RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	4	Day	6	STeLLA Strategy	SCSL Strategies B, C, and I STL Strategy 7	Subject Matter Focus	Energy Transfer
Focus Questions	• How can we begin and end a lesson to help students develop a coherent science content storyline? • How can selecting appropriate science activities help students develop a coherent science content storyline? • What happens to energy when objects collide? • Where does the energy of a moving object come from?						
Main Learning Goals	Participants will understand the following: • STeLLA strategies B, I, and 7 are like bookends that mark the beginning and end of a lesson. The science ideas in the summary should match the focus question from the beginning of the lesson, and both the focus question and the summary should match the lesson's main learning goal. • Activities should be selected because they will help students engage in making sense of the main learning goal, not because they're fun, easy to do, or only topically related. Therefore, activities must be closely matched to the main learning goal. • Energy can *transfer* or move from one object to another object. • Energy can *transform* or change from one form to another form (e.g., gravitational potential energy to kinetic energy and heat).						

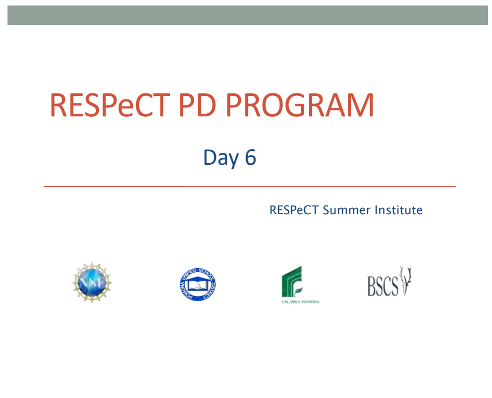
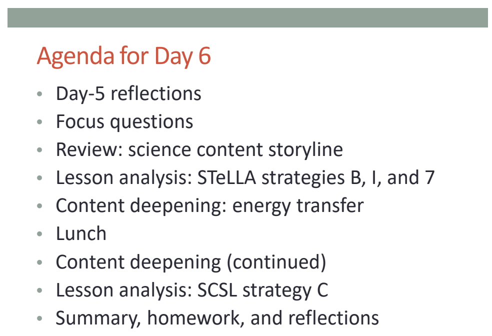
Preparation	Materials	Videos
Daily Setup Tasks • Check that video clips are correctly linked to PowerPoint (PPT) slides. • Set up PowerPoint. • Make sure video clips play correctly with good sound. • Arrange furniture and food. • Arrange participant materials. • Put up posters and charts. **Planning and Preparation Tasks** • Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to PPTs if needed. • Review the reflections from day 5 and create a summary slide. • Watch video clips and anticipate participant responses. • Prepare charts for the day's agenda and focus questions.	**Posters and Charts** • STeLLA Framework and Strategies poster • Day-6 Agenda (chart) • Day-6 Focus Questions (chart) • Norms for Working Together (chart) • Strategy charts from days 1–5 (STL strategies 1–6 and SCSL strategy A) • Parking Lot poster **Handouts in RESPeCT PD Binder Front Pocket** • Participants' SCSL and STL Z-fold summary charts **Handouts in RESPeCT PD Binder, Day 6** • 6.1 Analysis Guides B and I: Setting the Purpose and Summarizing Key Science Ideas (4 copies) • 6.2 Transcript for Video Clip 6.1 • 6.3 Transcript for Video Clip 6.2	• Video Clip 6.1: Bernstein classroom (strategy B; beginning of lesson); 6.1_stella_et_bernstein_L2_c1 • Video Clip 6.2: Knight classroom (strategy B; beginning of lesson); 6.2_stella_et_knight_L5_c1 • Video Clip 6.3: Bernstein classroom (strategy I; end of lesson); 6.3_stella_et_bernstein_L3_c3a–d • Video Clip 6.4: Knight classroom (strategy I; end of lesson); 6.4_stella_et_knight_L5_c5 Video clips from one Energy Transfer lesson: • Video Clip 6.5: Knight classroom (strategy C); 6.5_stella_et_knight_L4_c1 • Video Clip 6.6: Knight classroom (strategy C); 6.6_stella_et_knight_L4_c2 • Video Clip 6.7: Knight classroom (strategy C); 6.7_stella_et_knight_L4_c3

• Review the activities for ET lessons 3a/b and 4a in the lesson plans binder.	• 6.4 Analysis Guide C: Selecting Activities Matched to the Learning Goal (3 copies)
	• 6.5 Transcript for Video Clip 6.3
	• 6.6 Transcript for Video Clip 6.4
	• 6.7 Transcript for Video Clip 6.5
	• 6.8 Transcript for Video Clip 6.6
	• 6.9 Transcript for Video Clip 6.7
	• 6.10 Mumford and Leroy's Collision
	• 6.11 Daily Reflections—Day 6
	
	Handouts in RESPeCT Lesson Plans Binder
	• 3.1 Mumford and Leroy's Big Crash, Part 1 (from ET lesson 3a)
	• 3.2 Mumford and Leroy's Big Crash, Part 2 (from ET lesson 3a)
	• 4.1 Mumford and Leroy's Big Crash, Part 3 (from ET lesson 4a)
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• **Optional:** ramp-and-marble setup from lesson 3a:
	  • Grooved ruler
	  • 2 marbles
	  • Blocks of wood or notepads (to elevate the ramp)
	
	PD Resources
	• STeLLA strategies booklet
	• RESPeCT PD program binder
	• RESPeCT lesson plans binder
	
	Resources in Lesson Plans Binder
	Resources section:
	• Energy and Energy Transfer Content Background Document
	• Common Student Ideas about Energy	

DAY 6 SESSION OUTLINE

Time	Activities	Purpose
8:00–8:30 30 min	**Getting Started: Housekeeping, Agenda, Day-5 Reflections, Focus Questions**	• Build community by sharing participants' reflections from day 5. • Set the stage for a day of learning.
8:30–10:10 100 min (Includes 10-min break)	**Lesson Analysis: STeLLA Strategies, B, I, and 7**	• Use lesson analysis of classroom videos to better understand STeLLA strategies B, I, and 7. • Deepen participants' science-content knowledge of energy transfer through lesson analysis.
10:10–12:00 110 min	**Content Deepening: Energy Transfer**	• Deepen participants' science-content knowledge of energy in its various forms and the concepts of energy transfer and transformation. • Deepen participants' science-content knowledge of energy transfer by conducting investigations from ET lessons 3a/b.
12:00–12:45 45 min	**LUNCH**	
12:45–1:15 30 min	**Content Deepening (Continued)**	• Deepen participants' science-content knowledge of energy transfer by conducting investigations from ET lesson 4a.
1:15–3:15 120 min (Includes 10-min break)	**Lesson Analysis: SCSL Strategy C**	• Use lesson analysis of classroom videos to better understand SCSL strategy C. • Deepen participants' science-content knowledge of energy transfer through lesson analysis.
3:15–3:30 15 min	**Wrap-Up: Summary, Homework, and Reflections**	• Summarize and reflect on key ideas about STeLLA strategies B, I, 7, and C, and the Energy Transfer science content.

DAY 6

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
8:00–8:30 30 min **Getting Started** Slides 1–6	**Purpose** • Build community by sharing participants' reflections from day 5. • Set the stage for a day of learning. **What Participants Do** • Review the day's agenda. • Discuss reflections from day 5. • Review key areas of learning from day 5. • Read today's focus questions. **Posters and Charts** • STeLLA Framework and Strategies poster • Day-6 Agenda (chart) • Day-6 Focus Questions (chart) **Supplies** • Science notebooks		**Display Slide 1.** RESPeCT PD Program (6 min) a. Take care of any housekeeping issues.
			**Display Slide 2.** Agenda for Day 6 (5 min) a. Go over the agenda for the day.

