BSCS SCIENCE LEARNING

Energy: Every Day, Everywhere
Lesson 5: Energy Coming and Going

Grade: 4	**Length of lesson:** 110 minutes	**Placement of lesson:** 5 of 5 lessons on energy

Anchoring Phenomenon: The distance the rubber band is stretched in a toy car launcher affects the energy of a toy car as evidenced by the speed and distance the car travels.

Unit Learning Goal: The energy of objects and systems can be transferred and/or transformed. Changes in the energy of objects and systems can be observed and compared.

Lesson Main Learning Goal: Energy flows as it is transferred and changed in various ways between objects and in and out of systems.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Construct an explanation of observed relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions.

Energy and Matter in Systems

- Energy can be transferred in various ways and between objects.

Unit Central Question: How does the energy of an object or system change?	**Lesson Focus Question:** Where does the energy come from and where does it go when changes happen in a system?

Science content storyline: Energy transfers and changes occur in all interactions. Energy moves from object to object and from place to place, and we detect it in different ways. Energy transfers away from the system through sound, light, or heat. A system diagram can track the energy transfers and transformations that occur in interactions.

Ideal student response to the Focus Question: One way an object might get energy to move is when another object collides with it and energy gets transferred from one object to another. Another way an object could get energy to move is if it is higher up—like on the top of a hill—then it has position (potential) energy. Once it starts moving—like rolling down the hill—then the position (potential) energy changes into motion (kinetic) energy. Energy can also change from one way we detect it (like movement) into other ways we detect it (like sound or light). Energy changes, into other forms of energy that are difficult to detect; sometimes it turns into light, heat, or sound energy that spreads out all around us. Energy enters and leaves a system from the surroundings.

Preparation

MATERIALS NEEDED	AHEAD OF TIME
Teacher Resources • TE 5.1 *Teacher Key: System Diagram: Toy Car Launcher* • TE 5.2 *Mumford and Leroy's Big Crash!* • TE 5.3 *Mumford and Leroy's Collision—Teacher Key* **Student Handouts** • HO 5.1 *System Diagram: Toy Car Launcher* (1 per group of 3) • HO 5.3 *Mumford and Leroy's Collision* (1 per team of 2) **Other Materials** • 1 red pencil and 1 blue pencil • chart paper, colored markers (1 set per group of 3) • chart paper, colored markers, transparent tape (1 set per pair of students) • sticky notes • car launcher system (1 per group of 3)	• Review the information in the *Content Background* document. • Prepare all handouts and resources. • Post the DQB, the CSW, and the Science Ideas We've Figured Out charts in a visible location. • Other resources for students (cards from Lesson 3 card sort, System Diagram Key Components chart from Lesson 4, examples of system diagrams from Lesson 4) • *Suggestion for how to group students?*

Lesson 5 General Outline

Time	Phase of lesson	How the science content storyline develops
5 min	**Introduction:** Students summarize what the class figured out in the previous lessons.	
5 min	**Focus Question:** The teacher introduces the focus question. Students share their initial ideas about the question, *Where does the energy come from and where does it go when changes happen in a system?*	
5 min	**Setup for Activity 1:** Students revisit the system diagram criteria introduced in Lesson 4.	We can use a system diagram to explain how energy is moved (transferred) and changed (transformed) in the car launcher system. Energy is added to the launcher system when the rubber band is stretched and changes the position of the launcher. Energy is converted from energy of position (potential) to energy of motion (kinetic) when the rubber band is released and the launcher moves forward. Energy is transferred from the launcher bar to the car when they collide. When the launcher bar collides with the car, the energy of the launcher decreases and the energy of the car increases, making the car move faster. The farther the rubber band is stretched, the more energy is available to be transferred to the car, and the faster and farther the car will travel.
15 min	**Activity 1: Link to the Anchor** Students develop a final model and an explanation (why and how account) for the energy changes in the car launcher system when the rubber band is stretched to different lengths.	We can use a system diagram to explain how energy is moved (transferred) and changed (transformed) in the car launcher system. Energy is added to the launcher system when the rubber band is stretched and changes the position of the launcher. Energy is converted from energy of position (potential) to energy of motion (kinetic) when the rubber band is released and the launcher moves forward. Energy is transferred from the launcher to the car when they collide. When the launcher collides with the car, the energy of the launcher decreases and the energy of the car increases, making the car move faster. The farther the rubber band is stretched, the more energy is available to be transferred to the car, and the farther the car will travel.
25 min	**Follow-up to Activity 1:** Students do a gallery walk of the system diagrams and provide feedback based on the criteria for a system diagram introduced in the setup for the activity. Students revise their system diagram based on the feedback.	

