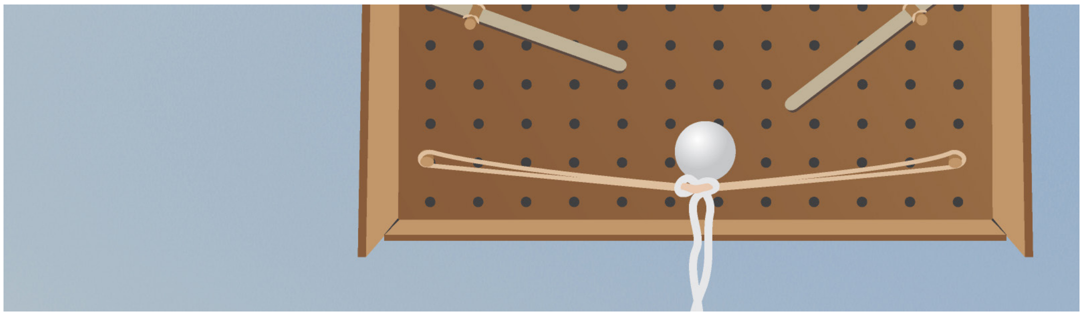
Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How can we create a pinball machine for our class?
Chapter 5 Question	How can we make the pinball machine do all the things we want it to do?
Opportunities to engage in practices and apply key concepts	• Read about designing solutions in *Room 4 Has a Problem* (5.1) • Create diagrams to plan student Box Model design based on Pinball Machine Design Goals (5.1) • Based on diagrammed plans, update student Box Model design (5.1) • Read about testing and updating designed solutions in *Room 4 Solves a Problem* (5.2) • Test student Box Model designs and revise as necessary (5.2) • Write to explain forces in pinball in *How to Play Pinball with Forces* mini-book (5.2-5.3) • Share and explain student Box Models in Box Model Showcase (5.3) • Modify Class Pinball Machine to meet Pinball Machine Design Goals (5.3)
Practice that students can do in response to the Chapter 5 Question	Students can more independently construct a solution to a problem by planning and constructing solutions based on what they've learned, then testing, evaluating, and revising their solution to better meet design goals.

Pushes and Pulls: Designing a Pinball Machine

Problem students work to solve	How do we recognize forces in the world?
Chapter 6 Question	Where are forces around us?
Investigation Question	Where are forces in the world? (6.1)
Evidence sources and reflection opportunities	• Brainstorm where students can find evidence of forces being exerted (6.1) • Use images in *A Busy Day in Pushville* to visualize forces being exerted and evidence of those forces (6.1)
Key concept	• Whenever we see an object start to move, stop moving, or change direction, that is evidence that something exerted a force on it. (6.1)
Application of key concepts to problem	• Investigate evidence of forces at school on School Forces Tour (6.1) • Use Explanation Language Frame to explain evidence of forces on School Forces Tour (6.2) • Read *A Busy Day in Pushville* (6.2)
Explanation that students can make to answer the Chapter 6 Question	There are strong and gentle forces in different directions all around us. We know a force has been exerted on an object whenever that object starts moving, changes direction, or stops moving.

AmplifyScience



Pushes and Pulls:

Designing a Pinball Machine

Investigation Notebook

Name: ______________________________ Date: ____________

Box Model Diagram: Drawing the Launcher

Directions:

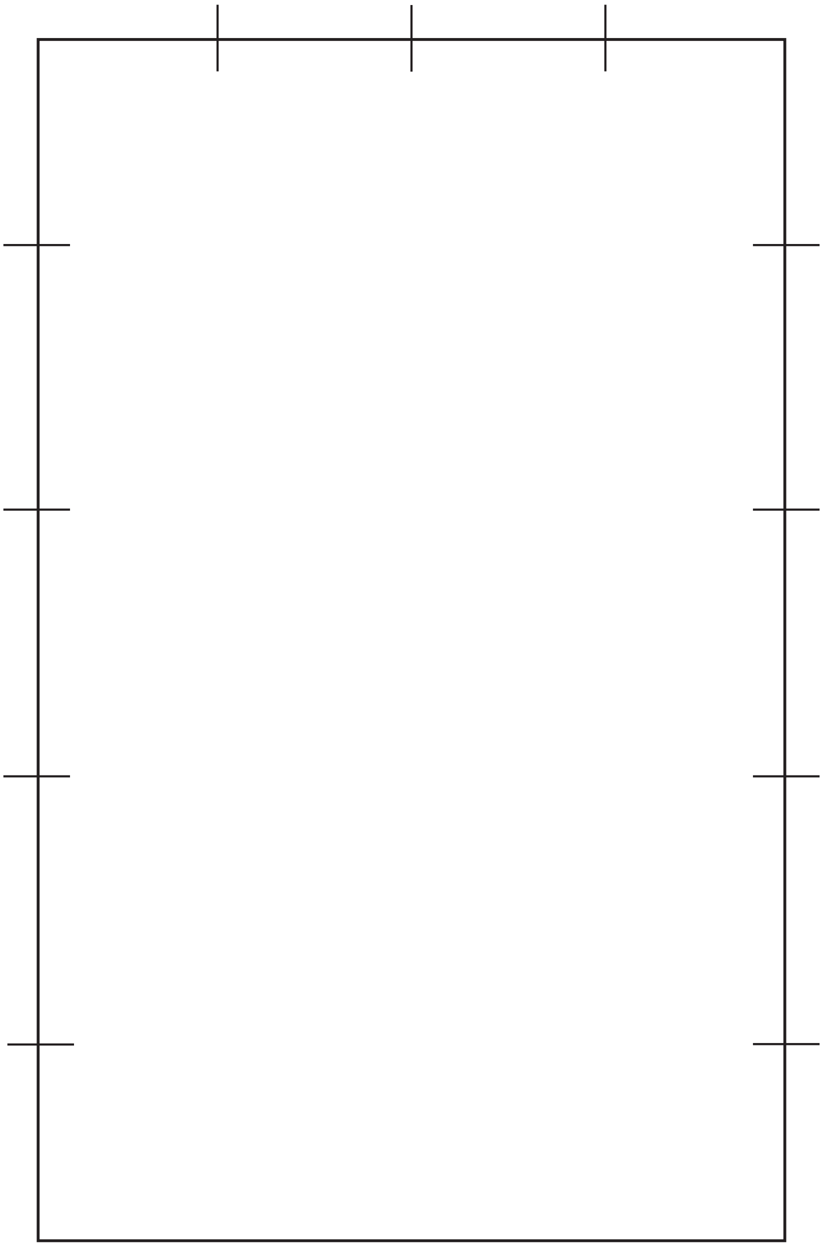
1. Draw the launcher in orange.

2. Draw the ball.

3. Draw how the ball moved.

Name: ______________________________ Date: ____________

Box Model Diagram: Drawing the Launcher (continued)



Connecting key concepts to chapter explanations

Pushes and Pulls

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	An object starts to move when another object exerts a force on it. (1.3) Forces happen between two objects. (1.3)	To make our pinball start to move, we must exert a force on the pinball. We can use a rubber band launcher to exert a force on the pinball.
2	An object moves a long distance when a strong force is exerted on it. (2.2) An object moves a short distance when a gentle force is exerted on it. (2.2)	To make our pinball go the distance we want, the rubber band launcher has to exert a strong force. To make it go a short distance, the rubber band launcher has to exert a gentle force. Attaching a shoelace to the rubber band launcher can help us adjust the force.
3	An object starts to move in the same direction as the force that starts the motion. (3.2) Every force has a strength—gentle or strong—and a direction, which makes the object move a certain distance and direction. (3.4)	To get the pinball moving in the direction we want (left or right), we must exert a force on the pinball in the direction that we want it to move.
4	A moving object changes direction when another moving object exerts a force on it. (4.2) A moving object changes direction when a still object in its way exerts a force on it. (4.2)	To make a moving pinball change direction, we have to exert another force on it, either from a moving object or from a still object in its path.

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

4. 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

Overview: 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 Assessment provides information to help guide decisions related to the instruction designed to address specific gaps in students' understanding. This document will serve as an overview of the *Pushes and Pulls: Designing a Pinball Machine* 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. Depending on the standards for a given grade level, a unit may include additional supporting content; however, the Progress Build serves as the conceptual core of the unit.

In the *Pushes and Pulls* unit, students will learn to construct scientific explanations that describe the different ways that an object moves as caused by different forces exerted on the object. In particular, students will focus on investigating and explaining the different distances and directions that a pinball can be made to move in a pinball machine.

Prior knowledge (preconceptions): There is no significant prior knowledge assumed. Students will certainly have experience with observing moving objects, including rolling balls, as well as making objects move in different ways. Students will have experience moving objects by pushing or pulling, but they likely have not thought carefully about how those objects do so. Students will have opportunities to explore these kinds of actions more carefully over the course of the unit.