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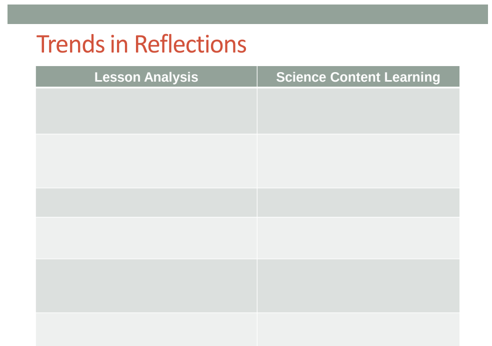
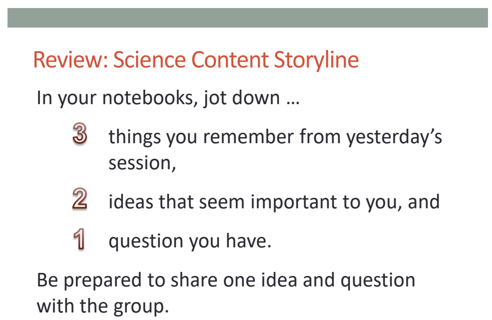
		 	**Display Slide 3.** Trends in Reflections (5 min) a. Give participants time to review your feedback on their reflections from day 5 and offer reactions, comments, or follow-up questions.
		 	**Display Slide 4.** Review: Science Content Storyline (10 min) a. Point out the three tasks on the slide. Allow 4–5 minutes for participants to write their responses in their science notebooks. b. Have each participant share one idea about the science content storyline that she or he thinks is really important. c. Then ask participants to share their questions. If you can answer them quickly, go ahead and do so. If a question needs a more detailed response, write it down and schedule a time to address it.

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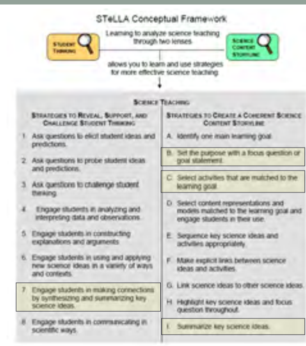
		Today's Focus Questions 1. How can we begin and end a lesson to help students develop a coherent science content storyline? 2. How can selecting appropriate science activities help students develop a coherent science content storyline? 3. What happens to energy when objects collide? 4. Where does the energy of a moving object come from?	**Display Slide 5.** Today's Focus Questions (1 min) a. Introduce today's focus questions.
			**Display Slide 6.** STeLLA Conceptual Framework (3 min) a. "Today we'll be looking at four new STeLLA strategies. Three of them are Science Content Storyline Lens strategies, and one is a Student Thinking Lens strategy. Throughout the session, think about how these strategies are different from one another and how they are closely linked to each other."

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8:30–10:10 100 min (Includes 10-min break) **Lesson Analysis: STeLLA Strategies B, I, and 7** Slides 7–14	**Purpose** • Use lesson analysis of classroom videos to better understand STeLLA strategies B, I, and 7. • Deepen participants' science-content knowledge of energy transfer through lesson analysis. **Content** • Strategies B, I, and 7 are like bookends that mark the beginning and end of a lesson. The science ideas used in the summary should match the focus question from the beginning of the lesson, and both the focus question and the summary should match the lesson's main learning goal. • Energy Transfer science content emerges from video-based lesson analysis. **What Participants Do** • Make, share, and discuss charts summarizing the purposes and key features of strategies B, I, and 7. • Discuss questions about strategies B, I, and 7. • Analyze video clips from the beginning and end of an Energy Transfer lesson. • Study the main learning goal (MLG), focus question, and summary in an Energy Transfer lesson plan. **Videos** • Video Clip 6.1, Bernstein	Lesson Analysis: Focus Question 1 How can we begin and end a lesson to help students develop a coherent science content storyline?	**Display Slide 7.** Lesson Analysis: Focus Question 1 (Less than 1 min) a. "Now let's dig into our first focus question."
		Strategies B, I, and 7: Purposes and Key Features **Group 1:** What are the purpose and key features of strategy B? • Why is a focus question or goal statement important for science content storyline coherence? **Group 2:** What are the purpose and key features of strategy I? • Why is summarizing key science ideas important for science content storyline coherence? **Group 3:** What are the purpose and key features of strategy 7? • How does strategy 7 compare with strategy I? **All groups:** Make sure to cite ideas from the STeLLA strategies booklet in your answers.	**Display Slide 8.** Strategies B, I, and 7: Purposes and Key Features (25 min) a. **Pairs (3 min):** Direct participants to retrieve their Z-fold summary charts and share with a partner what they learned from their homework assignment about STeLLA strategies B, I, and 7. b. **Small groups (12 min):** Divide participants into three small groups and have them make charts that capture the purposes and key features of the three strategies. **Note:** Challenge participants to imagine themselves in a Teacher Leader role. Ask them, "How would you explain these strategies to the teachers you're leading?" c. **Whole group (10 min):** Have small groups share their charts in a whole-group share-out. **Key ideas:** • Make sure participants understand that a

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	classroom (beginning of lesson) • Video Clip 6.2, Knight classroom (beginning of lesson) • Video Clip 6.3, Bernstein classroom (end of lesson) • Video Clip 6.4, Knight classroom (end of lesson) **Handouts in PD Binder** • 6.1 Analysis Guides B and I • 6.2 Transcript for Video Clip 6.1 • 6.3 Transcript for Video Clip 6.2 • 6.5 Transcript for Video Clip 6.3 • 6.6 Transcript for Video Clip 6.4 **Supplies** • Science notebooks • Chart paper and markers **PD Resources** • STeLLA strategies booklet • RESPeCT lesson plans binder • Participants' SCSL and STL Z-fold summary charts (front pocket of PD binder)		focus question is designed to do more than just get students interested in the lesson. It gets them thinking about a phenomenon or something else they've never thought about before. It also reveals important things about the knowledge and experiences they're bringing to the lesson, it conceptually situates the learning, and it's referred to throughout the lesson. • STeLLA strategies B, I, and 7 are like bookends that mark the beginning and end of a lesson. The science ideas used in the summary should match the focus question from the beginning of the lesson, and both the focus question and the summary should match the lesson's main learning goal.
		Discussion Questions: Strategy B 1. What is the difference between focus questions and goal statements? 2. Which do you think would be more useful in engaging student interest and making their thinking visible—focus questions or goal statements?	**Display Slide 9.** Discussion Questions: Strategy B (7 min) **Whole group:** Discuss the questions on the slide as a group. **Key ideas:** • A focus question is designed to be answered using the lesson's main learning goal and supporting science ideas. A goal statement describes the main science idea to be learned. • Focus questions are always used in RESPeCT lesson plans because they're useful in engaging student interest, making their thinking visible, and eliciting initial ideas at the beginning of a lesson. When posed at the end of a lesson, focus questions challenge students to use new ideas developed during the lesson.