Time	Phase of lesson	How the science content storyline develops
10 min	**Setup for Activity 2:** Students read a story about two characters riding a bike—one at the top of a hill and one at the bottom of the hill. Students make predictions about what will happen to the energy of the two bike riders when they collide.	We can use system diagrams to construct an explanation of observed relationships in energy changes (SEP 6).
15 min	**Activity 2: Use and Apply Link to Anchor** Students develop a system diagram to explain the changes in energy in the Mumford and Leroy bike crash scenario.	As energy is transferred and changes, it is not destroyed or lost. Energy may change into energy that is detected differently, but new energy is not made. An energy-flow diagram is a good way to track the energy transfers and transformations that occur in devices and interactions.
15 min	**Follow-up to Activity 2:** Two groups are paired and use the system diagram of the bike crash to construct an oral explanation for the changes in energy and how these changes are similar to or different from the changes in the car launcher system. Students revisit the Lesson Focus Question.	The energy of objects and systems can be transferred and/or transformed to other types of energy. Changes in the energy of objects and systems can be observed and compared.
10 min	**Summarize and Synthesize:** Students revisit the DQB and write and revise their response to the Unit Central Question. The class summarizes the science ideas of the lesson and unit. The students examine the illustration of the Mumford and Leroy Bike Crash and consider where the energy came from that causes the sound, heat, and light from the crash.	
5 min	**Link to Next Lesson:** Teacher reminds students of the next class's unit assessment.	

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
5 min	**Introduction** <u>Synopsis</u>: Students summarize what the class figured out in the previous lessons.	Link science ideas to other science ideas. Highlight key science ideas and focus question throughout.	Throughout this unit we have been adding ideas to the Science Ideas We've Figured Out chart. Now we will review those ideas to see if they can help us construct an explanation of the energy changes that are occurring in the car launcher system and other systems as well. ***NOTE TO TEACHER:*** *Invite students to refer to the Science Ideas We've Figured Out chart. Provide a few moments for silent think time. Mark rows 6 and 7 on the CSW chart and encourage students to use sentence stems from these rows as they listen as others share their ideas with the class to ask clarifying questions, agree or disagree with others' ideas, and to add on to someone else's ideas. As students share their ideas, listen for the distinction between what we <u>did</u> and what we <u>figured out</u>. Ask elicit and probe questions as needed to support students to focus on what we <u>figured out</u>.*	
5 min	**Focus Question** <u>Synopsis</u>: The teacher introduces the focus question. Students share their initial ideas about the question, *Where does the energy come from and where does it go when changes happen in a system?*	Set the purpose with a focus question.	Today we will continue thinking about energy changes—both the transfer of energy and the transformation of energy. Let's look at our focus question**.** Can someone read the question to the class? **Where does the energy come from and where does it go when changes happen in a system?** ***NOTE TO TEACHER:*** *Provide time for students to set up their notebook for a new lesson. Remind them that they should start on a new page and write the date and lesson title. Write this lesson's focus question on the board and also have students write it in their notebook and draw a box around it. Refer to the focus question often throughout the lesson.*	

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			Let's start thinking about this question by using these sentence starters: *One way energy changes can happen in a system is ...* *In this example, energy comes from ... and goes to ...* *This energy change occurs because ...* Write these starters in your notebook and leave plenty of room after each of them to add words to complete the sentences. As you complete this task, be sure to use our science words of motion (kinetic) energy, position (potential) energy, transfer of energy, or energy transformation when appropriate to your example. ***NOTE TO TEACHER:*** *Ask students to think about the answers now and to write their initial ideas. Tell them that they will do several activities to help them know what to write. They will have time to complete the sentences at the end of class. Allow time for students to write and respond to the focus question. Ask elicit and probe questions to encourage students to share with the class their best idea about the focus question so far.*	
5 min	**Setup for Activity 1** Synopsis: Students revisit the system diagram criteria introduced in Lesson 4.		We began this unit by investigating energy changes in the car launcher system. ***NOTE TO TEACHER:*** *Direct student attention to the Science Ideas We've Figured Out chart and note that we've figured out a lot of ideas about energy and how it changes in a system.* We've also learned how to represent these changes with system diagrams and communicated our ideas like scientists. We can use everything we've figured	