Progress Build Level 1: An object starts moving when a force is exerted on it.

When an unmoving object starts to move, it is because another object exerted a force on it.

Progress Build Level 2: Stronger force causes an object to move a longer distance.

When an unmoving object starts to move, it is because another object exerted a force on it. **A strong force will cause the object to move a long distance, while a gentle force will cause the object to move a short distance.**

Progress Build Level 3: An object starts to move in the direction of the force exerted on it.

When an unmoving object starts to move, it is because another object exerted a force on it. A strong force will cause the object to move a long distance, while a gentle force will cause the object to move a short distance. **The object starts moving in the same direction as the force that was exerted on it.**

Progress Build Level 4: Moving objects can change direction because of a force from a moving or still object.

When an unmoving object starts to move, it is because another object exerted a force on it. A strong force will cause the object to move a long distance, while a gentle force will cause the object to move a short distance. The object starts moving in the same direction as the force that was exerted on it. **If the object changes the direction it is moving, it is because a moving or still object exerted a force on it.**

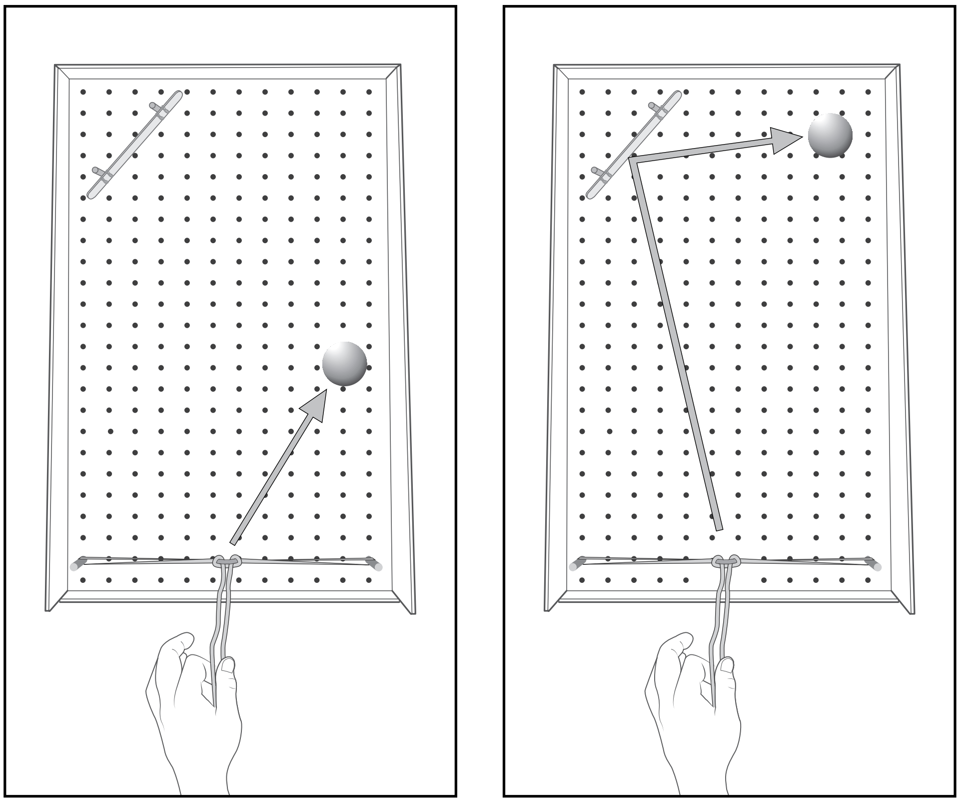
Progress Build and End-of-Unit Assessment

Pushes and Pulls

Directions:

1. Refer to the Pushes and Pulls End-of-Unit Assessment questions and the image from the End-of-Unit Assessment Class Pinball Machine Setup copymaster shown below.
2. Write expected responses to show how students at each level of the Progress Build would respond to the question from the assessment:
   - *Talk to me about the different forces that made the pinball move like it did.*

End-of-Unit Assessment
Class Pinball Machine Setup



First launch   Second launch

Summary of Progress Build level*	Describe how a student would respond to the prompt
1: An object starts moving when a force is exerted on it.	
2: A strong force will cause an object to move a long distance, while a gentle force will cause an object to move a short distance.	
3: An object starts to move in the direction of the force exerted on it.	
4: Moving objects can change direction because of a force from a moving or still object.	

