

Forces

Lesson 1: What makes something start to move?

Grade: 3	Length of lesson: 60 minutes	Placement of lesson: 1 of 6 lessons in the Forces lesson series.
Unit Central Questions: What makes something start to move? What makes something stop moving or change direction?		Lesson Focus Question: What makes something start to move?
Main learning goal: A force is a push or a pull. Forces cause changes in motion.		
Science content storyline: Objects start to move because something pushes it or pulls it. Pushes and pulls imply that there is the something being pulled or pushed and something doing the pushing or pulling – there is an interaction between two objects. Gravity is a type of pull. When an object drops or falls, we can say that Earth is pulling on the object with the force of gravity.		
Ideal student response to the Focus Question: Something starts to move because it is pushed, pulled or dropped. Two objects usually need to touch to push or pull, but Earth’s gravity pulls objects toward Earth even when objects aren’t touching the ground.		

Note to teacher: In the lesson plans for this module, anticipated student responses indicate ideas that students might have related to the elicit question posed. Some of these ideas are scientifically correct, but others represent misconceptions. Inaccurate ideas are indicated with italics. Notice that these inaccurate student ideas are not “corrected” by the teacher. Sometimes the teacher uses the opportunity to ask questions to push student thinking and make connections to science ideas developed during classroom activities. Other times, teachers should keep track of these ideas and return to them as the lessons progress to address these ideas.

Preparation

MATERIALS NEEDED	AHEAD OF TIME
<p>Teacher Masters:</p> <ul style="list-style-type: none"> Lesson 1 powerpoint <p>Student Handouts:</p> <p>1.1 Master: Forces reading</p> <p>Other Materials:</p> <ul style="list-style-type: none"> 1 per class: cart or rolling chair 1 per group: tray, ball, block, paddle ball, toy car 	<ul style="list-style-type: none"> Lesson 1: Review the information about <i>forces and motion</i> in the Content Background document Sort the moving objects so each group will have a tray with one of each object. Prepare cards for a word wall. These will be put on the board during the activity follow-up. <ol style="list-style-type: none"> Force: A force is a push or a pull. In most cases, two objects must touch to exert a force. Gravity: Gravity is the pull of the Earth. Gravity pulls on objects even when they do not touch.

Lesson 1 General Outline

Time	Phase of lesson	How the Science Content Storyline Develops
8 min	Central Unit Question: The teacher introduces the central unit questions: <i>What makes something start to move? What makes something stop moving or change direction?</i> Students discuss their initial ideas.	
6 min	Lesson Focus Question: The teacher introduces the focus question. Students write it in their science notebook.	
10 min	Set up for Activity 1: Students discuss what needs to happen to make a cart start to move. Words used to describe what makes the cart begin to move are recorded on a chart.	Something starts to move when it is pushed, pulled, or falls/drops. Pushing and pulling involves an interaction between two different objects.
14 min	Activity 1: Groups of students are provided with several objects and they describe and record what is being pushed or pulled and what is doing the pushing and pulling in order to make the object start to move, change direction, or stop.	Something starts to move because something else pushes or pulls it. There is an interaction between two objects causing motion.
12 min	Follow-up to Activity 1: The term “force” is introduced. Students read Master 1.1 about and brainstorm additional examples of what causes an object to move, change direction or stop.	Scientists use the term “force” to describe a push, pull or drop that causes changes in motion. Gravity is a force that does not require contact between two objects. Gravity is the pull of the Earth.
8 min	Synthesize/Summarize: Students answer the focus question in their science notebook with a sentence and drawing.	
2 min	Link to Next Lesson: How can a force that we cannot see be shown in a picture or drawing?	