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			out so far to explain how energy changes in the car launcher system. Making a system diagram might be a good way to think about the energy changes in the car launcher system. ***NOTE TO TEACHER:*** *Refer students to the System Diagram Key Components chart developed Lesson 4.* I want us to be reminded of the important ideas that we should make sure to include in our system diagrams. Can someone please read out loud the ideas we wrote in our notebooks as key components of a system diagram? System Diagram Key Components • The parts of the system with labels • Observable changes taking place • Where in the system energy changes are occurring • Where the energy in the system comes from • Where the energy in the system goes—where it is transferred or transformed	
15 min	**Activity 1: Link to the Anchor** <u>Synopsis</u> Students develop a final model and an explanation (why and how account) for the energy changes in the car launcher system when the rubber band is stretched to different lengths.		Now, we will draw a system diagram for the car launcher system. We will use all the science ideas we have figured out in this unit to draw our diagrams. Your system diagram should explain all the energy changes that occurred in the car launcher system. Remember to include the key components, as well as evidence, in your system diagram. ***NOTE TO TEACHER:*** *Place students in groups of 3 to draw a system diagram to explain the energy changes that occurred in the car launcher system.*	

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
	Main science ideas We can use a system diagram to explain how energy is moved (transferred) and changed (transformed) in the car launcher system. Energy is added to the launcher system when the rubber band is stretched and changes the position of the launcher. Energy is converted from energy of position (potential) to energy of motion (kinetic) when the rubber band is released and the launcher moves forward. Energy is transferred from the launcher to the car when they collide. When the launcher collides with the car, the energy of the launcher decreases and the energy of the car increases, making the car move faster. The farther the rubber band is stretched, the more energy is available to be transferred to the car, and the farther the car will travel.		*Distribute one copy of HO 5.1* System Diagram: Toy Car Launcher *to each group. Post system diagrams from Lesson 4 for students to refer to as examples. Give each group a car launcher system to refer to as they make their diagram. Circulate while groups work, asking the questions related to the system diagram key components.* *Give groups about 15 minutes to draw on chart paper their system diagram for the car launcher system. Provide a 5-minute warning as the end of the time approaches.* Remember to consider the system diagram key components recorded in your notebook during the last lesson as you develop your diagram. Also refer to the Science Ideas We've Figured Out chart to link science ideas and include other evidence of energy changes besides motion.	

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
25 min	**Follow-up to Activity 1** Synopsis: Students do a gallery walk of the system diagrams and provide feedback based on the System Diagram Key Components criteria introduced in the set up for the activity. Students revise their system diagram based on the feedback.	Engage students in communicating in scientific ways.	Let's do a gallery walk of the system diagrams. Follow the method we used last time—one piece of feedback per sticky note. Focus your feedback on our System Diagram Key Components list, as well as the Science Ideas We've Figured Out chart. You should not only give feedback, but you should also discuss with your group any ideas you have for revising your own diagram based on observing others' diagrams. ***NOTE TO TEACHER:*** *Have student groups visit and review four posters. Give students about 2 minutes for the first two posters and increase the time to 3 minutes each for the third and fourth posters to give time to read the feedback as well. Once the gallery walk is complete, allow another 5 minutes for them to revise their group's system diagram based on peer feedback.* Use the feedback you received by sorting and grouping the sticky notes, accepting or rejecting feedback, and showing revisions by using a single line through changes and using a different color for added information. Remember the examples we discussed in the last lesson for useful feedback. **Who will share one piece of feedback that you accepted and how you revised your initial system diagram as a result of that feedback?**	The feedback was that we didn't include the last two key components on the list. Because of that we added above our launcher position energy label "energy from stretching rubber band." Then we added by our motion energy label "transformed from position energy when rubber band starts to move."

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				And, also, we added by our motion energy by the car that it was transferred from the moving rubber band and launcher. **Thank you, good job using the feedback to add detail to your diagram! Who else will share?** Our feedback said we didn't have all of the energy changes. We figured out we were missing sound energy, so we added it. **Does a group have different feedback that you used other than these?** Our feedback told us we didn't include all of our observations, so we went back and added them. **Give one example of an observation you added, please.** We added that we saw the rubber band get stretched beside our position label by the launcher.
10 min	**Setup for Activity 2** <u>Synopsis:</u> Students hear a story about two characters riding bikes—one at the top of a hill and one at the	Ask questions to elicit student ideas and predictions.	Scientists, these were all examples of very useful feedback. Great job of using the key components to guide you! **How did this gallery walk feedback process help you?**	We used the feedback to add detail to our diagrams and make them better.