*For a more detailed description of each Progress Build level, refer to the Pushes and Pulls 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. Coherent instruction
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 preconceptions students at your grade level have 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 from the table above to focus more deeply on. Summarize it in the Preconception row of Table 2 below.
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**

Coherent instruction

Goal: Gain confidence in using a Coherence Flowchart as a tool to see how ideas build across a chapter.

1. **As a group, use the Coherence Flowchart for Chapter __ to:**
   a. **Discuss the Chapter __ Question.** How does it connect to the unit problem and to what students figure out in Chapter __?

   b. **Discuss the first Investigation Question.** How does this question help students answer the Chapter Question?

2. **Individually, use the Coherence Flowchart and Teacher's Guide to:**
   a. **Consider evidence sources and reflection opportunities:**
      - **Each group member, choose an activity from the first evidence source/reflection opportunity box in the Coherence Flowchart.** It is okay if some group members choose the same activity, but make sure that there are a variety of activities chosen. Place a star next to the activity you chose on your Coherence Flowchart.
      - **In the Teacher's Guide, navigate to the lesson listed next to your chosen activity and read the Lesson Overview.** What is the purpose of the activity you chose to consider?

      - **Navigate to the activity and then read the steps.** What do students do in the activity? How does this activity help students figure out or reflect upon the Investigation Question?

      - **Check the Teacher Support notes (if applicable).** Do any of the notes help you further understand the purpose of the activity? Are there suggestions for deepening students' experience with the activity or providing more support?

3. **As a group, refer to responses in step 2 and to the Coherence Flowchart for Chapter __ to:**
   a. **Discuss evidence sources and reflection opportunities.**
      - Each group member, share a brief description of the activity you considered and its purpose.
      - How do the activities you discussed build on each other and fit together?
      - How do the activities support the students in answering the Investigation Question?

   b. **Discuss the transition to the next question:**
      - Based on what students figured out, what will they be motivated to wonder next?
      - How does this connect to the next question (Investigation Question or Chapter Question) they work with?

Goal: Gain confidence in using a Coherence Flowchart as a tool to see how ideas build across a chapter.

1. **As a group, use the Coherence Flowchart for Chapter __ to:**
    a. **Discuss the Chapter __ Question.** How does it connect to the unit problem and to what students figure out in Chapter __?

    b. **Discuss the first Investigation Question.** How does this question help students answer the Chapter Question?

2. **Individually, use the Coherence Flowchart and Teacher's Guide to:**
    a. **Consider evidence sources and reflection opportunities:**
        - **Each group member, choose an activity from the first evidence source/reflection opportunity box in the Coherence Flowchart.** It is okay if some group members choose the same activity, but make sure that there are a variety of activities chosen. Place a star next to the activity you chose on your Coherence Flowchart.
        - **In the Teacher's Guide, navigate to the lesson listed next to your chosen activity and read the Lesson Overview.** What is the purpose of the activity you chose to consider?
        - **Navigate to the activity and then read the steps.** What do students do in the activity? How does this activity help students figure out or reflect upon the Investigation Question?
        - **Check the Teacher Support notes (if applicable).** Do any of the notes help you further understand the purpose of the activity? Are there suggestions for deepening students' experience with the activity or providing more support?

3. **As a group, refer to responses in step 2 and to the Coherence Flowchart for Chapter __ to:**
   a. **Discuss evidence sources and reflection opportunities.**
      - Each group member, share a brief description of the activity you considered and its purpose.
      - How do the activities you discussed build on each other and fit together?
      - How do the activities support the students in answering the Investigation Question?

   b. **Discuss the transition to the next question:**
      - Based on what students figured out, what will they be motivated to wonder next?
      - How does this connect to the next question (Investigation Question or Chapter Question) they work with?

Formative assessment and differentiation

Pushes and Pulls

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 Pushes and Pulls deep dive sequence, you conducted a forces investigation using a variety of objects and practiced using scientific language to describe what you were observing in the investigation.

- Navigate to Pushes and Pulls → Chapter 1 → Lesson 1.3 → Activity 2
- Select Embedded Formative Assessment
- Select On-the-Fly Assessment 2: Using Scientific Language While Investigating Forces
- Read the Look for and Now what? sections and then complete the table below.

Pushes and Pulls Lesson 1.3, 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 1.3 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

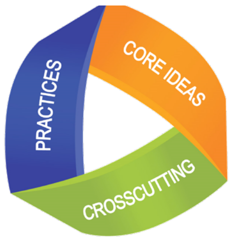
Directions:

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