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		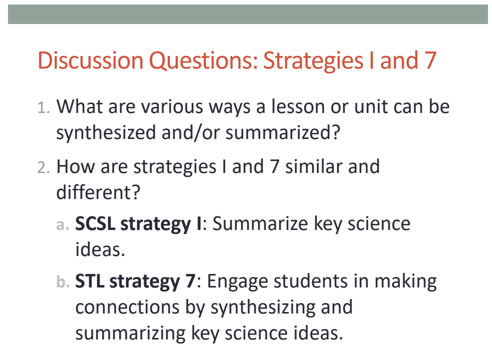	**Display Slide 10.** Discussion Questions: Strategies I and 7 (7 min) a. **Whole group:** Discuss the first question on the slide. Participants can refer to the information on strategy 7 in the STeLLA strategies booklet to identify a variety of ways in which key science ideas in a lesson can be synthesized. b. **Emphasize:** “Toward the end of a unit, an entire lesson may be devoted to strategy 7, which engages students in synthesizing and summarizing science ideas across several lessons.” c. Discuss the second question on the slide. **Key ideas:** • In strategy I, the *teacher* creates a summary of key science ideas in the lesson. Strategy 7, however, engages *students* in synthesizing and summarizing key science ideas in the lesson. When *students themselves* perform this work, it makes their thinking visible, engages them in active sensemaking, and reveals to the teacher any misunderstandings or gaps in knowledge. Using both strategies brings coherence to a science lesson and is a powerful way to end it. • In strategy 7, summarizing involves making connections between key science ideas, which helps students *synthesize* the main learning goal or big idea in a lesson. • Summaries should focus on key

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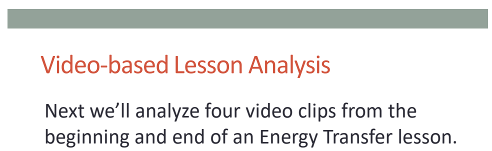
			science ideas, not activities; that is, focusing on “what we *learned*” versus “what we *did*.” • For a variety of reasons, a lesson sometimes ends before the main learning goal has been fully developed. However, summarizing work should still take place. For example, the teacher might say, “Our focus question today was *How do plants get their food?* What have we found out so far?” After students respond, the teacher could reply, “Yes, so far we’ve discovered that water and soil aren’t food for plants. But we still haven’t figured out what *is* food for plants. We’ll continue working on this question next time.”
			**Display Slide 11.** Video-based Lesson Analysis (Less than 1 min) a. **Transition:** This slide marks the transition to video-based lesson analysis.

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		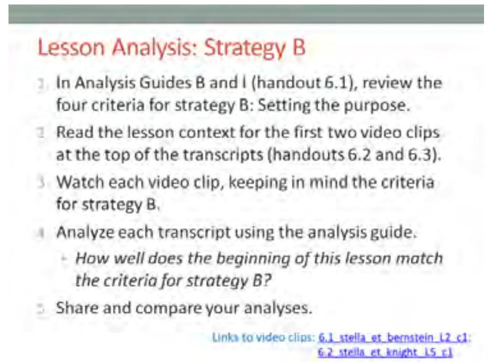	**Display Slide 12.** Lesson Analysis: Strategy B (20 min) a. Have participants locate Analysis Guides B and I (handout 6.1 in PD program binder) and spend 1 or 2 minutes reading the criteria for strategy B: Setting the purpose. b. **Ask:** “Do you have any questions about these criteria?” c. **Emphasize:** “Keep the criteria for strategy B in mind as you watch the video clips from the beginning of an Energy Transfer lesson.” d. **Individuals:** Give participants a couple of minutes to read and think about the lesson context at the top of each video transcript (handouts 6.2 and 6.3). e. Show each video clip. f. **Whole group:** “How well does the beginning of this lesson match the criteria for strategy B?” **Note:** During the discussion, be on the lookout for opportunities to clarify science-content ideas.

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		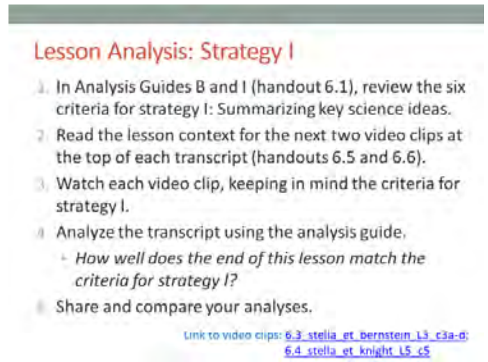	**Display Slide 13.** Lesson Analysis: Strategy I (20 min) a. Allow participants 1 or 2 minutes to read the six criteria in the analysis guide for strategy I: Summarizing key science ideas. b. **Ask:** "Do you have any questions about these criteria?" c. **Emphasize:** "Keep the criteria for strategy I in mind as you watch the video clips from the end of the same Energy Transfer lesson." d. **Individuals:** Give participants a couple of minutes to read and think about the lesson context at the top of each video transcript (handouts 6.5 and 6.6). e. Show each video clips. f. **Whole group:** "How well does the end of this lesson match the criteria for strategy I? How well does the summary statement match the beginning of the lesson?"

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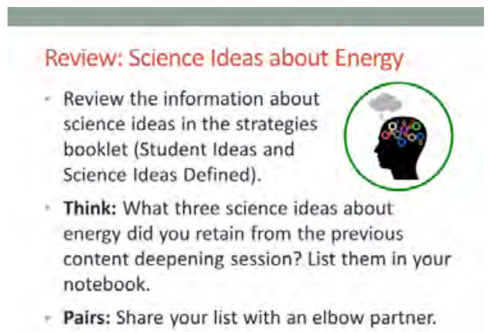
		Energy Transfer Lesson Plans: Reading and Analysis 1. Examine the main learning goal, the lesson focus question, and the lesson summary for your assigned Energy Transfer lesson plan (parts A and B). 2. Answer these questions in your notebooks, keeping in mind the analysis-guide criteria for strategies B and I: • What do you notice? • What do you wonder about?	**Display Slide 14.** Energy Transfer Lesson Plans: Reading and Analysis (10 min) **Note:** This slide can be abridged or skipped if time is running short. a. Read the instructions on the slide and assign a two-part lesson plan (parts A and B) to each participant. b. Ask participants if they have any questions about the assignment. c. **Individual reading-and-analysis time (5 min):** "Answer the slide questions in your notebooks, keeping in mind the analysis-guide criteria." d. **Whole-group discussion (5 min):** Briefly discuss participants' observations and questions for their assigned lesson plans. **Note:** Participants should see a close match between the main learning goal, the lesson focus question, and the summary. However, also welcome critiques and suggestions for improvement. Just make sure critiques are based on good understandings of the strategies involved.
10:00–10:10 10 min	**BREAK**		

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
10:10–12:00 110 min **Content Deepening: Energy Transfer** Slides 15–36	**Purpose** • Deepen participants' science-content knowledge of energy in its various forms and the concepts of energy transfer and transformation. • Deepen participants' science-content knowledge of energy transfer by conducting investigations from ET lessons 3a/b. **Content** • Kinetic energy is the energy of motion. The amount of kinetic energy in an object depends on its mass (m) and speed (v). • Potential energy is stored energy associated with the relative position of two objects. The amount of potential energy in a system depends on the mass (m) and relative distance between two objects. Potential energy has several forms, including gravitational, chemical, and elastic. • Heat is a transfer of energy from a warmer object to a cooler object by conduction, radiation, and convection. • Internal energy equals the sum of the kinetic and potential energies of the individual atoms in a system.		**Display Slide 15.** Content Deepening: Energy Transfer (Less than 1 min) a. **Transition:** This slide marks the transition to the content deepening work. **Note:** Throughout this content deepening phase, refer as needed to the content background document and Common Student Ideas about Energy.
			**Display Slide 16.** Review: Science Ideas about Energy (8 min) a. **Individuals (1 min):** Have participants review the information on science ideas in the STeLLA strategies booklet (Student Ideas and Science Ideas Defined). b. **Think-Pair-Share (4 min):** "What three science ideas about energy did you retain from the previous content deepening session? List these ideas in your notebooks and then share them with an elbow partner." c. **Whole group (3 min):** Invite participants to share their lists with the group. As participants share, record their ideas on chart paper. Identify similar ideas and conflate them into one idea on the chart.