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	bottom of the hill. Students make predictions about what will happen to the energy of the two bike riders when they collide.	Engage students in communicating in scientific ways.	Before we move on, what questions do you have about any feedback you received? Or questions about how to best revise your diagram based on the feedback? You might also have questions about something you saw on another diagram. Let's share and discuss these. ***NOTE TO TEACHER:*** *Guide this sharing and questioning to assist students in discourse that makes their thinking visible, as well as using peer feedback to adjust and enhance their thinking. Once complete, hang the diagrams nearby to refer to during Activity 2.* Now that we have explained how energy changes occurred in the car launcher system, I wonder if we can use these science ideas to explain a different phenomenon. Let's read about two fourth grade students, Mumford and Leroy, and see if there are any energy changes that we can explain with our science ideas about energy. ***NOTE TO TEACHER:*** *Read the story aloud to the class. Keep in mind the timing of this lesson. Reading the story to students as they follow along will take less time. However, if you can use the reading as*	We had a sticky note that said we were missing an energy change, but we don't think we are. **OK, please share with us what energy changes you labeled.** We have position energy and then kinetic energy for the rubber band, and we have motion energy for the car. **What do others think? Is there an energy change missing?** Oh, I don't think you said sound energy transformed from some of the car's motion energy.

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			part of your reading time, you can support students' literacy skills, too. In your science notebook, make a prediction: **What do you think will happen when two objects (like, Leroy on his bike and Mumford on his bike) collide?** Use these sentence stems: *I predict when Mumford and Leroy collide ...* *I think the energy change(s) will be ...* *I think this because ...* ***NOTE TO TEACHER*: *Provide a few moments of individual think time. Then, ask students to share their ideas with an elbow partner. Give a few moments for partners to share. As students share their predictions, ask them to use the sentence stems. Refer them to rows 6, 7, and 9 of the CSW chart when responding to ideas that are shared. As students share, ask probe questions such as, "What science idea(s) supports your prediction?" Also, engage as many students as possible by asking if others agree or said it in another way.*	
15 min	**Activity 2: Use and Apply Link to Anchor** Synopsis: Students develop a system diagram to explain the changes in energy in the Mumford and Leroy bike crash scenario.	Engage students in using and applying new science ideas in a variety of ways and contexts.	***NOTE TO TEACHER:*** *Create teams of 2 and distribute one copy HO5.3:* Mumford and Leroy's Collison *to each team. Have students tape the three pictures to a piece of chart paper. Point out the System Diagram Key Components chart and remind them to revisit the other system diagrams if they need to.* OK, let's get to work on making a system diagram for our Mumford and Leroy story. Be sure to include information that explains the energy	

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
	<u>Main science ideas</u> As energy is transferred and changes, it is not destroyed or lost. Energy may change into energy that is detected differently, but new energy is not made. An energy-flow diagram is a good way to track the energy transfers and transformations that occur in devices and interactions.		changes during this bike collision. You will have 15 minutes to do the following: • Note the observable changes such as movement and so forth. • Identify and label any energy changes that occur in the bike collision, including heat, light, and sound if they are produced. • Note where the energy comes from and where it goes. • Fill in the energy bars on the handout for before, during, and after the crash. • Refer to the system diagram key components and the car launcher system diagrams you work on your system diagram for the collision. ***NOTE TO TEACHER:*** *Circulate among teams as they work. Use elicit, probe, and challenge questions to guide students through any difficulties they are having. Observe their diagrams and ask specific questions about their thinking when necessary. Once student pairs have completed their diagram, have two pairs join, share and discuss diagrams, and provide useful feedback, then revise, when needed. Prompt them to be ready to share when their work is complete.*	
15 min	**Follow-up to Activity 2** <u>Synopsis:</u> Two groups are paired and use the system diagram of the bike crash to construct an oral explanation for the changes in energy and how these changes are similar to or different from the changes in the car	Engage students in constructing explanations and arguments. Engage students in communicating in scientific ways.	We are going to use our diagrams to construct an explanation of the crash. However, let's share some feedback and revisions that you made while in your group of 4. This provides you an opportunity to self-assess your understanding of energy changes. ***NOTE TO TEACHER:*** *Use elicit, probe, and challenge questions to ensure students can reflect and think about if and how their diagram shows their understanding. Encourage sharing of multiple*	**Who will begin our discussion by sharing one observation you noted and what it provided evidence for?**

