

## Energy Transfer

### Lesson 1a: Evidence of Energy

<b>Grade 4</b>	<b>Length of lesson:</b> 35 minutes	<b>Placement of lesson in unit:</b> 1a of 6 two-part lessons on energy transfer
<b>Unit central question:</b> How does the energy of an object move and change?		<b>Lesson focus question:</b> How do we know whether something has energy?
<b>Main learning goal:</b> Seeing objects move, hearing a sound, feeling heat, and seeing light are all ways of detecting energy.		
<b>Science content storyline:</b> Energy is all around us, and we can detect it using our senses. We can see objects moving, feel heat, hear sound, and see light. All of this is evidence that energy is present.		
<b>Ideal student response to the focus question:</b> You can know whether something has energy by seeing motion, feeling heat, hearing sound, or seeing light.		

#### Preparation

<p><b>Materials Needed</b></p> <ul style="list-style-type: none"> <li>• Science notebooks</li> <li>• Chart paper and markers</li> <li>• Match and matchbox (with strike plate)</li> <li>• Cup of water (to extinguish the match)</li> </ul>	<p><b>Ahead of Time</b></p> <ul style="list-style-type: none"> <li>• Review the Energy and Energy Transfer Content Background Document: sections 1–3.</li> <li>• <b>ELL support:</b> Identify Tier 2 and Tier 3 words in the lesson plan to review in advance with ELL students. Possible terms include <i>energy</i>, <i>detect</i>, <i>detective</i>, <i>match</i>, <i>heat</i>, <i>light</i>, <i>evidence</i>, <i>data table</i>, <i>record</i>. Consider using one or more of the following activities to present unfamiliar terms: (1) Introduce the words/terms explicitly; (2) define terms in the context of a shared experience; (3) ask students to name the word in their first language; (4) record these terms on chart paper and display them so they're visible to students during the unit; (5) have students complete a Frayer model; (6) encourage students to construct “key word/term” dictionaries for future reference (which can include the word’s definition and its use in a sentence, the word in the student’s first language, and an image or picture the student draws or finds). Dictionaries can be constructed individually or in small groups.</li> </ul>
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## Lesson 1a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
1 min	<b>Unit central question:</b> The teacher introduces the unit central question, <i>How does the energy of an object move and change?</i>	<ul style="list-style-type: none"> <li>• Energy is all around us, and we can detect its presence.</li> </ul>
5 min	<b>Lesson focus question:</b> The teacher introduces the focus question, <i>How do we know whether something has energy?</i> Students share their ideas about how to detect the presence of energy in objects around them.	
8 min	<b>Setup for activity:</b> Students act out having a lot of energy and little or no energy. The teacher records their observations and ideas and links them to the focus question.	<ul style="list-style-type: none"> <li>• Humans have energy and can detect its presence using their senses.</li> </ul>
10 min	<b>Activity:</b> Students look for evidence of energy in another object—a match. Then they set up a class data table to record their evidence.	<ul style="list-style-type: none"> <li>• Objects exhibit energy in a variety of ways. When objects move or produce sound, heat, and/or light, they demonstrate that they have energy.</li> </ul>
5 min	<b>Follow-up to activity:</b> The teacher helps students link using their senses to detect energy with evidence that energy is present.	<ul style="list-style-type: none"> <li>• We can detect energy using our senses. We can see objects move, feel heat, hear sound, and see light. This is evidence that energy is present.</li> </ul>
5 min	<b>Synthesize/summarize today’s lesson:</b> Students write a preliminary answer to the focus question using what they’ve learned so far.	<ul style="list-style-type: none"> <li>• We can detect energy using our senses. We can see objects move, feel heat, hear sound, and see light. This is evidence that energy is present.</li> </ul>
1 min	<b>Link to next lesson:</b> The teacher informs students that in the next lesson, they’ll use their senses to detect the presence of energy in different objects.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
1 min	<p><b>Unit Central Question</b></p> <p><b>Synopsis:</b> The teacher introduces unit central question, <i>How does the energy of an object move and change?</i></p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>• Energy is all around us, and we can detect its presence.</li> </ul>		<p><b>Show slides 1 and 2.</b></p> <p>Today we're going to begin a new unit about energy. Our unit central question is <i>How does the energy of an object move and change?</i></p> <p>Write this question in your science notebooks and draw a double-lined box around it.</p> <p>We'll keep this question in mind throughout this unit.</p> <p><b>NOTE TO TEACHER:</b> <i>Display this question on the board for students to see and refer to throughout the unit.</i></p>		
5 min	<p><b>Lesson Focus Question</b></p> <p><b>Synopsis:</b> The teacher introduces the focus question, <i>How do we know whether something has energy?</i> Students share their ideas about how to detect the presence of energy in objects around them.</p> <p><b>Main science idea(s):</b></p>	<p>Set the purpose with a <u>focus question</u> or goal statement.</p>	<p><b>Show slide 3.</b></p> <p>The purpose of this lesson is to gather evidence that will help us answer the focus question, <i>How do we know whether something has energy?</i></p> <p>Write this question in your science notebooks and draw a box around it.</p> <p>Answering this question will also help us answer the unit central question.</p>		