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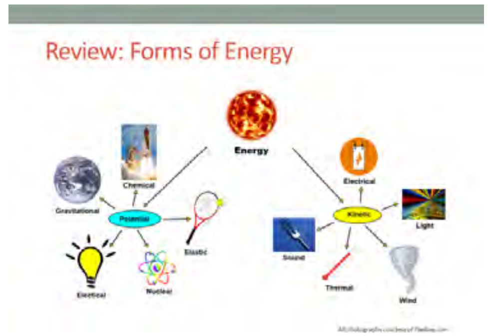
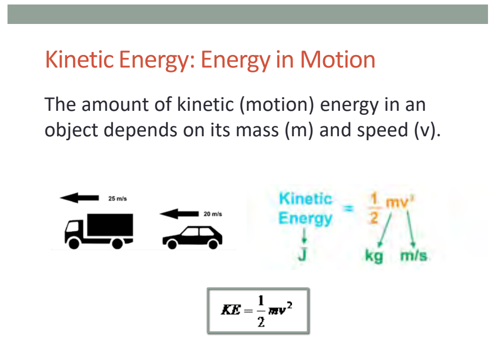
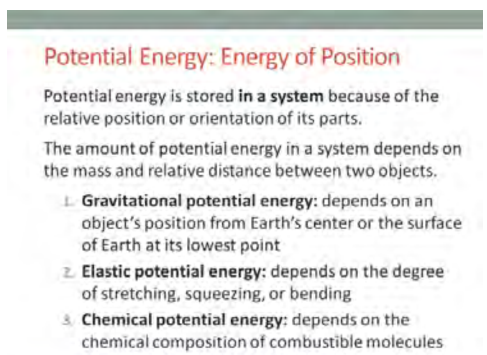
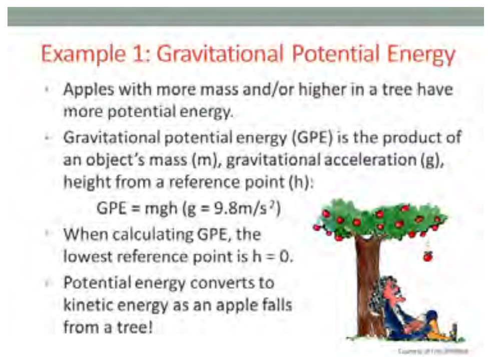
	• In elastic collisions, all kinetic energy remains constant; in inelastic collisions, some kinetic energy converts to other forms of energy. • Mumford and Leroy's big crash is an example of an inelastic collision. • At the top of the hill, all of Mumford's energy is in the form of potential energy. As Mumford coasts down the hill, his potential energy transforms to kinetic energy. Just before the crash, all of Mumford's potential energy has converted to kinetic energy. When Mumford collides with Leroy, some of Mumford's kinetic energy transfers to Leroy, and some transforms into heat and other forms of energy, like sound and light energy. Most of the energy works against materials in the crash, such as bikes, tires, arms and legs, and the ground. **What Participants Do** • Review the information on science ideas in the STeLLA strategies booklet. • Review the forms of energy from the previous content deepening session. • Explore the distinctions between different forms of energy. • Discuss the modes of heat energy		**Display Slide 17.** Review: Forms of Energy (10 min) a. Review kinetic energy and potential energy and highlight the examples (subsets) on the slide. 1. **Kinetic energy** is associated with the motion of a body, an object, or a system. 2. **Potential energy** is stored energy associated with the position or orientation of an object relative to another object. An object with potential energy has the capacity to move from a higher position to a lower position or to make something else move. b. Review the definition of *heat*: Thermal energy that automatically flows (transfers) from hot things toward cooler things. c. Draw participants' attention to the subsets of kinetic and potential energy on the slide and ask these questions: • What is the moving entity in each example of kinetic energy on the slide? • Describe the stored energy in each example of potential energy on the slide. • Can you detect energy transfer in the form of heat in any of these examples?

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	and the differences between heat and internal energy. • Examine common misconceptions about energy and energy transfer. • Learn about elastic and inelastic collisions. • Read about Mumford and Leroy's big crash and investigate the energy transfers and transformations that take place before, during, and after the collision. **Handouts in PD Binder** • 6.10 Mumford and Leroy's Collision **Handouts in Lesson Plans Binder** • 3.1 Mumford Leroy Big Crash, Part 1 (from ET lesson 3a) • 3.2 Mumford Leroy Big Crash, Part 2 (from lesson 3a) **Supplies** • Science notebooks • Chart paper and markers • **Optional:** ramp-and-marble setup from lesson 3a **PD Resources** • STeLLA strategies booklet **Resources in Lesson Plans Binder** *Resources section:* • Content background document • Common Student Ideas	 	**Display Slide 18.** Kinetic Energy: Energy in Motion (1 min) a. Highlight the information on the slide and emphasize the following points: • When an object begins to move, stored potential energy converts to kinetic energy. • All of the particles of an object move in the same direction and at the same speed, unlike internal energy in which the energy in a system is generated from the relative positions and interactions of the parts. • Anything that moves *must* have some kinetic energy. • The amount of kinetic energy is proportional to the mass of object and the square of its speed (KE = $1/2mv^2$).
		 	**Display Slide 19.** Potential Energy: Energy of Position (2 min) a. Emphasize that potential energy is stored *in a system* because of the relative position or orientation of its parts. b. "The amount of potential energy in a system depends on the mass and relative distance between two objects." c. Highlight the following examples: • **Gravitational potential energy** is the stored energy of an object at a higher elevation in relation to the ground. The amount of potential energy is

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			determined by the object's position (or elevation) relative to Earth's center or the surface of Earth at its lowest point. • **Elastic potential energy** relates to energy stored when matter is bent, stretched, or squeezed. The degree of stretching, squeezing, or bending determines the amount of potential energy. • **Chemical potential energy** relates to energy stored in a molecule based on the composition and arrangement of its atoms. The chemical composition of combustible molecules determines the amount of potential energy.
			**Display Slide 20.** Example 1: Gravitational Potential Energy (4 min) a. Walk participants through the information on the slide. b. Point out that height (h) relates to the height (distance) of an object (an apple) from a reference point (the ground). When calculating GPE, participants should make the lowest point of reference 0. c. Emphasize that gravitational acceleration (g) is a constant number that equals the strength of an object's acceleration toward Earth, resulting from the mass of Earth and the distance from Earth's center. All objects free-fall at a gravitational acceleration of 9.8 m/s^2 or 32 ft/s^2 (meters per second squared, or feet per second squared).