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6 min	<p>Introduce the Central Unit Question</p> <p>Synopsis: The teacher introduces the central unit questions: <i>What makes something start to move move? What makes something stop moving or change direction?</i> Students discuss their initial ideas.</p>	Set the purpose with a focus question	<p><i>Display the Central Unit Question for the class to see and refer to it through the lesson series.</i></p> <p>For the next several lessons, we will be asking the questions, <i>What makes something start to move? What makes something stop moving or change direction?</i></p> <p>Note to teacher: <i>Show the Lesson 1 ppt, slide 2.</i></p> <p>Have you ever thought about that question before? Picture something that moves. What made it start moving? What would make it stop moving?</p> <p><i>Pause to let students think of an example. Ask one or two people to share their “thing that moves” so that if some students don’t yet have an idea, they can get some hints from their classmates.</i></p> <p>Does everyone have in their mind something that moves? Thumbs up or thumbs down. Turn to your partner and share your ideas about what made the “thing” start to move and what would happen to make the thing stop moving. Each partner gets 1 minute to share their ideas.</p>		

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			<p>Who wants to share what you and your partner talked about that describes what makes something start to move and what makes something stop moving? <i>Allow only 2 or three students to share at this time. Keep track of the examples students give so you might come back to them later in the lesson or lesson series.</i></p> <p>These are all wonderful examples. I'm glad you could think of so many things in your life that move! Over the next several days we will be investigating what makes something <i>start to move, change speed or direction, or stop moving.</i></p>	<p>A car moves. The engine makes it move and the brakes make it stop moving.</p> <p>A person moves. Muscles make the person move and stop moving.</p> <p>The wind moves. I don't know what makes the wind move or stop moving!</p> <p>A shopping cart at the grocery store moves. It starts moving when you push it and stops moving when you stop pushing it.</p>	
8 min	<p>Focus Question</p> <p><u>Synopsis:</u> The teacher introduces the focus question. Students write it in their science notebook.</p>		<p>Today we will focus on just one part of the Central Unit Question; today's question is: <i>What makes something start to move?</i></p> <p>Please write the Central Unit Question in your science notebook and draw two boxes around it. [<i>Model how to draw these boxes for the students.</i>] Below that box, write today's focus question and draw one box around it. At the end of class today, we will write down some ideas we have to answer today's focus question.</p>		
10 min	Set up for Activity 1		[<i>Have a cart positioned in the class where all the students can see it.</i>]		

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			<p>cart moving – there was something that touched cart that made the motion happen. Something had to do the pushing or the pulling to make the cart start to move.</p>		
12 min	<p>Activity 1</p> <p><u>Synopsis:</u> Groups of students are provided with several objects and they describe and record the <i>interactions</i> that change an objects motion (start to move, change direction or stop).</p> <p><u>Main science ideas:</u> Something starts to move because something else pushes or pulls it. There is an interaction between two objects causing motion.</p>	<p>Select activities that are matched to the learning goal.</p>	<p>You have come up with several good words to describe what makes something move.</p> <p>I’m going to give each of you a tray of science materials. On the tray are objects that you might sometimes use as toys. In science class we’re going to use these objects to learn about what makes thing start to move, so please use the objects at your table as “science tools,” not like toys! In particular, if you are exploring the paddle ball, we need to be safe. Please only have the ball go straight toward the ground, not toward your neighbor!</p> <p><i>[Model the appropriate use of the paddleball. Strike the ball gently with the paddle so the ball goes straight toward ground and comes back toward the paddle.]</i></p> <p>When your group has a set of objects, each person should select one or two of the items from the tray to explore. Use this time to think of different ways you might make something move.</p> <p>Record your findings on a new page in your science notebook using a Tree Map to record the name of the object, what “other thing” pushed or pulled, and what action caused the motion or a change in motion. Try to be very specific in your notes. What</p>		