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	<ul style="list-style-type: none"> <li>Energy is all around us, and we can detect its presence.</li> </ul>	<p>Ask questions to elicit student ideas and predictions.</p>	<p><b>NOTE TO TEACHER:</b> <i>Write the focus question on the board for students to see and refer to throughout the lesson.</i></p> <p>At the end of today’s lesson, you’ll think about what you’ve learned so far about energy and use your ideas and evidence to write an initial answer to the focus question in your science notebooks.</p> <p><b>NOTE TO TEACHER:</b> Before introducing the activity, define the word <i>evidence</i> for ELL students as it relates to this lesson, and identify what evidence of energy is (i.e., heat, light, sound, and motion). Students will be in a better position to participate in this activity if sources of evidence are made explicit.</p> <p><b>Show slide 4.</b></p> <p>So how might we find evidence of energy in the world around us? How might we tell that something has energy?</p> <p><b>NOTE TO TEACHER:</b> <i>Keep this discussion brief. The main purpose is to find out what students already know about energy and to identify any inaccurate ideas or misconceptions they might have. Expect a variety of answers, but students will likely say they can tell something has energy if it’s moving or if</i></p>		

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			<i>it gives off heat.</i>		
8 min	<p><b>Setup for Activity</b></p> <p><b>Synopsis:</b> Students act out having a lot of energy and little or no energy. Teacher records their observations and ideas and links them to the focus question.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>Humans have energy and can detect its presence using their senses.</li> </ul>	<p>Make explicit links between science ideas and activities <b>before</b> the activity.</p> <p>Select content representations and models matched to the learning goal and engage students in their use.</p>	<p>Has someone ever said to you, “You have a lot of energy today” or maybe, “You don’t have much energy today”?</p> <p>How were you feeling or acting when someone said this to you?</p> <p>How would you act if you had a lot of energy?</p> <p><b>NOTE TO TEACHER:</b> <i>Have students stand up next to their desks and demonstrate in their spaces how they would behave if they had a lot of energy. Allow students to be active for 3–5 minutes to fully explore this idea.</i></p> <p><b>Show slide 5.</b></p> <p>What did you and your classmates do to show that you had a lot of energy? What evidence of energy did you see?</p> <p>As you share your observations, I’ll record them on chart paper.</p>	<p>I was sick.</p> <p>I was tired.</p> <p><i>Possible answers:</i></p> <ul style="list-style-type: none"> <li>I’d jump!</li> <li>I’d run!</li> <li>I’d yell!</li> <li>I’d wiggle all around!</li> </ul> <p>I moved around a lot.</p> <p>We made a lot of noise.</p> <p>I jumped up and</p>	