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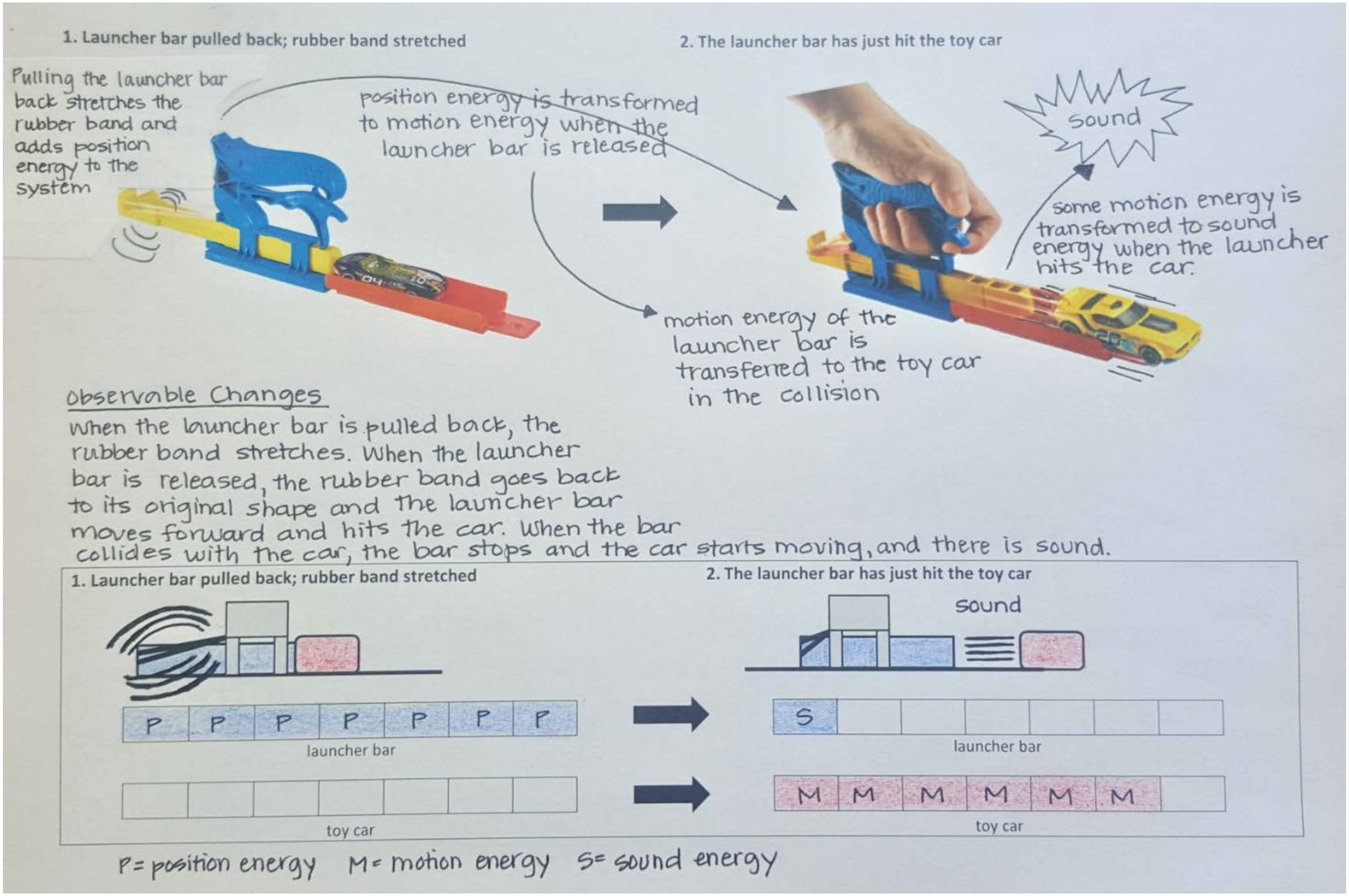
	launcher system. Students revisit the Lesson Focus Question. <u>Main Science Ideas</u> The energy of objects and systems can be transferred and/or converted to other types of energy. Changes in the energy of objects and systems can be observed and compared. Energy can also change from one way we detect it (like movement) into other ways we detect it (like sound or light). Sometimes it may look like energy goes away or is destroyed, for example, when the light goes out, you no longer hear a sound, or an object stops moving. However, that energy didn't go away, it turned into other forms of energy that are difficult to detect; sometimes it turns into heat energy that spreads out all around us. Energy enters and leaves a system from the surroundings.	Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking.	*diagrams and remaining questions students might have.* Now that you have self-assessed through this discussion, it is time to construct an explanation in	I said that Mumford was at the top of the hill, so he had position energy. I agree with (_), but should we say "Mumford and his bike" to include every part of the system? Another one is when Mumford and his bike starting rolling, the position energy transforms—actually, feedback helped me use this word instead of "transfer"—to energy of motion. **Thanks for sharing your revision. Why did you change from "transfer" to "transform"?** Well, they are confusing, but I think I got it now. *Transfer* is when the same kind of energy goes from one thing to another, but *transform* means when the kind of energy changes. **Thumbs up if you think (_) has it correct now. Thumbs down if not, to the side if you aren't sure.** **These two words can be confusing. Let's share and discuss all the energy transfers and energy transformations in this system. Who will start us out with another transfer?**