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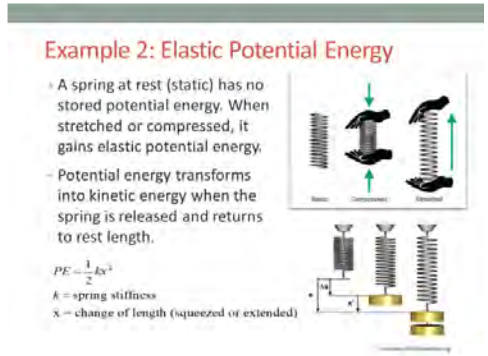
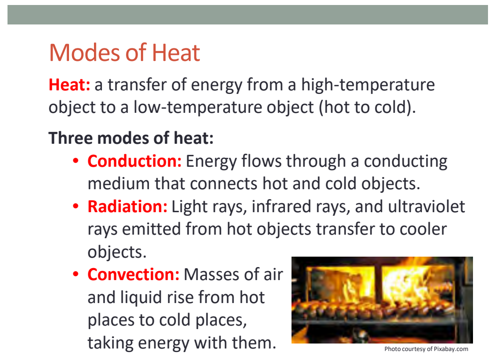
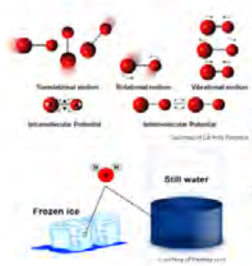
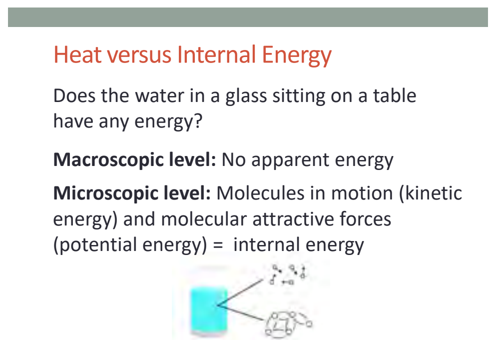
			**Display Slide 21.** Example 2: Elastic Potential Energy (3 min) a. Walk participants through the information on the slide. b. Emphasize that a spring at rest or in a static position (neither stretched nor compressed) has no stored potential energy. c. "When a spring is compressed or stretched, it gains elastic potential energy. The amount of potential energy depends on the amount of length change (∆x, or delta x) in the spring, the mass of the hanging object, and the stiffness of the spring (PE = $1/2kx^2$). In theoretically 'perfect' elastic springs, no energy is lost when spring length changes; it's simply stored as potential energy and then released entirely as kinetic energy." d. "In the process of returning to rest or static length from a stretched or compressed length, a spring's potential energy transforms into kinetic energy."
			**Display Slide 22.** Example 3: Chemical Potential Energy (2 min) a. Read the information on the slide. b. Emphasize that chemical potential energy involves a complex interdependence between particles and the chemical bonds that hold them together. Chemical potential energy can be released as heat or through

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			work (e.g., an electrical current). c. Note that something somewhere paid, or exerted, great energy to break these chemical bonds. d. Cite examples of materials with chemical potential energy, such as food, batteries, gasoline, candles, and firewood.
			**Display Slide 23.** Modes of Heat (5 min) a. Review the definition and modes of heat on the slide. b. Ask participants to describe the different modes of heat in the picture of sausages on a wood grill. c. Cite other good examples: • *Conduction:* The energy that transfers from your hand to the cold drink you're holding. As heat leaves your hand and decreases its internal energy (leaving it numb), it enters the drink and increases its internal energy. • *Radiation:* glowing coals, glowing toaster heating elements, and the Sun. No contact between objects is needed to receive the heat. • *Convection:* Hot air floats upward.

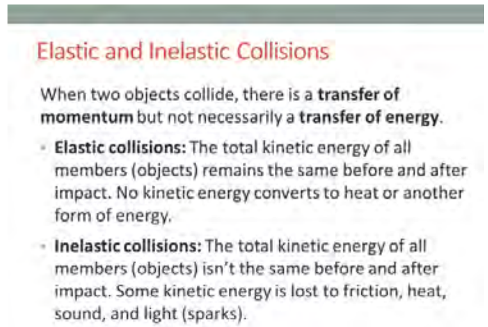
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Characteristics of Heat • The flow of heat is spontaneous (automatic) and irreversible (always from hot to cold). • The internal energy of an object can decrease when it loses heat and increase when it gains heat. • Energy that transforms into heat becomes less useful. It doesn't disappear; it's just displaced. • Heat isn't easy to measure like internal energy.	**Display Slide 24.** Characteristics of Heat (2 min) a. Read through the information on the slide. b. Emphasize that heat is not temperature, internal energy, or a state of matter. It's a *transfer* of energy. Also remind participants that heat energy is kinetic energy. c. Ask participants to compare heat energy in the following examples and identify which is more useful: • Heat from fuel entering the piston of a car engine versus heat escaping from a car's exhaust pipe • Heat from a burning log versus heat rising into the sky • Heat radiating from the Sun versus heat radiating from Earth • Kinetic energy from a moving car versus heat energy radiating from car brakes • Heat spreading from Earth to the atmosphere.
		Internal Energy (IE)  • IE is the sum of kinetic and potential energies of individual particles at the level of atoms. • It can be measured using a thermometer and roughly compared with other materials. • Work or the transfer of heat into or out of a system can increase or decrease internal energy.	**Display Slide 25.** Internal Energy (IE) (2 min) a. Walk participants through the information on the slide. b. Emphasize that internal energy isn't a new kind of energy; it represents the total kinetic and potential energy in a system resulting from the random motion and arrangement of atoms. Potential energy increases

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			internal energy, whereas kinetic energy decreases it. c. “You can visualize internal energy by thinking of molecules as small balls moving around and attaching to each other by soaring like forces.” d. **Ask:** “How does internal energy differ from kinetic energy?” [**Answer:** In kinetic energy, all particles move at same speed in the same direction, but with internal energy, the motion of particles is random.]
			**Display Slide 26.** Heat versus Internal Energy (3 min) a. Initially reveal only the title and the question on the slide. b. Ask participants, “Does the water in a glass sitting on a table have any energy?” c. Elicit ideas from participants and probe their responses. d. Show the explanation on the slide. e. Explain that on a macroscopic scale, we can’t see evidence that the water has energy. But microscopically, internal energy is evident in the motion and attractive forces (kinetic and potential energy) of water molecules.

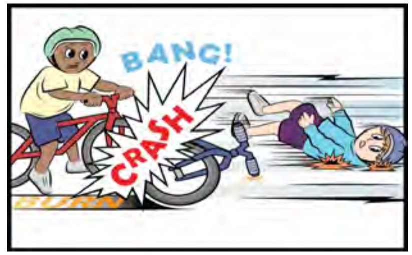
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Heat versus Internal Energy  $W = F \bullet d$ F = Force = frictional force from the road d = distance of skid  Courtesy of Hector Mireles	**Display Slide 27.** Heat versus Internal Energy (3 min) a. Emphasize that internal energy isn't visible and can't be felt, but heat from an object can detected. This is a key difference between internal energy and heat. b. "The internal energy of an object can be increased when heat is applied or a force works against it." c. Briefly discuss how heat increases internal energy in the first example on the slide (the pot of boiling water). Ask participants which modes of heat are involved. d. "Force working against an object can also increase internal energy. One example is rubbing one object against another object. Let's rub our hands together. Do you feel them getting warmer? Frictional forces are increasing the internal energy." e. Draw participants' attention to the second image on the slide and discuss how the tires working against the motion of the car relative to the frictional force from the road surface increases the internal energy of the car as it screeches to a stop. Emphasize that work is the product of force (frictional force from the road) and distance (the distance of the skid).