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			<p>How would you describe the difference between how you acted to show you had a lot of energy and how you acted to show you had little or no energy?</p> <p><b>NOTE TO TEACHER:</b> <i>Record student observations on chart paper and help students understand that even when they're still and quiet, they still have energy. If students bring this up, ask whether their bodies are <b>completely</b> still. They should realize that their hearts are beating, their eyes are blinking, and their chests are moving up and down when they breathe. Remind students that the inside parts of their bodies are moving as well as their outside parts.</i></p> <p>Do you think these observations help us answer our focus question? Why or why not?</p>	<p>We moved around to show we had a lot of energy, and we were very still and quiet to show we had no energy.</p>	<p>Does breathing or blinking have anything to do with energy?</p>
10 min	<p><b>Activity</b></p> <p><b>Synopsis:</b> Students look for evidence of energy in another object—a match. Then they set up a class data table to record their evidence.</p> <p><b>Main science idea(s):</b></p>	<p>Ask questions to elicit student ideas and predictions.</p>	<p><b>Show slide 7.</b></p> <p>We need more information to answer our focus question, so let's see if we can find some other evidence of energy.</p> <p>Do you think an object like this match has energy? Why or why not?</p>	<p>I'm not sure.</p>	

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	<ul style="list-style-type: none"> <li>Objects exhibit energy in a variety of ways. When objects move or produce sound, heat, and/or light, they demonstrate that they have energy.</li> </ul>	<p>Select content representations and models matched to the learning goal and engage students in their use.</p> <p>Ask questions to probe student ideas and predictions.</p> <p>Ask questions to challenge student thinking.</p>	<p><b>NOTE TO TEACHER:</b> <i>Hold up a match for students to see but don't light it yet.</i></p> <p><b>ELL support:</b> Give ELL students (or the entire class) a few minutes to discuss this question with shared-language partners in a Think-Pair-Share.</p> <p><b>NOTE TO TEACHER:</b> <i>Elicit and probe student ideas about this question. Some students may say that an object can't have energy if it isn't moving. Challenge this idea by moving the match around before striking it.</i></p> <p><b>Show slide 8.</b></p> <p>[Strike the match.] Does the match have energy now? What's your evidence?</p> <p><b>CAUTION:</b> <i>Ensure that no flammable objects are near the match. Following the activity, dispose of the match in a cup of water.</i></p> <p><b>NOTE TO TEACHER:</b> <i>Hold the lighted match still and make sure students notice that it isn't moving. Emphasize that motion is only one piece of evidence for the presence of energy. Ask students to identify other ways they can tell that an object has energy. Since the lighted match is giving off light and heat, students might mention this as evidence of energy. If they</i></p>	<p>I don't think it has energy!</p> <p>It's still not moving.</p> <p>It's on fire!</p> <p>Fire is hot!</p>	<p>Why do you think the match doesn't have energy?</p> <p>Can you think of a situation where the match would have energy? If so, describe it.</p> <p>Tell me more about fire and energy.</p> <p>Is there any other evidence of energy?</p>

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		<p>Ask questions to probe student ideas and predictions.</p> <p>Make explicit links between science ideas and activities <b>during</b> the activity.</p>	<p><i>don't, make this explicit.</i></p> <p><i>Some students may observe that the match has potential or stored energy before it's lighted. If they do, write this idea on chart. You might also probe their thinking a bit, but keep any discussion brief. Students will have an opportunity to learn more about potential energy in later lessons. At this point, it's important they realize that energy doesn't just magically appear. It comes from somewhere.</i></p> <p>So today we've been exploring the idea of energy, and we've gathered some information about what it is and how we can find evidence of it.</p> <p>Why do you think evidence of energy is important?</p> <p>Right! We need evidence to answer our focus question, don't we? But it's also important because it tells us that an object really does have energy.</p> <p>When scientists gather data and evidence in an investigation, what do they do with it?</p>	<p>We wouldn't know if there was energy if we didn't have evidence.</p> <p>We need evidence to answer our focus question!</p> <p>They write it down?</p>	<p>Can anyone add to this idea?</p>

