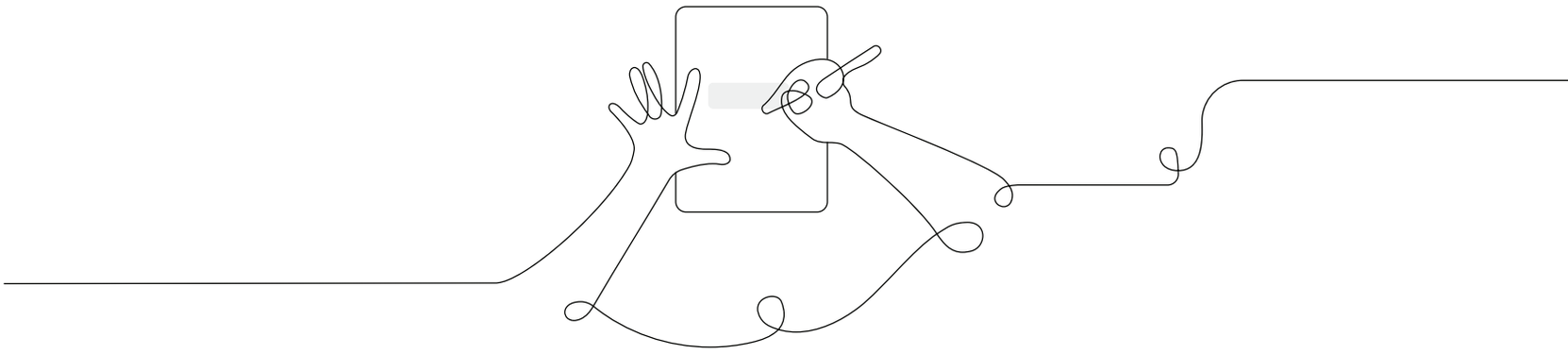
Amplify Science

Participant Notebook

Supporting Diverse Learner Needs
Grade K: Pushes and Pulls

New York City Schools



Supporting Diverse Learners
Unit-specific workshop agenda

Reflections and Framing the Day

Defining Diverse Learners

Understanding Opportunities for Supporting Diverse Learners

Analyzing Formative Assessment Data and Embedded Differentiation Strategies

Planning to Teach

Closing

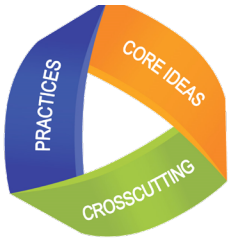
Demo account for your workshop:

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

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

Password: **AmplifyNumber1**

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**

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.

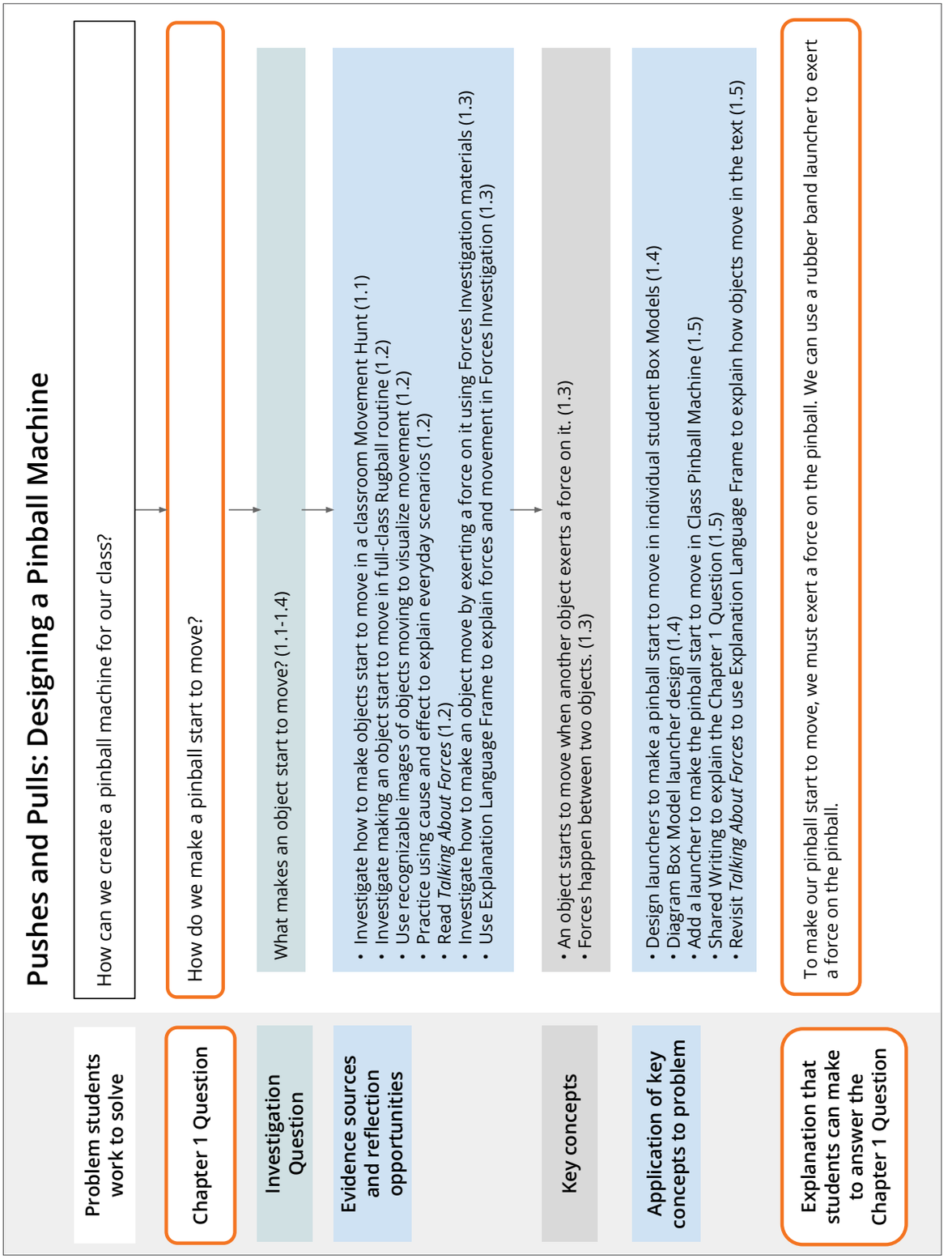
How they figure it out: Students create and then improve a pinball machine, first on their own in their Box Models and then in the Class Pinball Machine. Students draw their plans and write a mini-book to explain what they have learned.