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Common Misconceptions about Energy • Kinetic (motion) energy depends on speed, not mass. • Gravitational potential energy is the only type of potential energy. • Elastic potential energy happens only during stretching, not compression. • Only visible things have energy. • Only objects that feel warm or hot have thermal energy. • Internal energy is measured by touching it.	**Display Slide 28.** Common Misconceptions about Energy (15 min) a. Read the common misconceptions about energy on the slide. b. **Pairs:** “Discuss these misconceptions with an elbow partner and use the science ideas about energy that we’ve learned about in our content deepening work to develop a statement that corrects each misconception.” c. **Whole group:** Ask participants to share their ideas for correcting each misconception. Probe participants’ responses and elicit differing points of view. d. During the discussion, record key ideas on chart paper and highlight the following explanations as needed: • *Kinetic (motion) energy depends on speed, not mass.* The amount of kinetic energy in an object depends on speed (v) and mass (m). Mathematically, the relationship between energy, mass, and velocity is expressed $KE = ½mv^2$. If a heavier marble and a lighter marble collide with a packing peanut at the same speed, the heavier marble will move the packing peanut a greater distance. Thus, both mass and speed affect the amount of kinetic energy. • *Gravitational potential energy is the only type of potential energy.* Other forms of potential energy exist besides gravitational potential energy. Elastic, chemical, and electromagnetic energy

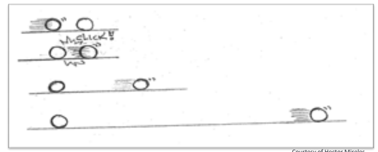
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			are also forms of potential energy. For example, a stretched rubber band stores elastic potential energy, gasoline stores chemical potential energy, and opposite electrical charges separated from each other by some amount of distance store electromagnetic energy. Each category of stored potential energy can be transformed into another form of energy. • *Elastic potential energy happens only during stretching, not compression.* Elastic objects, like springs, can be compressed (squeezed) or expanded (stretched). Both movements cause elastic potential energy to change. Bed springs are compression springs. Bungee cords are expansion springs. Both store potential energy. • *Only visible things have energy.* It's common to think that energy requires a visible agent to express it. For example, a hammer hitting a nail is a visible agent of motion energy. But invisible objects are also agents of energy transfers and transformations. Heat waves (infrared radiation) are invisible, and yet they have energy. For example, the heat lamps used in restaurant buffets keep food warm until it's served. • *Only objects that feel warm or hot have thermal energy.* All objects have some thermal energy because they're composed of molecules in motion. For example, the warm water in one cup and the cold water in another cup both have thermal energy. The water molecules in both cups are in motion, but the warmer molecules are moving

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			faster, on average, than the colder molecules. If both cups contain the same amount of water, we would say that the warm water has more thermal energy than the cold water.
			**Display Slide 29.** Elastic and Inelastic Collisions (5 min) a. Walk participants through the information on the slide. b. Discuss examples of an elastic collision: • Rubber superballs (reach the same height after a bounce as when they started) • Billiard balls (complete transfer of kinetic energy from one ball to another) • Rare, idealized events c. A familiar example of an inelastic collision is a car crash. Note that when two cars collide and mesh together rather than bounce off each other, all kinetic energy is lost, but the total momentum of both cars before and after the crash is the same. d. Emphasize that collisions involve a transfer of momentum, but not necessarily a transfer of energy. An elastic collision doesn't involve energy transfer, since the amount of kinetic energy in both objects remains the same before and after impact. None of the kinetic energy transforms into heat or another form of energy. In contrast, an inelastic collision involves a transfer of energy, since the amount of kinetic energy in both objects is different before and after

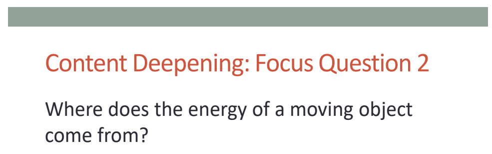
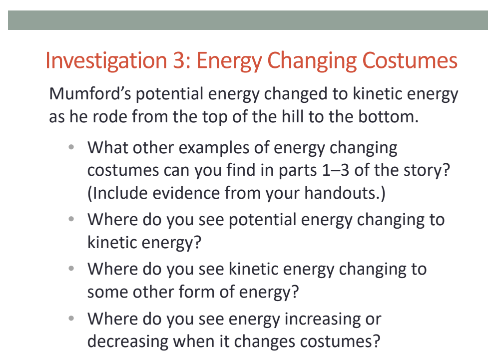
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			impact. Some of the kinetic energy is lost as heat and transforms into other forms of energy (e.g., sound, light).
		Key Science Ideas • Kinetic energy is the energy of motion. The amount of kinetic energy in an object depends on its mass (m) and speed (v). • Potential energy is stored energy associated with the relative position of two objects. The amount of potential energy in a system depends on the mass (m) and relative distance between two objects. Potential energy has several forms, including gravitational, chemical, and elastic. • Heat is a transfer of energy from a warmer object to a cooler object by conduction, radiation, and convection. • Internal energy equals the sum of the kinetic and potential energies of the individual atoms in a system. • In elastic collisions, all kinetic energy remains constant; in inelastic collisions, some kinetic energy converts to other forms of energy.	**Display Slide 30.** Key Science Ideas (5 min) a. Review the key science ideas on the slide to summarize the content deepening work so far. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Have participants copy these science ideas into their science notebooks.
		Content Deepening: Focus Question 1 What happens to energy when objects collide?	**Display Slide 31.** Content Deepening: Focus Question 1 (Less than 1 min) a. Read the focus question on the slide b. Emphasize that this question will guide student learning throughout ET lessons 3a/b. c. Ask participants to write the focus question in their science notebooks and draw a box around it.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Mumford and Leroy's Big Crash  	**Display Slide 32.** Mumford and Leroy's Big Crash (5 min) a. Have participants locate handouts 3.1 and 3.2 (Mumford and Leroy's Big Crash, parts 1 and 2) in their lesson plans binders. b. Read the story aloud as participants follow along. c. "Next, we'll use the science ideas we've been learning about to investigate how energy moved and changed in this story."
		Investigation 1: Mumford and Leroy's Collision 1. Look at each pictures on the handout. What happens to the **kinetic energy** and **potential energy** of Mumford and Leroy in each scene? 2. What do you think happens to the energy after the crash when everything stops moving? Where does all of the energy go? 3. What kind of collision is this? How do you know? 4. Write your descriptions on the handout and your answers to the questions in your notebook.  	**Display Slide 33.** Investigation 1: Mumford and Leroy's Collision (15 min) a. Distribute handout 6.10 (Mumford and Leroy's Collision). Read the questions on the slide and the directions on the handouts. b. **Pairs:** "First, pair up and discuss what happens with Mumford's and Leroy's energy before, during, and after their big crash. Look at each picture on the handout and think about the kinetic energy and potential energy of each boy. Try to reach a consensus about the energy transfers and transformations that take place in each scene. Then write your descriptions in the space provided. After completing the handout, discuss the other two questions on the slide and write your answers in your science notebooks. Make sure to include science ideas and evidence from the story in your responses."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			c. **Whole group:** Ask participants to share their ideas and evidence with the group. Probe participants' responses and elicit differing points of view. d. As participants share their ideas, record them on chart paper. **Ideal responses:** • **Question 1:** All of Mumford's energy at the top of the hill is potential energy. As Mumford races down the hill, his potential energy transforms to kinetic energy. Just before the crash, all of his potential energy has converted to kinetic energy. When Mumford and Leroy collide, a small amount of Mumford's kinetic energy transfers to Leroy, causing him to fly off his bike and skid across the sidewalk. Eventually, Leroy skids to a stop. Some of Mumford's kinetic energy also transforms to the sound of the crash and light from the sparks. But most of Mumford's kinetic energy works against the materials in the crash (the bikes, tires, arms and legs, the ground) and heats them up. Ultimately, heat energy from the crash radiates into the environment. • **Question 2:** After the crash, when everything has stopped moving, all of the energy in the system (objects and environment) is in the form of internal energy. • **Question 3:** Mumford and Leroy's big crash is an example of an *inelastic collision* because energy transfers from Mumford to Leroy when the boys collide.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Investigation 2: Colliding Marbles The marbles in this model represent Mumford and Leroy, and the ruler-ramp represents the hill in the story.  Courtesy of Hector Mireles What are some similarities and differences between this model and Mumford and Leroy's crash?	**Display Slide 34.** Investigation 2: Colliding Marbles (10 min) a. "In our previous content deepening session, we explored energy transfers and transformations using a ramp-and-marble model. In ET lesson 3, students designed a similar model using two marbles and a ramp to simulate Mumford and Leroy's collision." **Note:** In addition to the diagram on the slide, you may want to set up and demonstrate a ramp-and-marble model from lesson 3a to support this investigation. b. Explain that the marbles on the slide represent Mumford and Leroy, and the ruler-ramp represents the hill in the story. c. Ask participants the question on the slide. d. As participants share, record their observations on chart paper. **Ideal responses:** • *Similarities:* Like Mumford, the first marble gains kinetic energy as it rolls down the ramp. • *Differences:* (1) Mumford and Leroy's collision is *inelastic*, but the marbles' collision is nearly an *elastic* collision. After the marbles collide ("click"), the second marble takes off at a speed very similar to the speed of first marble just before the collision. (2) The second marble continues rolling after the collision because light friction barely slows it down. The marble finally rolls to a stop far from the point of