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		<p>Select content representations and models matched to the learning goal and engage students in their use.</p>	<p><b>NOTE TO TEACHER:</b> <i>Students may give a variety of answers, but the main point to emphasize is that they record it so they can analyze, share, and compare it with data and evidence from other scientists.</i></p> <p>Yes! Scientists record their data and evidence so they can share it with other scientists and compare it with other evidence. One of the ways scientists do this is by creating a data table.</p> <p><b>Show slide 9.</b></p> <p>As scientists, let’s record our evidence from the match investigation on a data table so we can share and compare our ideas. We’ll use this data table in our next lesson too.</p> <p><b>NOTE TO TEACHER:</b> <i>Create a data table on chart paper similar to the following sample table. Have students copy this table (with column headings) into their science notebooks as well. Make sure they leave extra room at the bottom for more rows. Wait until students have done this before you begin recording evidence on the chart.</i></p>		

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			<table border="1" data-bbox="932 329 1432 542"> <thead> <tr> <th data-bbox="932 329 1129 367">Object</th> <th data-bbox="1129 329 1432 367">Evidence of Energy</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> </tbody> </table> <p data-bbox="932 581 1432 711">At the beginning of this lesson, you acted out having a lot of energy. So let’s add this to our data tables. What evidence of energy did you observe in this activity?</p> <p data-bbox="932 743 1432 841">Good job! Now make sure to record this evidence on your data tables in the evidence column.</p> <p data-bbox="932 881 1432 1247"><b>NOTE TO TEACHER:</b> Add “<i>Our bodies</i>” to the Object column and record students’ evidence in the Evidence of Energy column on the data table. Tell students they should record on their tables any observations they think are evidence that an object has energy. Also let them know it’s OK to record more than one piece of evidence for a single object, or the same evidence for multiple objects.</p> <p data-bbox="932 1287 1432 1352">You also observed a match today, so let’s add that object to our data tables.</p> <p data-bbox="932 1385 1432 1450">How did you know the match had energy? What evidence did you find?</p>	Object	Evidence of Energy											<p data-bbox="1457 703 1717 768">We were moving around.</p> <p data-bbox="1457 808 1717 938">Some students were jumping up and down and making noise.</p> <p data-bbox="1457 971 1717 1003">I felt hot.</p> <p data-bbox="1457 1442 1717 1474">I saw the light.</p>	<p data-bbox="1743 703 1982 735"><i>Probe questions:</i></p> <ul data-bbox="1743 735 1982 938" style="list-style-type: none"> <li>• How do you know other students have energy?</li> <li>• What is your evidence?</li> </ul> <p data-bbox="1743 971 1982 1068">Is that evidence of energy? Why do you think so?</p>
Object	Evidence of Energy																

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			<p>Record that evidence on your tables as well.</p> <p><b>NOTE TO TEACHER:</b> <i>Allow adequate time for students to record evidence for each object on their data tables (see sample below). Then ask a few volunteers to share their evidence.</i></p> <p><b>Show slide 10.</b></p> <p>So let's review what we have on our tables so far.</p> <table border="1" data-bbox="932 764 1415 1146"> <thead> <tr> <th data-bbox="932 764 1121 800">Object</th> <th data-bbox="1121 764 1415 800">Evidence of Energy</th> </tr> </thead> <tbody> <tr> <td data-bbox="932 800 1121 870">Our bodies</td> <td data-bbox="1121 800 1415 870">They move; they make noise</td> </tr> <tr> <td data-bbox="932 870 1121 940">A match</td> <td data-bbox="1121 870 1415 940">Light; fire; heat; burning</td> </tr> <tr> <td data-bbox="932 940 1121 1010"></td> <td data-bbox="1121 940 1415 1010"></td> </tr> <tr> <td data-bbox="932 1010 1121 1079"></td> <td data-bbox="1121 1010 1415 1079"></td> </tr> <tr> <td data-bbox="932 1079 1121 1146"></td> <td data-bbox="1121 1079 1415 1146"></td> </tr> </tbody> </table> <p>In our next lesson, we'll observe other objects and add more evidence of energy to our data tables.</p>	Object	Evidence of Energy	Our bodies	They move; they make noise	A match	Light; fire; heat; burning							<p>The match was on fire, and it was giving off heat.</p> <p>I smelled the match burning.</p>	
Object	Evidence of Energy																
Our bodies	They move; they make noise																
A match	Light; fire; heat; burning																
5 min	<p><b>Follow-Up to Activity</b></p> <p><b>Synopsis:</b> The teacher helps students link using their senses to detect</p>	<p>Make explicit links between science ideas and activities <b>after</b> the activity.</p>	<p>Now let's look more closely at the evidence of energy on our data tables.</p> <p>What do you notice? How did you figure out that each of these objects (your bodies</p>														