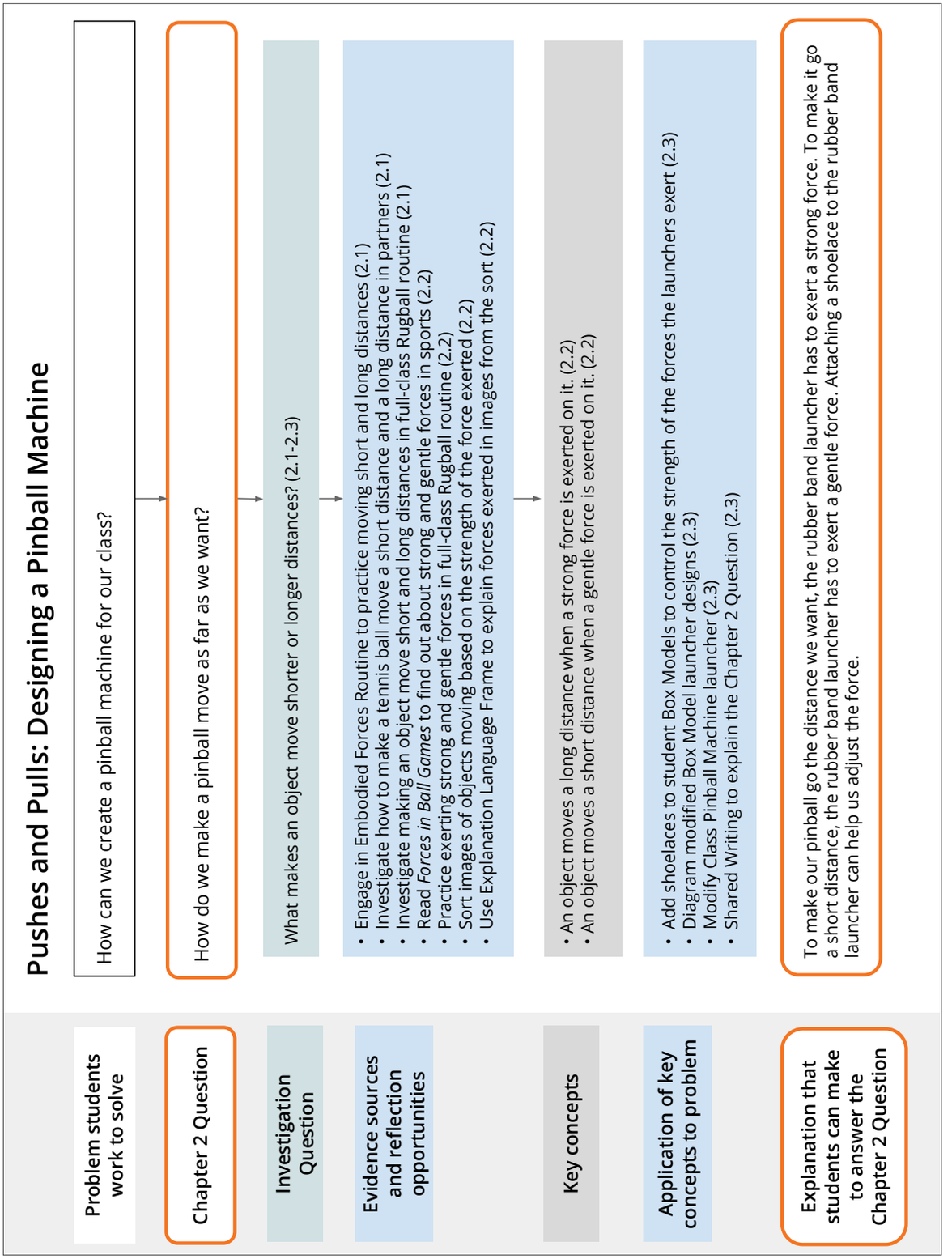
Chapter 6: Where are forces around us?

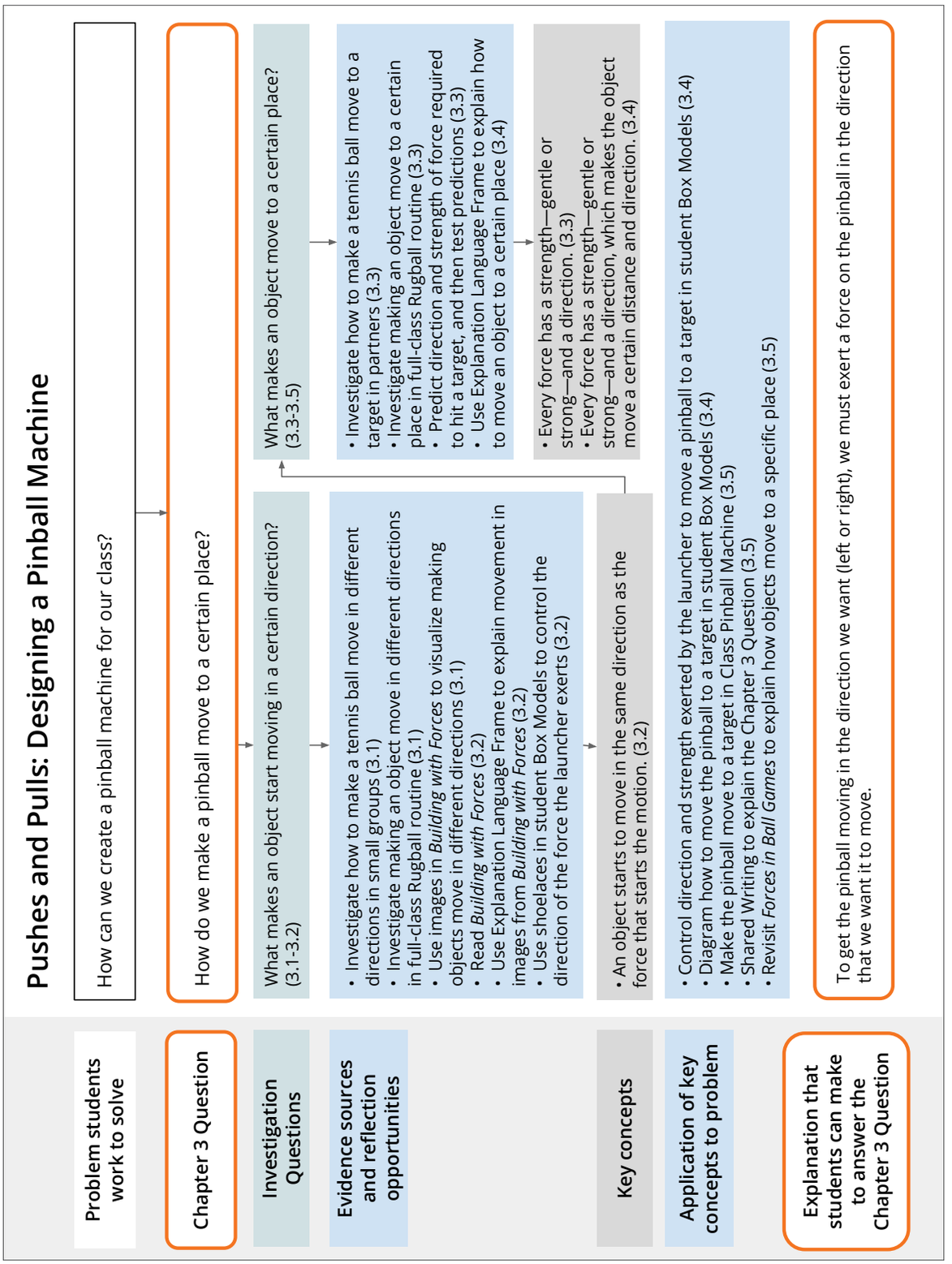
Students figure out: There are strong and gentle forces in different directions all around us. We know a force has been exerted on an object whenever that object starts moving, changes direction, or stops moving.