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			impact. Leroy, on the other hand, skids to a stop very quickly because of significant friction between his body and the ground. **Note:** Participants may observe a slight uphill grade on the right side of the ramp on the slide that might also slow the marble down. This grade doesn't appear in lesson 3a.
		Reflect: Content Deepening Focus Question 1 What happens to energy when objects collide?	**Display Slide 35.** Reflect: Content Deepening Focus Question 1 (5 min) a. Review the focus question on the slide. b. Invite participants to share their ideas for answering the question, using science ideas about energy and evidence from the previous investigation. c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share. d. During this discussion, record key ideas on chart paper.
		Key Science Ideas • Energy can transfer or move from one object to another object. • When two objects collide, energy moves or transfers from one object to another. • Evidence that energy transfer is taking place is the changing speed of both objects following the collision. When Mumford (the first marble) hits Leroy (the second marble), he stops moving, and Leroy starts moving.	**Display Slide 36.** Key Science Idea (5 min) a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Have participants copy these science ideas

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			into their science notebooks under the focus question.
12:00–12:45 45 min	**LUNCH**		
12:45–1:15 30 min **Content Deepening (Continued)** Slides 37–40	**Purpose** • Deepen participants' science-content knowledge of energy transfer by conducting investigations from ET lesson 4a. **Content** • The energy of a moving object can come from (1) energy transfer or (2) an energy transformation (costume change). • Energy can change, or transform, from one form to another (e.g., potential energy to kinetic energy). • Potential energy can't be detected like kinetic energy (i.e., using our senses). • To have potential energy, an object must be above or off the ground and have the capacity (potential) to move from a higher place to a lower place. • The higher an object is off the ground, the more potential energy it has. **What Participants Do** • Read part 3 of Mumford and Leroy's big crash and discuss the energy transformations that take place as Mumford coasts from the		**Display Slide 37.** Content Deepening: Focus Question 2 (Less than 1 min) a. Read the focus question on the slide. b. Emphasize that this question will guide student learning throughout ET lesson 4a. c. Ask participants to write the focus question in their science notebooks and draw a box around it.
			**Display Slide 38.** Investigation 3: Energy Changing Costumes (20 min) a. Have participants locate ET handout 4.1 (Mumford and Leroy's Big Crash, Part 3) in their lesson plans binders. They'll also need to use lesson handouts 3.1 and 3.2 and PD handout 6.10 as resources for this investigation. b. Read part 3 of the story as participants follow along. Then discuss how Mumford's energy changed costumes as he coasted from the top of the hill to the bottom. Focus on potential and kinetic energy, as well as energy increasing or decreasing. c. **Pairs:** "Discuss the questions on the slide

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	top of the hill to the bottom. • Investigate other examples of energy changing costumes in parts 1–3 of the story. **Handouts in PD Binder** • 6.10 Mumford and Leroy's Collision **Handouts in Lesson Plans Binder** • 3.1 Mumford Leroy Big Crash, Part 1 (from ET lesson 3a) • 3.2 Mumford Leroy Big Crash, Part 2 (from lesson 3a) • 4.1 Mumford Leroy Big Crash, Part 3 (from ET lesson 4a) **Supplies** • Science notebooks • Chart paper and markers • **Optional:** ramp-and-marble setup (from lesson 3a) **PD Resources** • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** *Resources section:* • Content background document • Common Student Ideas		with an elbow partner and write your answers in your science notebooks. Make sure to include science ideas about energy and evidence from the handouts to support your answers." d. **Whole-group share-out:** Invite participants to share their ideas and evidence with the group. Probe participants' responses and elicit differing points of view and evidence. e. During this discussion, record key ideas on chart paper. **Note:** If participants are having trouble with the concept of energy changing costumes, use the ramp-and-marble model to demonstrate where energy transformations are taking place.
		Reflect: Content Deepening Focus Question 2 Where does the energy of a moving object come from?	**Display Slide 39.** Reflect: Content Deepening Focus Question 2 (5 min) a. Review the focus question on the slide. b. Invite participants to share their ideas for answering the question, using science ideas about energy and evidence from the previous investigation. c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share. d. During this discussion, record key ideas on chart paper.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Key Science Ideas • The energy of a moving object can come from (1) an energy transfer or (2) an energy transformation (costume change). • Energy can change, or transform, from one form to another (e.g., potential energy to kinetic energy). • Potential energy can't be detected using our senses. • To have potential energy, an object must be above or off the ground. It must have the potential to move from a higher place to a lower place. • The higher an object is off the ground, the more potential energy it has.	**Display Slide 40.** Key Science Ideas (5 min) a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Have participants copy these science ideas into their science notebooks under the focus question.
1:15–3:15 120 min (Includes 10-min break) **Lesson Analysis: SCSL Strategy C**	**Purpose** • Use lesson analysis of classroom videos to better understand SCSL strategy C. • Deepen participants' science-content knowledge of energy transfer through lesson analysis. **Content** • To reflect the purpose and key features of strategy C, activities should be selected that can help students engage in making sense	**Lesson Analysis: Focus Question 2** How can selecting appropriate science activities help students develop a coherent science content storyline?	**Display Slide 41.** Lesson Analysis: Focus Question 2 (Less than 1 min) a. Read the focus question on the slide. b. "To help us answer this question, we're going to explore STeLLA strategy C: Select activities that are matched to the learning goal."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
Slides 41–46	of the main learning goal, not because they're fun, easy to do, or only topically related. **What Participants Do** • Make and discuss a chart summarizing the purpose and key features of strategy C. • Use the criteria in Analysis Guide C to analyze video clips from an Energy Transfer lesson (before, during, and after an activity). • Identify activities that are *not* matched to the lesson's main learning goal. **Videos** • Video Clip 6.5, Knight classroom • Video Clip 6.6, Knight classroom Video Clip 6.7, Knight classroom **Handouts in PD Binder** • 6.4 Analysis Guide C • 6.7 Transcript for Video Clip 6.5 • 6.8 Transcript for Video Clip 6.6 • 6.9 Transcript for Video Clip 6.7 **Supplies** • Chart paper and markers • Lesson materials kit **PD Resources** • STeLLA strategies booklet **Resources in Lesson Plans Binder** *Resources section:* • Content background document	Strategy C: Purpose and Key Features According to the strategies booklet, what are the purpose and key features of strategy C: Select activities that are matched to the learning goal?	**Display Slide 42.** Strategy C: Purpose and Key Features (25 min) a. Ask participants to locate the section on strategy C in the STeLLA strategies booklet. b. Have one participant lead the group in creating a chart that summarizes the purpose and key features of strategy C: Select activities that are matched to the learning goal. c. **Ask:** "What does the strategies booklet say about science activities that are fun and engaging for students? **Ideal responses:** • Activities should be selected because they can support students in understanding the main learning goal, *not* because they're fun or easy to do. • Avoid activities that are only topically related (e.g., something about plants); instead, activities should focus on a specific science idea that is closely linked to the main learning goal (e.g., Plants get their food by making it out of carbon dioxide, water, and light energy). • Activities should not just be interesting supplements to the science content storyline; they should help develop it. d. **Follow-up:** "Think back on science-lab activities in high school or college. Did these activities play a key role in helping you better understand the science concepts