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
			your notebook for the changes in energy in the bike crash system and how these changes are similar to or different from the energy changes in the car launcher system. Use our CSW sentence starters if you need help sharing your ideas. ***NOTE TO TEACHER****: Place students in teams of 2 and give them about 10 minutes to use their system diagram of the bike crash to construct an explanation in their notebooks.* *After about 10 minutes, team up two pairs of students and have them share their explanations with one another. Give students about 5 minutes to share their explanations. Instruct the groups to compare explanations, provide at least one helpful feedback, discuss that feedback and what revision(s) might be made.* ***NOTE TO TEACHER:*** *Rows 4 and 5 on the CSW chart can be helpful to students sharing ideas and predictions. Rows 6, 7, 9, and 11 can be helpful for those responding to ideas that are shared. As students are sharing their explanations, circulate and ask questions to probe and challenge student thinking. After students have constructed and shared their explanations, bring the class back together.* Now let's revisit today's focus question and your initial thoughts. Use what you've learned today to add to and revise your response. Revise your answer to the Lesson Focus Question in your notebook.	

Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
10 min	**Summarize and Synthesize** <u>Synopsis</u>: The class summarizes the science ideas of the lesson and adds them to the science ideas chart. They then add to and revise their response to the Unit Central Question from Lesson 1 <u>Main science ideas</u> We can observe changes in energy when we detect changes in light, sound, heat, or motion. When an object moves faster or produces more light or sound or more heat, then it has more energy and vice versa. The amount of energy an object has can change as energy is transformed from stored energy to energy of motion and is transferred from one object to another within a system. We can represent the changes in energy with systems diagrams and energy bars.	Highlight key science ideas and focus question throughout.	***NOTE TO TEACHER:*** *Refer to the Driving Question Board and the Unit Central Question. Have students identify the DQB questions we have answered over the course of the unit by adding a heavy check mark on those sticky notes. Celebrate all that we've figured out! Acknowledge there may still be questions we haven't answered and perhaps some new questions that we thought of during the unit. Explain this happens to scientists when they investigate a phenomenon, too!* Wow, we have learned so much about energy and changes in many different systems! So, let's now put it all together in order to respond to our Unit Central Question. Copy the Unit Central Question onto the current page in your science notebook. You will write your response to the question using the Science Ideas We've Figured Out chart created by class throughout the unit. In your response also consider these questions: • How did the CSW strategies help us figure out important science ideas? • How did using the analogy map help us compare different systems? • How did the system diagrams and energy bars help us keep track of and represent energy changes in the system? ***NOTE TO TEACHER:*** *Rows 4 and 5 on the CSW chart can be helpful to students sharing ideas and predictions. Rows 6, 7, and 9 can be helpful for those responding to ideas that are shared. Give students 10 minutes to write their responses.*	

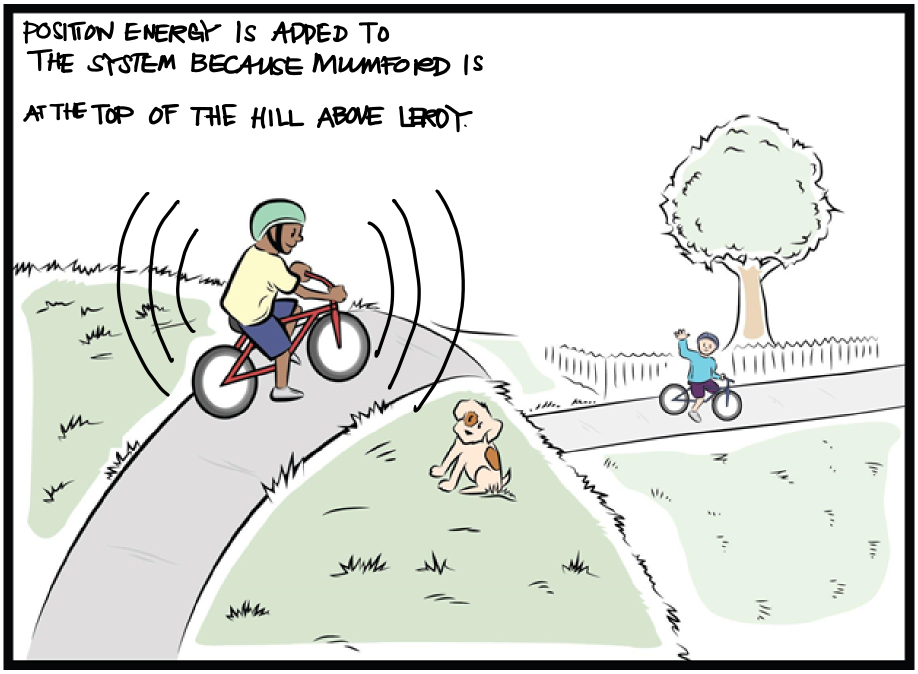
Time	Phase of lesson and how the science content storyline develops	STeLLA strategy	Teacher talk and questions	Possible student and teacher dialogue
			Would anyone like to share their response to the Unit Central Question? ***NOTE TO TEACHER:*** *As students share, encourage other students to use their CSW sentence starters to add to, agree or disagree, and respond to ideas being shared. Help students negotiate a response to the Unit Central Question that includes the ideas given as the Ideal Student Response to the Unit Central Question provided on the Unit Lesson Plan (see the main science ideas to the left).* Now that we have discussed our learnings about Unit Central Question, check your response and make any edits or additions you would like to. As always, use a different color for these changes.	
5 min	**Link to Next Lesson** Synopsis: Teacher reminds students of the next class's unit assessment.	Link science ideas to other science ideas.	**Congratulations on figuring out so many important science ideas about energy! Next time, you will use your understanding of energy on the unit assessment.**	