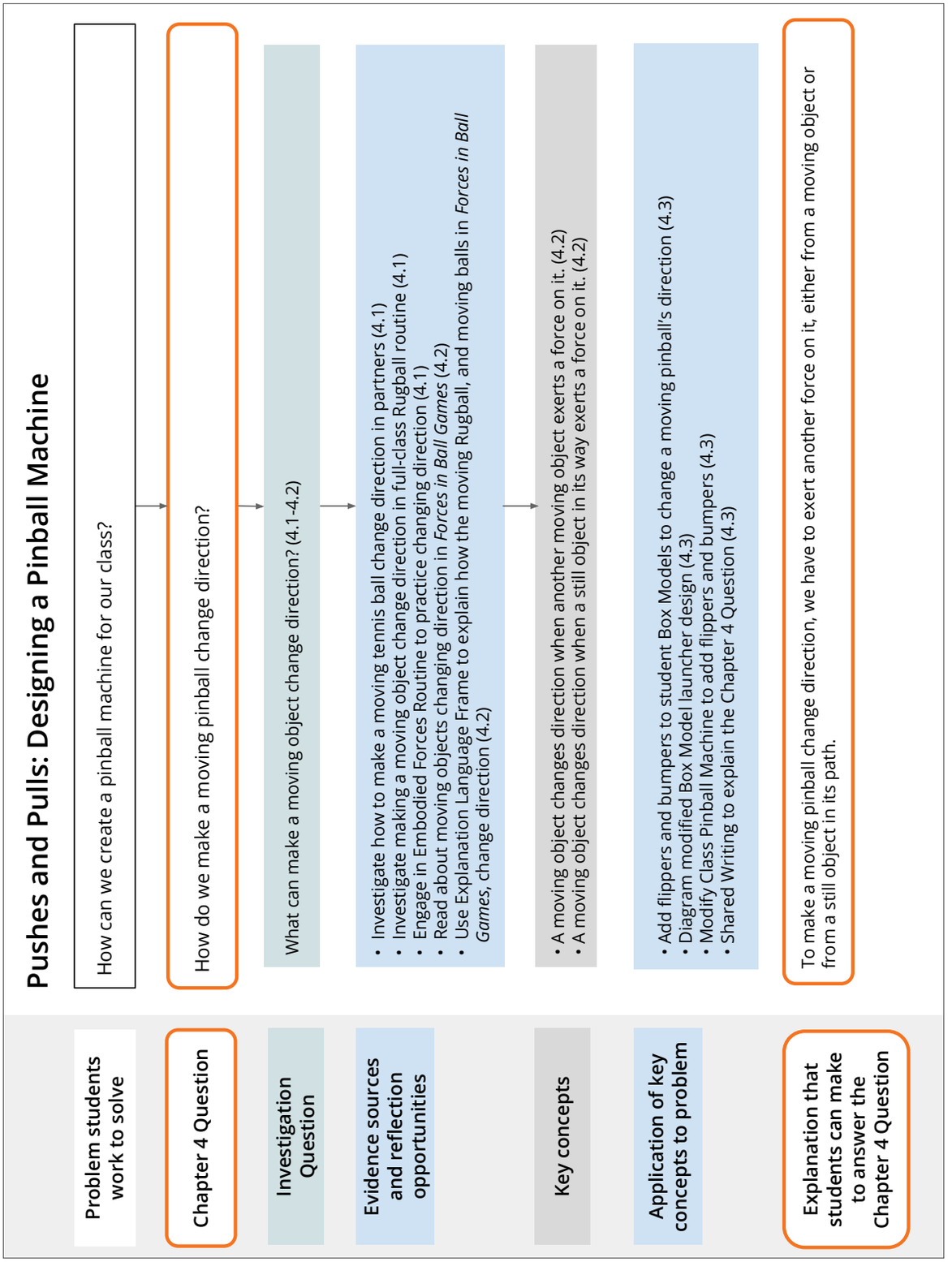
How they figure it out: Students tour their school to identify evidence of forces. Then students read and discuss a book that shows forces at work in the world.