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			presented in textbooks or lectures? Or were they more like add-on activities that were only loosely related to the science concepts being taught?”
		Lesson Analysis Question **Main Learning goal**: Energy can transform or change from potential energy to kinetic energy. **Focus question:** Where does the energy of a moving object come from? **Analysis question:** Are the activities well matched to the main learning goal?	**Display Slide 43.** Lesson Analysis Question (1 min) a. For this lesson analysis, participants will view a set of three video clips from one Energy Transfer lesson. b. Review the main learning goal and focus question on the slide. Then introduce the analysis question: *Are the activities well matched to the main learning goal?*
	10-MINUTE BREAK		
		Lesson Analysis: Strategy C 1. Locate Analysis Guide C in your program binders (handout 6.4) and read the main learning goal at the top of page 1. 2. For this analysis, we’ll watch three video clips from the same Energy Transfer lesson. 3. **Before each clip:** Read the lesson context at the top of the video transcript. 4. **After each clip:** Complete part 1 of Analysis Guide C. Links to video clips: 6.5_stella_et_knight_L4_c1; 6.6_stella_et_knight_L4_c2; 6.7_stella_et_knight_L4_c3	**Display Slide 44.** Lesson Analysis: Strategy C (50 min) **Note:** Refer to the content background document as needed throughout this lesson analysis. a. Have participants locate Analysis Guide C (handout 6.4) in their PD binders. b. As participants to read the main learning goal at the top of the handout. Then orient them to part 1 of the analysis guide. c. **Before each clip:** Have participants read the lesson context at the top of the

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			corresponding video transcript. d. Show each video clip. e. **After each clip (individuals or pairs):** Allow time for participants to review the analysis guide, write down science ideas revealed in the activity, and assess how well matched these ideas are to the main learning goal.
		Lesson Analysis: Strategy C Discuss these questions with a partner: 1. Were the activities well matched to the learning goal? Provide evidence to support your response. 2. Suggest ways to improve the match between the activities and the main learning goal (part 2, Analysis Guide C). Be prepared to share your ideas in a group discussion.	**Display Slide 45.** Lesson Analysis: Strategy C (12 min) a. **Pairs:** "Discuss the questions on the slide and be ready to share your ideas with the group." b. **Whole group:** Assess how well the activities in the video clips matched the main learning goal, and ask participants to offer suggestions for improving the match. **Key ideas:** • The marble's potential energy is greater at the top of the ramp than halfway down the ramp or at the bottom. • Potential energy is transformed to kinetic energy as the marble rolls down the ramp. • The marble's kinetic energy is greatest at the bottom of the ramp than halfway down the ramp or at the top. • Potential energy decreases as kinetic energy increases.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Practice: Strategy C **Main learning goal:** Energy can be transformed. **Activities:** 1. Students construct a roller-coaster track out of paper-towel tubes. 2. Students push a weighted cart into a stationary weighted cart and look for evidence of energy transfer or transformation. **Ask these questions for each activity:** • How well is the activity matched to the main learning goal (closely, partially, weakly, not at all)? • How might the activity be changed to better match the main learning goal?	**Display Slide 46.** Practice: Strategy C (10 min) **Note:** This activity may be skipped if time is running short. a. **Individuals (2–3 min):** “Think about how well the activities on the slide are matched to the main learning goal. Be prepared to give a rationale for your answers.” b. **Whole group:** Invite participants to share their ideas and reasoning with the group. **Ideal response:** • Activity 2 is much more closely matched to the learning goal than activity 1. When one weighted cart is pushed into a stationary cart, the stationary cart will start to move (energy transfer). There is also a sound when the collision occurs, which denotes an energy transformation.
3:15–3:30 15 min **Wrap-Up: Summary, Homework, and Reflections** Slides 47–50	**Purpose** • Summarize and reflect on key ideas about STeLLA strategies B, I, 7, and C, and the Energy Transfer science content. **What Participants Do** • Review today’s focus questions. • Share key ideas about strategies B, I, 7, and C from the lesson analysis and content deepening work. • Copy down the homework assignment for day 7.	Today’s Focus Questions 1. How can we begin and end a lesson to help students develop a coherent science content storyline? 2. How can selecting appropriate science activities help students develop a coherent science content storyline? 3. What happens to energy when objects collide? 4. Where does the energy of a moving object come from?	**Display Slide 47.** Today’s Focus Questions (Less than 1 min) a. Remind participants of today’s focus questions.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	• Write reflections on today's learning. **Handouts in PD Binder** • 6.11 Daily Reflections—Day 6 **Supplies** • Science notebooks	Summarize Today's Work Hold up three fingers when you have all of these in mind: 1. One idea you're taking away about strategy C: Select activities that are matched to the learning goal 2. One idea you're taking away about strategies B, I, and 7: • Set the purpose with a focus question or goal statement (strategy B) • Summarize key science ideas (strategy I) • Engage students in making connections by synthesizing and summarizing key science ideas (strategy 7) 3. One science idea about energy transfer that you're taking away from today's content deepening work.	**Display Slide 48.** Summarize Today's Work (7 min) a. **Individuals:** Read the instructions on the slide and give participants enough time to come up with three ideas to summarize today's work. b. **Whole group:** In a round-robin, invite participants to share a key idea for each category on the slide. (Allow participants to pass if they wish.)
		Homework • In the STeLLA strategies booklet, read about SCSL strategy D: *Select content representations and models matched to the learning goal and engage students in their use.* • Fill in the appropriate column on your Z-fold summary chart.	**Display Slide 49.** Homework (Less than 1 min) a. Go over the homework assignment and have participants write it in their notebooks. b. Make sure participants understand each part of the assignment.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Reflections on Today's Session • How are STeLLA strategies B, I, 7, and C related to one another? • What new insights or questions have emerged about energy transfer and transformation? • Only two more days are left of our time together at the Summer Institute. What burning questions do you think should be answered before the end of the week?	**Display Slide 50.** Reflections on Today's Session (7 min) a. Allow participants **at least 5 minutes** to think about today's session and write their reflections and feedback on the Daily Reflections sheet (handout 6.11 in PD program binder).