Teacher Key
System Diagram
Toy Car Launcher



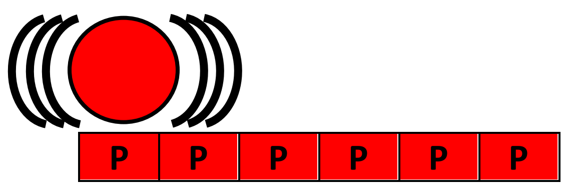
Mumford and Leroy's Collision—Teacher Key

1. Mumford is at the top of the hill. Leroy is at the bottom of the hill.

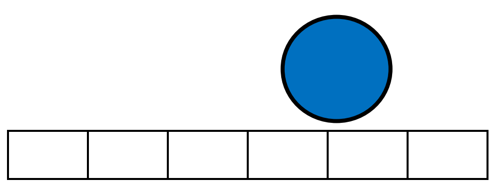


OBSERVABLE CHANGES

THERE ARE NO OBSERVABLE CHANGES. BOTH MUMFORD AND LEROY ARE NOT MOVING (BUT MUMFORD HAS POSITION ENERGY)



Mumford (red bicycle)



Leroy (blue bicycle)

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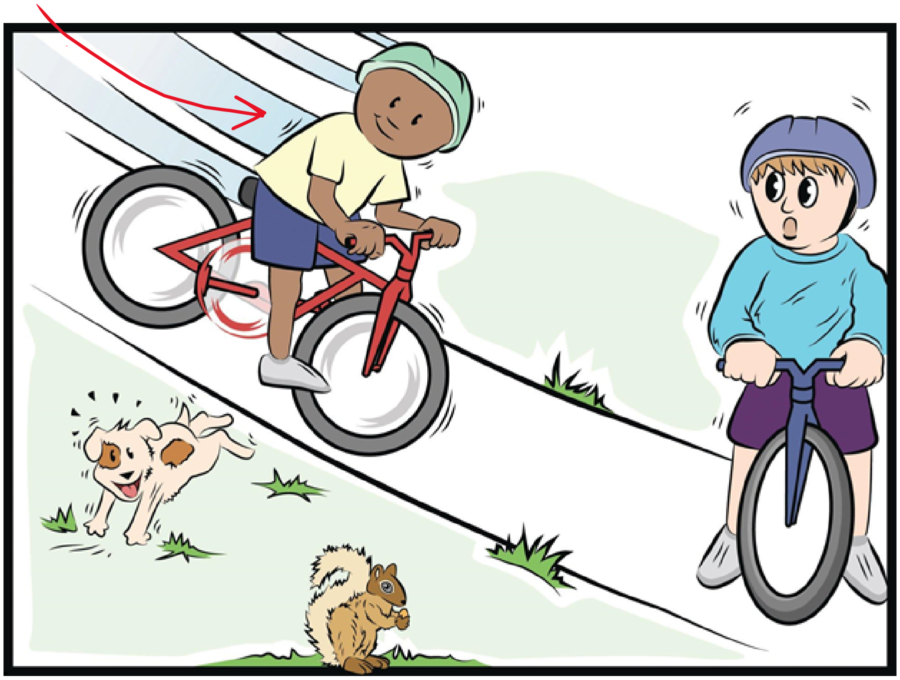
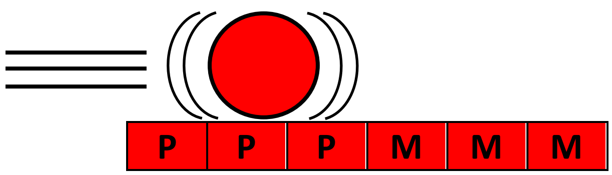
2. Mumford is rolling down the hill. Leroy is at the bottom of the hill.