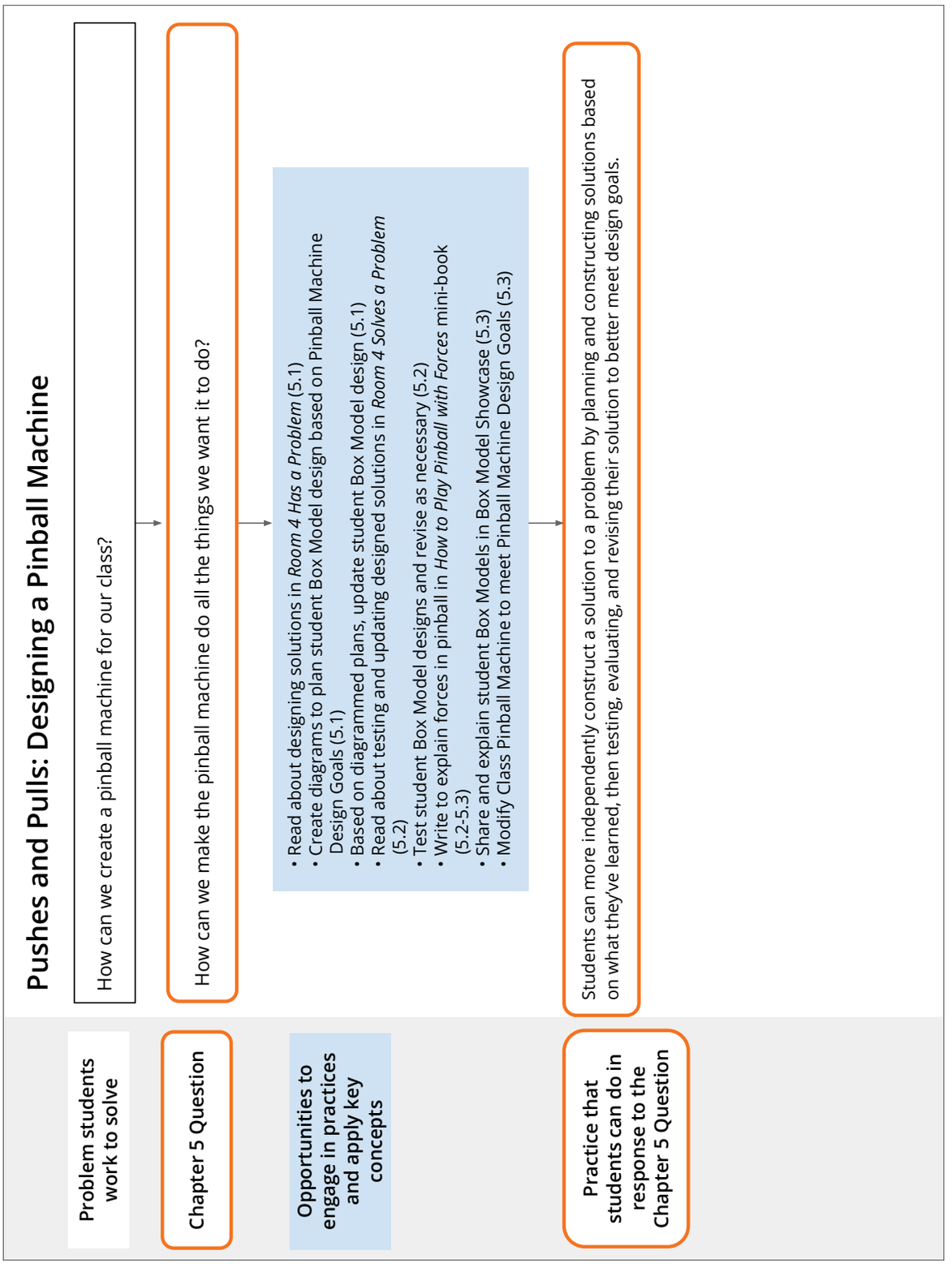
Pushes and Pulls Coherence Flowchart

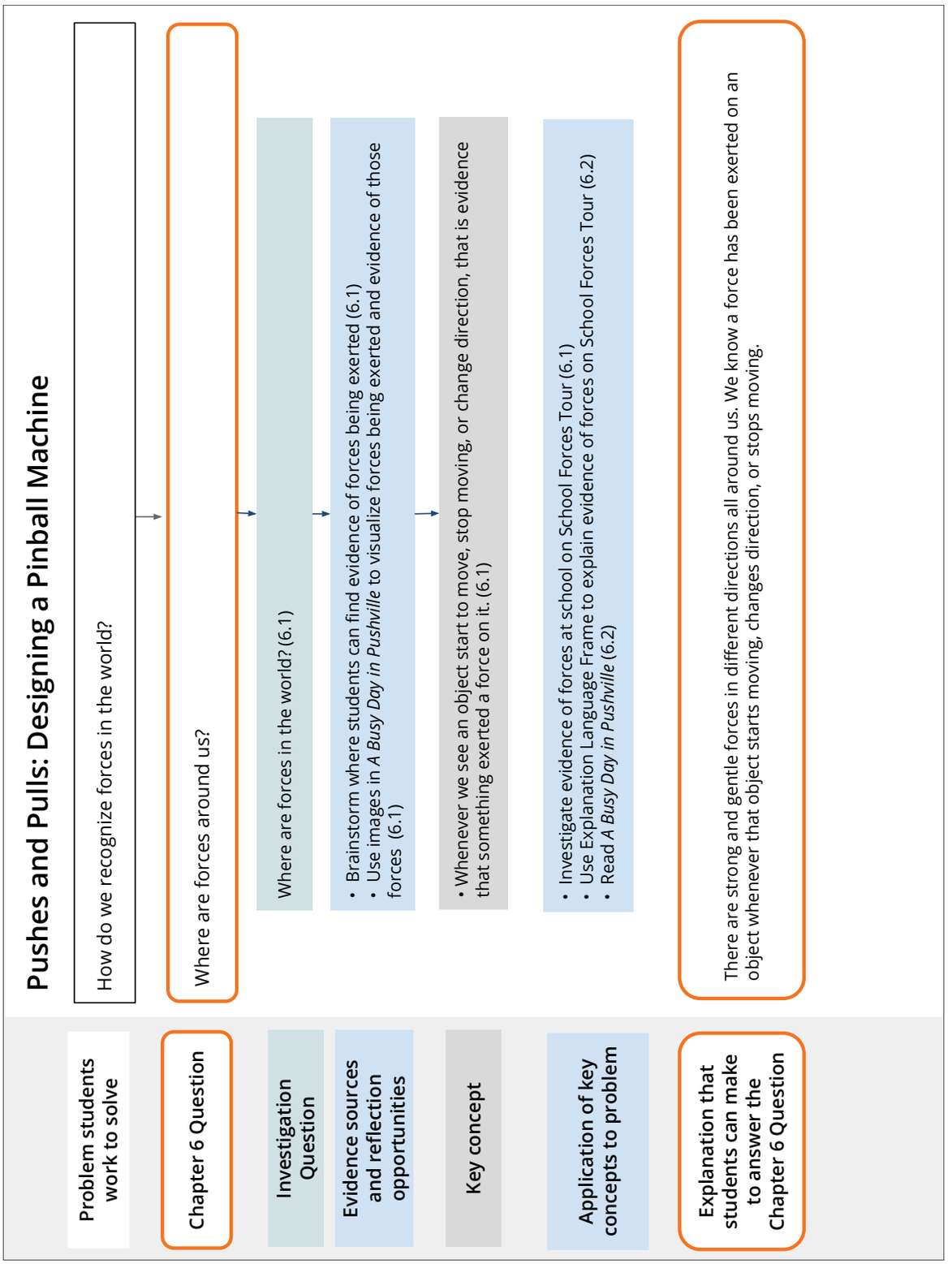




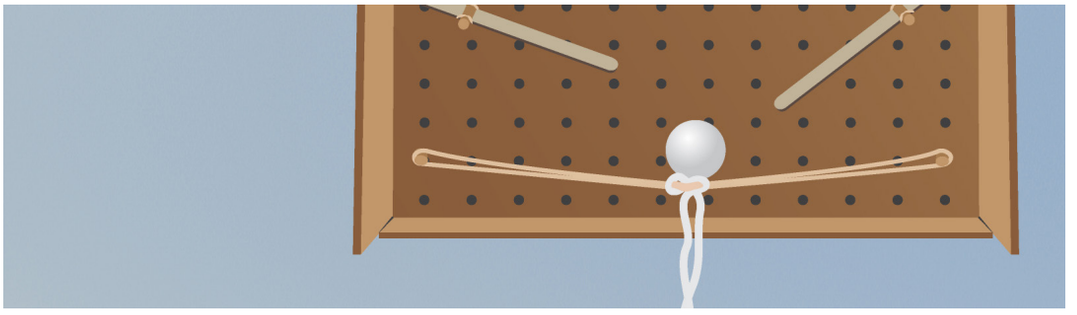








AmplifyScience

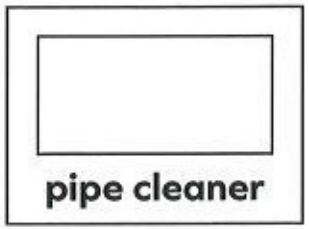


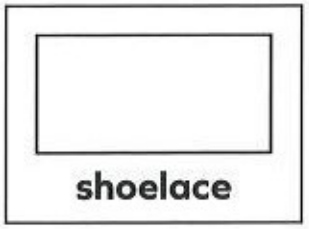
Pushes and Pulls:

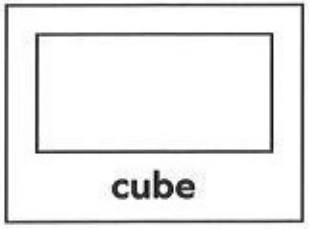
Designing a Pinball Machine

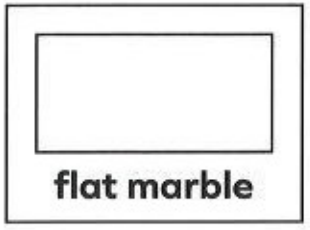
Investigation Notebook

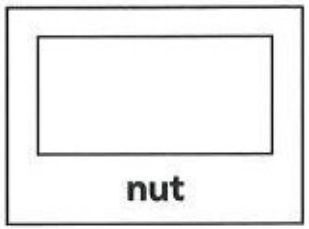
The _____ started to move because the _____ exerted a force on it.


pipe cleaner


shoelace


cube


flat marble


nut


wooden stick


paper towel

Teacher: Mr. Saturn **Grade Level** : K **Date:** 8 /2018
Unit Name: Pushes and Pulls **Chapter:** 1 **Lesson:** 1.3, Act. 2

A.) Determine the "Look For's" for the On the Fly Assessment
On-the-Fly Assessment 2: Investigating Forces

B.) Rate the Look -Fors
'**3'** if student demonstrates a **strong understanding**
'**2'** if student demonstrates **some understanding**
'**1'** if student demonstrates **no understanding**

Look Fors	Learner A	Learner B	Learner C	Learner D
Look for #1: Student participates in exploration of why objects move.	3	3	2	2
Look for #2: Student correctly incorporates vocabulary word '**exert'** in explanation. (Can explain that one object exerts a force on the other object to make it move.)	2	1	1	2
Look for #3: Student correctly incorporates vocabulary word '**force'** in explanation. (Can explain that one object exerts a force on the other object to make it move.)	2	2	2	2
Look for #4: Student shares ideas with a partner, demonstrating listening and speaking behaviors.	3	3	1	1

C.) After data are collected for the OTF, analyze the student needs and refer to the **NOW WHAT** section for ideas on how to respond to your students' needs.