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		Ask questions to probe and challenge student ideas.	<p>is moving, and what touched it to cause the motion to occur. Are there times when something moves without anything touching it?</p> <p><i>Show the example of how to set up the tree map on slide 4 in the Lesson 1 powerpoint.</i></p> <p><i>Allow student groups 7 minutes to explore and record their ideas about what causes the object to start moving for one or two of the objects. Each person in the group can decide which objects to explore. Circulate among the students asking them to describe what caused the action, what were the two things that were touching that caused the object to start moving.</i></p>	<p>I hit the ball with the paddle and the ball went forward then came back.</p> <p>The paddle pushed the ball.</p> <p>The rubber band made the ball come back. The rubber band pulled the ball back.</p> <p>I pushed the ball and it rolled off the table.</p> <p>The ball moved in the same direction that I pushed it. But when it got to the end of the table, it fell to the floor. I think gravity pulled the ball to the floor.</p>	<p>Okay, you pushed the paddle. What pushed the ball? Why didn't the ball just keep going when you pushed it, what made it come back? How did the rubber band make the ball come back?</p> <p>Okay, you pushed the ball. What direction did you push it in? Did it move in that direction? Why didn't it keep moving in that direction after it went off the end of the table? What made the ball fall to the floor?</p> <p>Oh, that's interesting. You said gravity pulled the ball. Is that another kind of pull? Keep that idea in mind – write it down in your notebook.</p>

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			<p><i>Encourage students to explore different objects and record their ideas in their science notebook at a brisk pace. It is not necessary that they write something about each object, but each student should have ideas about at least one object written in their tree map.</i></p> <p>Please place the items back on your tray and have one person in the group return the tray to my table.</p>	<p>I blew on the ball.</p> <p>I did!</p> <p>No. I didn't touch the ball.</p> <p>The air. I blew the air and the air pushed the ball.</p>	<p>What made the ball move when you blew on it?</p> <p>Were you touching the ball when it moved?</p> <p>What was touching the ball that made it move?</p>
10 min	<p>Follow-up Activity 1</p> <p><u>Synopsis:</u> The term “force” is introduced. Students read Master 1.1 about and brainstorm additional examples of what causes an object to move, change direction or stop.</p> <p><u>Main science ideas:</u></p> <ul style="list-style-type: none"> • Scientists use the term “force” to describe a push, pull or drop that causes motion or 		<p>There is a word that scientists use to describe what makes something start moving, stop moving, or change direction. That word is “Force.” A force is a push or a pull.</p> <p>I’m going to give you each a reading about forces. Read to find out what a force is. When both you and your partner are done, talk with your partner about to answer the two questions, What is a force What is gravity</p> <p><i>[Show Lesson 1 ppt, slide 6]</i></p>		

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	<p>changes in motion.</p> <ul style="list-style-type: none"> Gravity is a force that pulls things toward the Earth. It is different from most forces because the object doesn't have to touch Earth to feel the force of gravity. 		<p><i>Allow a few students to share their responses.</i></p> <p><i>Write or place the word "Force" on the word wall along with the definition.</i></p> <p><i>Write or place the word "Gravity" on the word wall along with the definition.</i></p> <p>Now I want you to read the page again. After reading a second time, I want you to be ready to share some examples from the text of forces and gravity. When both you and your partner have read it a second time, discuss the examples with your partner. <i>[click on the slide to reveal this instruction.]</i></p> <p>Now that you've had a chance to read about forces and gravity, who can come up with additional examples from your own life? <i>[click on the slide to reveal this instruction.]</i></p>		
8 min	<p>Summarize/Synthesize</p> <p><u>Synopsis:</u> Students answer the focus question in their science notebook with a sentence and drawing.</p>		<p>Remember at the beginning of the lesson I had you write down the focus question? Today you explored what makes something start to move, to change direction, or to stop. I'd like you to open your science notebook and do two things,</p> <ul style="list-style-type: none"> write a sentence that describes what you learned about what makes something start to move, speed up, slow down or change direction, and 		

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			<ul style="list-style-type: none"> • <i>draw and label</i> a picture that shows what you now understand. <p><i>Show Lesson 1 ppt slide 7 with a sentence starter to prompt student writing. Suggest that students draw something they saw move in class today. Have them try to use the words they heard in class today such as push, pull, force and gravity.</i></p>		
2 min	<p>Link to Next Lesson</p> <p><u>Synopsis:</u> The teacher connects the students' final drawing to tomorrow's question, how can a force that we cannot see be shown in a picture or drawing.</p>		<p>Make sure you have a drawing in your science notebook as well as a sentence. Tomorrow we're going to look at a couple of the drawings you just made to figure out how we might draw a force ... something that you really can't see. I'm interested in seeing how some of you represented a force in your drawings today.</p>		