POSITION ENERGY (FROM MUMFORD BEING AT THE TOP OF THE HILL ABOVE LEROY) IS TRANSFORMED TO MOTION ENERGY

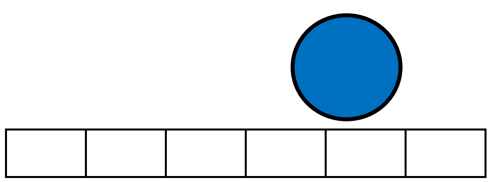


OBSERVABLE CHANGES

MUMFORD WAS NOT MOVING AT THE TOP OF THE HILL BUT THEN HE MOVES REALLY FAST DOWN THE HILL.



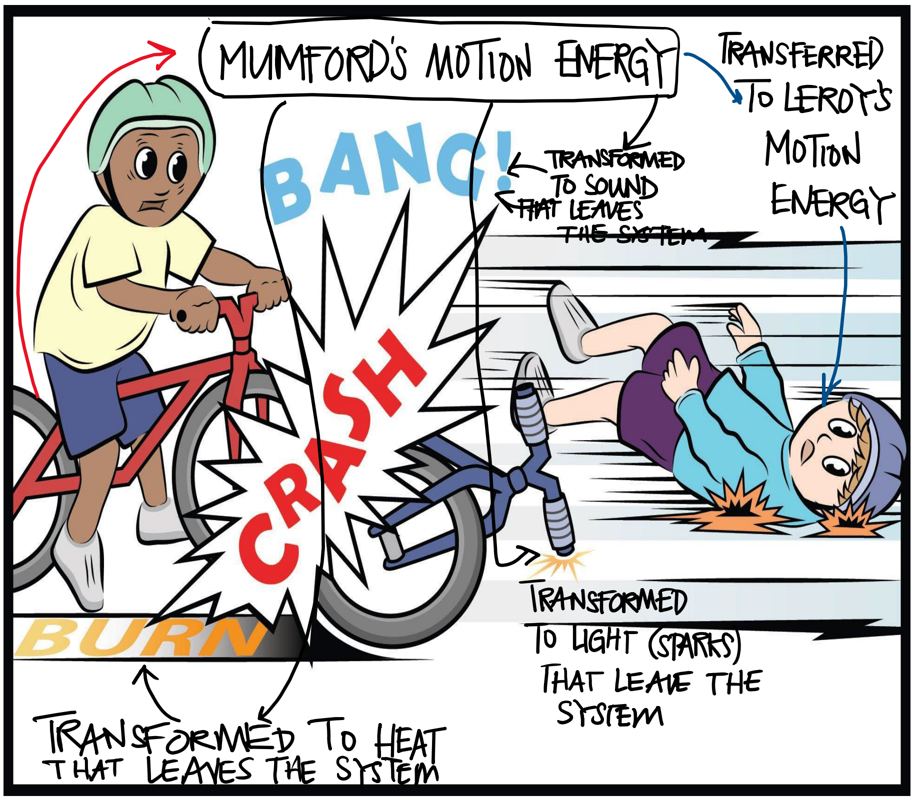
Mumford (red bicycle)



Leroy (blue bicycle)

22

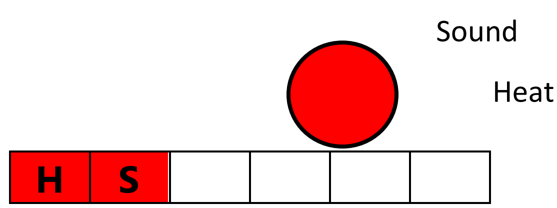
3. Mumford collides with Leroy.



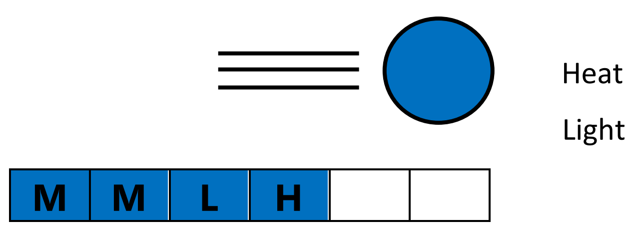
OBSERVABLE CHANGES

MUMFORD WAS MOVING REALLY FAST AND THEN STOPPED MOVING WHEN HE COLLIDED WITH LEROY.

LEROY WAS NOT MOVING AT FIRST BUT WHEN MUMFORD COLLIDED WITH HIM HE SKIDDED ACROSS THE PAVEMENT. A LOUD BANG WAS HEARD WHEN THE BIKES COLLIDED. SPARKS CAME FROM THE HANDLE BARS OF LEROY'S BIKE AS IT HIT THE GROUND. RUBBER FROM MUMFORD'S TIRE LEFT SKID MARKS ON THE GROUND.



Mumford (red bicycle)



Leroy (blue bicycle)