Learner Profiles

Learner A: Enjoys science and math. Loves to tell stories about her many travels and enjoys figuring out phenomena presented. While she finds verbal explanations to be sufficient, she does not find it necessary to elaborate on her ideas through written explanation or written argument. She often shuts down when pushed to provide supporting details in writing.

Learner B: Enjoys reading and writing. When provided a written assignment, he is anxious to provide lengthy written and verbal explanations. Although, this learner enjoys reading, writing and speaking he is challenged by sentence structure, spelling and staying on topic.

Learner C: This new student enjoys expressing himself through art and drawings. He is not a strong reader, yet, as English is his second language. This student has strong comprehension skills and has adapted to using the classroom artifacts to help him construct written explanations.

Learner D: Enjoys solving critical thinking problems and has rich science vocabulary. She works best when provided independent tasks and does not work well in collaborative group settings. She relies on step by step teacher validation and is not likely to complete a task without making sure her answer affirmed by an adult in the room.

Name: _____ Date: _____

Box Model Diagram: Drawing the Launcher

Directions:

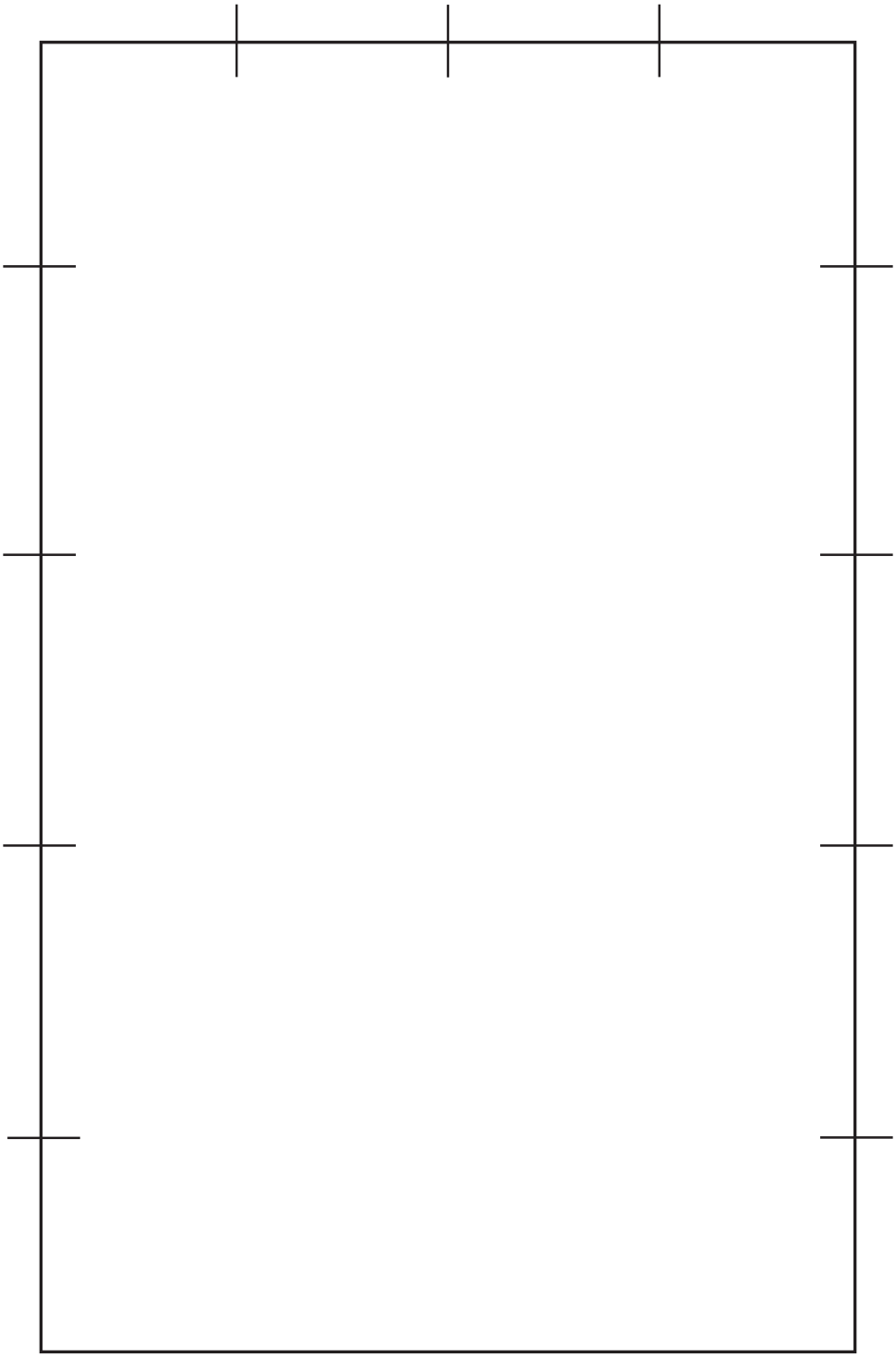
1. Draw the launcher in orange.

2. Draw the ball.

3. Draw how the ball moved.

Name: _____ Date: _____

Box Model Diagram: Drawing the Launcher (continued)



Name: _____ Date: _____

Box Model Diagram:
Planning Our Box Models

Directions:

1. Draw the launcher in orange.

2. Draw the shoelace in black.

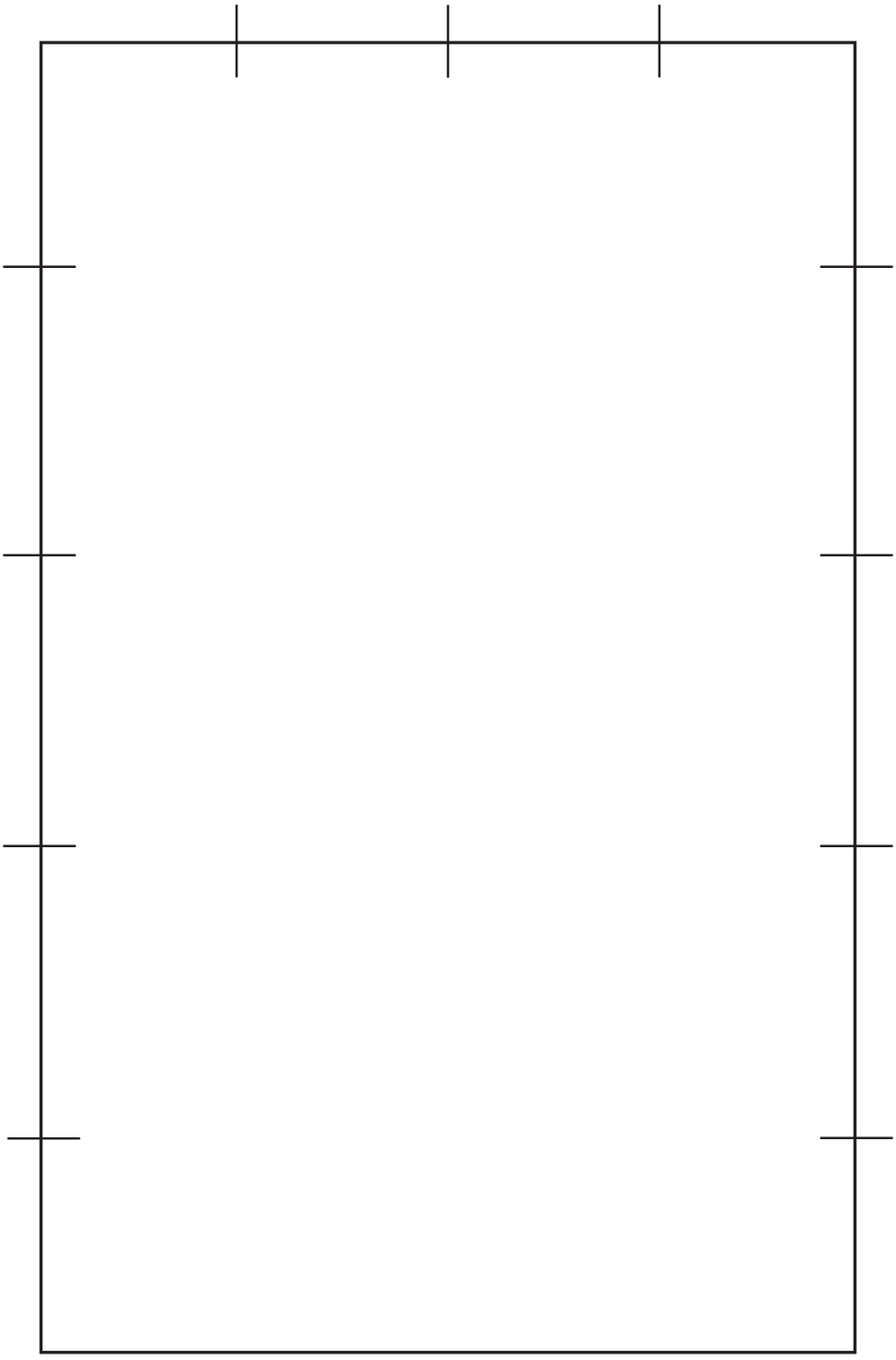
3. Draw the target in red.