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	<p>energy with evidence that energy is present.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>We can detect energy using our senses. We can see objects move, feel heat, hear sound, and see light. This is evidence that energy is present.</li> </ul>	Summarize key science ideas.	<p>and the match) had energy?</p> <p>So what did you use to figure this out?</p> <p><b>Show slide 11.</b></p> <p>That’s right! You used your eyes and ears. Another way to say this is that you used your senses.</p> <p>You <i>saw</i> your classmates move around and the match light up.</p> <p>You <i>heard</i> classmates being noisy and the match strike the matchbox.</p> <p>You may have even <i>felt</i> yourself getting hot and <i>smelled</i> the match burning.</p> <p>You used your senses of seeing and hearing and maybe even smelling and feeling to gather evidence of energy.</p>	<p>I watched everyone move around.</p> <p>I saw the match light up.</p> <p>Oh, we made noise.</p> <p>Our eyes!</p> <p>Our ears!</p>	What else do you notice on your tables?
5 min	<p><b>Synthesize/Summarize Today’s Lesson</b></p> <p><b>Synopsis:</b> Students write a</p>	Highlight key science ideas and	<p><b>Show slide 12.</b></p> <p>To summarize the science ideas we learned about today, let’s review our</p>		

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	<p>preliminary answer to the focus question using what they've learned so far.</p> <p><b>Main science idea(s):</b></p> <ul style="list-style-type: none"> <li>We can detect energy using our senses. We can see objects move, feel heat, hear sound, and see light. This is evidence that energy is present.</li> </ul>	<p>focus question throughout.</p> <p>Engage students in making connections by synthesizing and summarizing key science ideas.</p>	<p>focus question, <i>How do we know whether something has energy?</i></p> <p>Think about everything we saw and did in our investigations today. Then think about the evidence we gathered to show that objects have energy.</p> <p>Then complete the sentence on the slide in your science notebooks using this sentence starter:</p> <p><i>I know that something has energy because it _____.</i></p> <p>Write down at least one piece of evidence that showed you something had energy. Connect the energy with the evidence.</p> <p>For extra credit, you can answer the second, <i>How did your senses help you find evidence of energy?</i></p> <p><b>ELL support:</b> Give ELL students (or the entire class) a few minutes to discuss this task with shared-language partners in a Think-Pair-Share before writing an answer in their notebooks.</p> <p><b>Whole-class share-out:</b> So how do you know that something has energy? Let's hear your ideas.</p> <p><b>NOTE TO TEACHER:</b> <i>Record student ideas on chart paper to review at the</i></p>		

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			<i>beginning of the next lesson. Student responses may center on their bodies and the food they eat. Students may also say that an object has energy if it's moving, it's hot, or it shocks them.</i>		
1 min	<p><b>Link to Next Lesson</b></p> <p><b>Synopsis:</b> The teacher informs students that in the next lesson, they'll use their senses to detect the presence of energy in different objects.</p>		<p><b>Show slide 13.</b></p> <p>In our next lesson, you'll become energy detectives and use your senses to gather more evidence of energy in everyday objects.</p>		