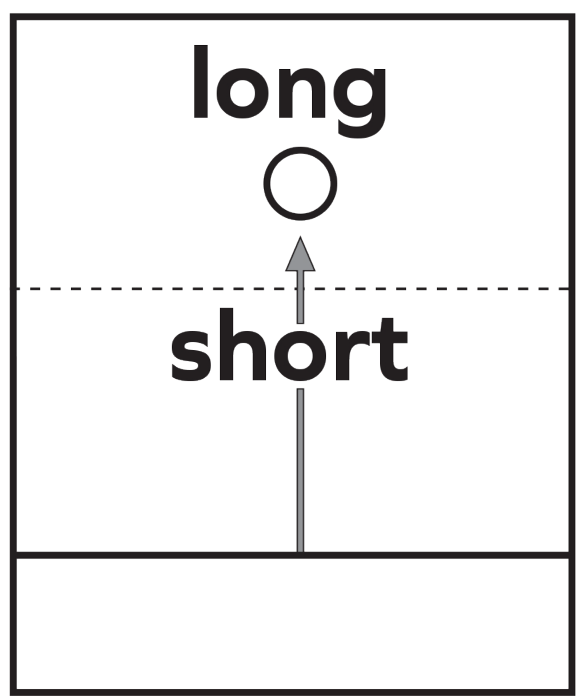
4. Draw the flippers in blue.

5. Draw the bumpers in brown.

Name: _____ Date: _____

Box Model Diagram:
Planning Our Box Models (continued)



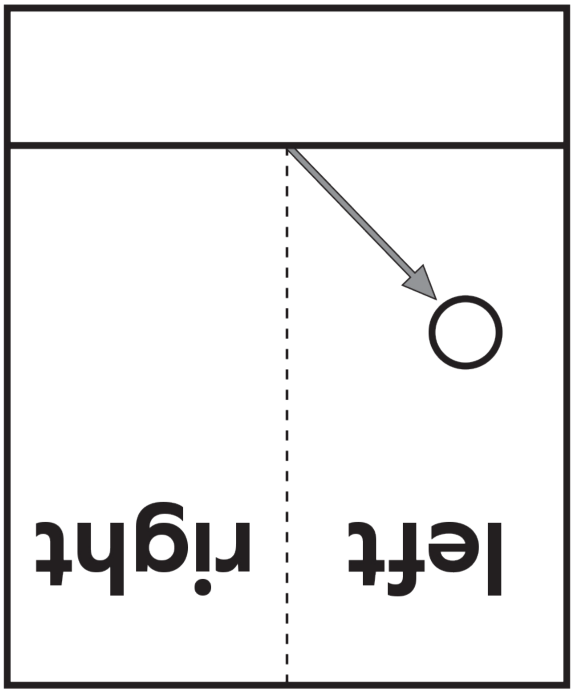


2

3

_____________ a force to the left to make the pinball move to the left.

4



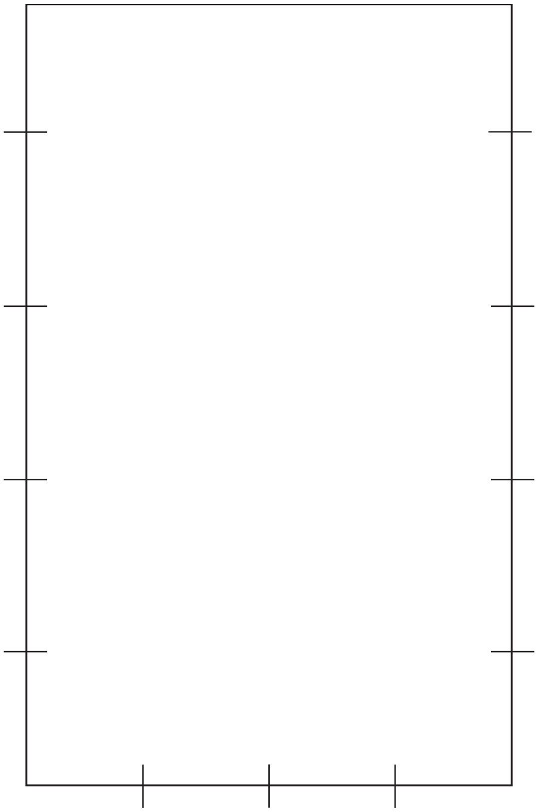
_____________ a _____________

with a moving object to make

the pinball change direction.

5

9



1

Exert a strong __________

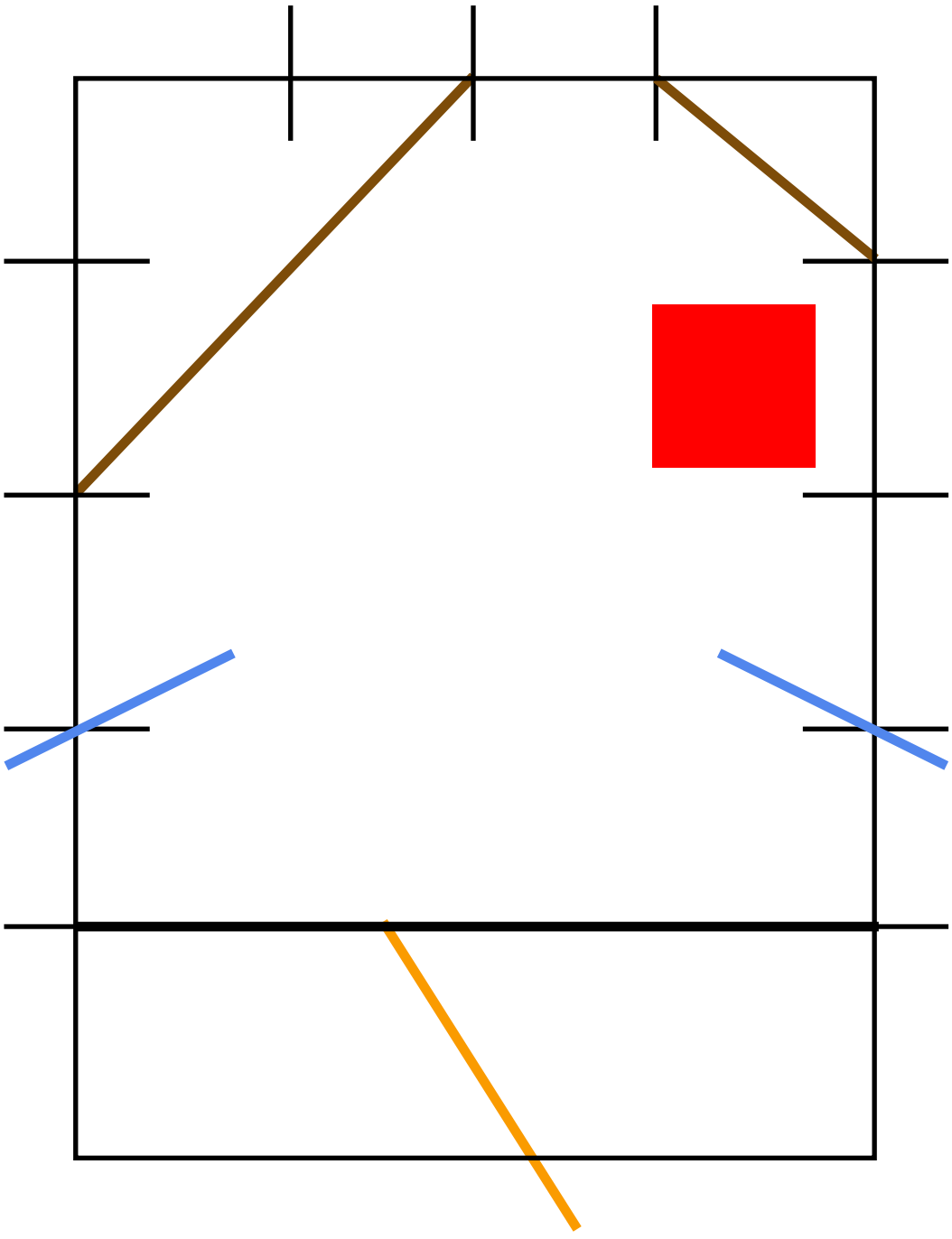
to make the pinball move a

long distance.

How to Play Pinball with Forces

Name: ______________________

Sample Incorrect
Box Model Diagram: Lesson 5.2



Keeping Diverse Learner Needs in Mind

Reflection Tool

Unit Name: _____ Chapter #: _____ Lesson #: _____

Circle the Selected Learner Profile: A B C D

Directions: Reflect on each lesson activity and jot down strategies to support the student you selected from the Learner Profile.

Lesson Activity	My Student May be **Challenged by...**	Suggestions from the **Differentiation Brief**	Suggestions from my own **Teacher Toolkit**
1			
2			
3			
4			
5			

Take a Moment: How will this activity influence your planning practices?

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.

End-of-Unit Assessment Questions

Science Content: Forces and Motion

Prompt the student to explain the forces that were exerted.

- *We have learned a lot about how different kinds of forces make things, like the pinball, move in different ways. I am going to make the pinball move in our Class Pinball Machine. Talk to me about the different forces that made the pinball move like it did.*

Ask follow-up questions to probe for aspects of motion that students did not explain. If students do not mention ideas that were the focus of the unit, they may still have some understanding of those ideas, even if they did not independently use them in their explanations. You can ask the following questions to probe for ideas that students did not include.

If the student does not mention the force from the bumper:

- *Were there any forces exerted on the ball after I launched it the second time? Why do you think so?*

If the student does not mention the direction of forces:

- *Why did the ball move in this direction when I pulled the launcher and in that direction after the ball hit the bumper?*

If the student does not mention the strength of forces:

- *Why did the ball move only a short distance the first time but a long distance the second time?*

Crosscutting Concept: Cause and Effect

Prompt the student to give an example of cause and effect in the pinball's motion. Remind the student that cause and effect means something happens because another thing caused it.

- *Think about how the ball moved in the pinball machine. Can you describe an example of cause and effect?*

If the student has difficulty giving an example:

- *Can you use the word* because *to explain what made the ball move the way it did?*

If the student still has difficulty giving an example, launch the pinball one more time and provide the following scaffolding:

- *What caused the ball to move?*
- *What happened to the ball when the launcher hit it?*
- *How can we use the word* because *to explain what happened?*

End-of-Unit Assessment Questions (continued)

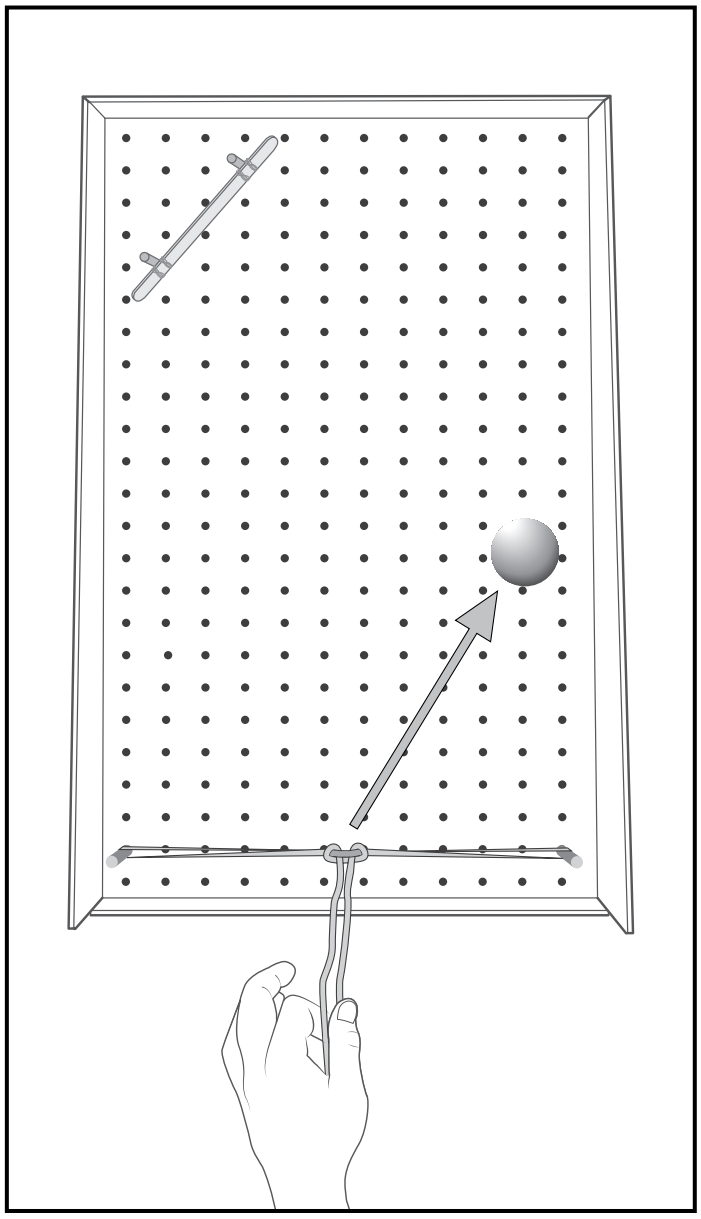
Science and Engineering Practice: Supporting an Answer with Evidence

Prompt the student to provide evidence of the strength of a force. Launch the pinball two more times—the first time very gently so the ball moves only a short distance; the second time with a stronger force so the ball moves a longer distance.

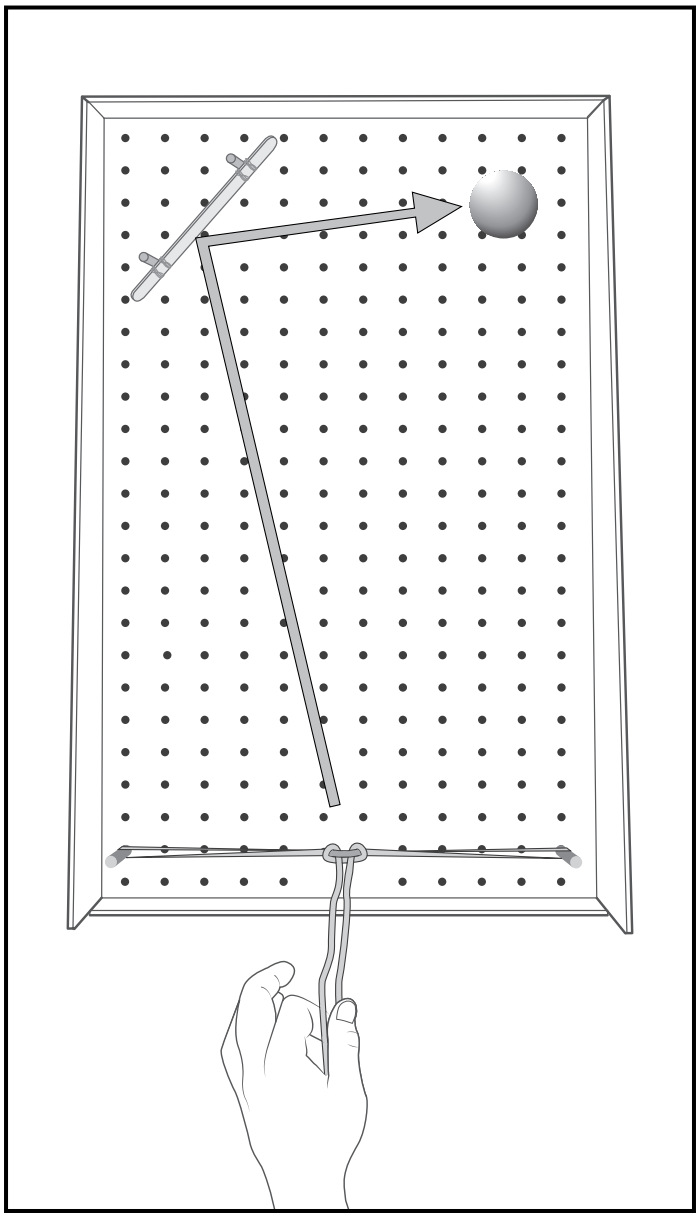
- *I launched the ball two times. Which time do you think the force was stronger—the first time or the second time?*
- *What is your evidence that that force was stronger?*

  If the student is not sure how to respond:
  - *What did you see that made you think the force was stronger?*

End-of-Unit Assessment
Class Pinball Machine Setup



First launch



Second launch

Grade K: Unit 2 - Pushes and Pulls

Sample Rubric Compilation & Scoring Guide for the End of Unit Assessment (Lesson 6.3)

Criteria	0	1	2	3	4
Assessing Students Understanding of Science Concepts in the Unit. Did the student provide an accurate explanation of how different forces are responsible for different movement in the class pinball machine? Did the student's explanations reflect an understanding of the Disciplinary Core Ideas (DCI) in the unit?	No or inaccurate response	The student **only explains one** of the following: the ball moved because the launcher exerted force on it, the ball moved a short distance because the launcher exerted a gentle force on it, the ball moved a long distance because the launcher exerted a strong force on it,the ball moved in a given direction because the launcher exerted a force on it in that direction, **or** the ball changed direction because the still object exerted a force on it.	The student **only explains two** of the following: the ball moved because the launcher exerted force on it, the ball moved a short distance because the launcher exerted a gentle force on it, the ball moved a long distance because the launcher exerted a strong force on it,the ball moved in a given direction because the launcher exerted a force on it in that direction, **or** the ball changed direction because the still object exerted a force on it.	The student **only explains three or four** of the following: the ball moved because the launcher exerted force on it, the ball moved a short distance because the launcher exerted a gentle force on it, the ball moved a long distance because the launcher exerted a strong force on it,the ball moved in a given direction because the launcher exerted a force on it in that direction, **or** the ball changed direction because the still object exerted a force on it.	The student **explains all** of the following: the ball moved because the launcher exerted force on it, the ball moved a short distance because the launcher exerted a gentle force on it, the ball moved a long distance because the launcher exerted a strong force on it,the ball moved in a given direction because the launcher exerted a force on it in that direction, **and** the ball changed direction because the still object exerted a force on it.
Assessing student understanding of the Crosscutting Concept of Cause and Effect Did the student describe and identify an example of cause and effect (in the context of the pinball machine)?	No or inaccurate response	The student **does one** of the following: describes an appropriate example of cause and effect **or** explicitly identifies cause and effect accurately, provides an appropriate example of cause and effect from the Class Pinball Machine, **or** explicitly identifies cause and effect in his/her example.	The student **does two** of the following: describes an appropriate example of cause and effect **or** explicitly identifies cause and effect accurately, provides an appropriate example of cause and effect from the Class Pinball Machine, **or** explicitly identifies cause and effect in his/her example.	The student **does three** of the following: describes an appropriate example of cause and effect **or** explicitly identifies cause and effect accurately, provides an appropriate example of cause and effect from the Class Pinball Machine, **or** explicitly identifies cause and effect in his/her example.	The student **does all** of the following: describes an appropriate example of cause and effect **and** explicitly identifies cause and effect accurately, provides an appropriate example of cause and effect from the Class Pinball Machine, **and** explicitly identifies cause and effect in his/her example.
Assessing Students Understanding of the Practice of Supporting an Answer with Evidence Did the student provide a description of appropriate observations as evidence of the nature of the force exerted?	No or inaccurate response	Student describes **one** of the following: the movement of the pinball as evidence for his/her response, describes the ball's long distance traveled as evidence a stronger force was exerted, **or** did not know what to provide when explicitly asked for evidence he/she described the long distance traveled as what he/she saw that led to his/her answer.	Student describes **two** of the following: the movement of the pinball as evidence for his/her response, the ball's long distance traveled as evidence a stronger force was exerted, **or** did not know what to describe when explicitly asked for evidence he/she described the long distance traveled as what he/she saw that led to his/her answer.	Student describes **all** of the following: the movement of the pinball as evidence for his/her response **and** describes the ball's long distance traveled as evidence a stronger force was exerted.	Student describes **all** of the following: the movement of the pinball as evidence for his/her response **and** describes the long distance traveled by the ball as evidence a stronger force was exerted. Provides an additional example with supporting evidence.

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.*

Grade: _____ Unit Name:_____

Scoring Guide for the End of Unit Assessment (Template)

Criteria	0	1	2	3	4

[Status of the Class Data Collection and Organizational Tool]

Teacher: **Grade Level** : **Date:**
Unit Name: **Chapter:** **Lesson:**

A.) Determine the "Look For's" for the On the Fly Assessment
On-the-Fly Assessment # ____:

B.) Rate the Look -Fors
'3' if student demonstrates a strong understanding
'2' if student demonstrates some understanding
'1' if student demonstrates no understanding

Students	Look For #1	Look For #2	Look For #3	Look For #4	Look For #5

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