RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	6	**Day**	7	**STeLLA Strategy**	SCSL Strategy D: Select Content Representations and Models	**Subject Matter Focus**	The Sun's Effect on Climate (SEC)

Focus Questions	• How do you know when a content representation is appropriate and matched to the main learning goal? • How can we engage students in using content representations and models in meaningful ways? • Why do some places at the same latitude have different temperature patterns? • How does being near the ocean or another large body of water affect air temperature? • How does being near the ocean or at a higher elevation affect air temperature? • How can we use what we've learned about the Sun's effect on climate to answer the unit central question, *Why are some places on Earth hotter than others at different times of the year?*
Main Learning Goals	Participants will understand the following: • Content representations can be helpful tools if they're matched to the learning goal of a lesson, are scientifically accurate, and address common student misconceptions. In addition, they must be comprehensible to students without reinforcing or introducing misconceptions and without distracting students with too many details or new terms. • To ensure meaningful learning from content representations, students need to be engaged in modifying or creating the representations, in analyzing their meaning, and in critiquing them. • While the curved surface of Earth, its consistent tilt, and its orbital path around the Sun are key factors that produce climate variations at different latitudes, other factors, such as elevation and proximity to large bodies of water, influence climate as well. • Water and land absorb and reflect (release) the Sun's incoming energy at differing rates. These variations in heating and cooling rates impact regional climates by affecting average air temperatures. • Because of Earth's curved surface and consistent tilt, the angle of sunlight hitting the surface varies at different times of the year, causing uneven heating. While latitude is a key factor influencing climate, other factors are involved, such as elevation and proximity to large bodies of water.

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.	**Posters and Charts** • STeLLA Framework and Strategies poster • Day-7 Agenda (chart) • Norms for Working Together (chart) • Day-7 Focus Questions (chart) • Strategy charts from days 1–6 (STL strategies 1–7 and SCSL strategies A, B, C, and I) • Parking Lot poster **Handouts in RESPeCT PD Binder Front**	• Video Clip 7.1: Kawamura classroom (SCSL strategy D); 7.1_stella_SEC_kawamura_c1–c3 • Video Clip 7.2: Hannigan classroom (SCSL strategy D); 7.2_stella_SEC_hannigan_L6_c6 • Video Clip 7.3: Belcastro classroom (SCSL strategy D); 7.3_stella_SEC_belcastro_c1

Planning and Preparation Tasks	Pocket	

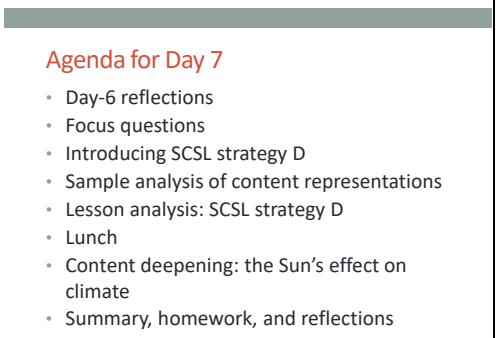
• Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to PPTs if needed.
• Review the reflections from day 6 and create a summary slide.
• Watch the video clips and anticipate participant responses.
• Prepare charts for the day's agenda and focus questions.
• Review the activities for SEC lessons 5a/b, 6a/b, and 7a/b in the lesson plans binder.
• Consider whether to set up in advance the materials needed to conduct the investigation from lesson 6a or have participants set them up as part of the activity. You could also facilitate gathering data points by collecting temperature readings as a group.
	• Z-fold summary chart: Science Content Storyline Lens Strategies
	
	Handouts in RESPeCT PD Binder, Day 7
	• 7.1 Analysis Guide D: Selecting and Using Content Representations (six copies: three for sample analysis of content representations, and three for video-based lesson analysis)
	• 7.2 Tray-and-Globe Example
	• 7.3 Transcript for Video Clip 7.1
	• 7.4 Transcript for Video Clip 7.2
	• 7.5 Transcript for Video Clip 7.3
	• 7.6 Investigating Temperatures at the Same Latitude (from SEC lesson 5a)
	• 7.7 Uneven Heating (from SEC lesson 6a)
	• 7.8 Daily Reflections—Day 7
	
	Handouts in RESPeCT Lesson Plans Binder
	• 2.3 The Sun's Incoming Energy (from SEC lesson 2b)
	• 5.3 Map of Three Cities in the United States (from SEC lesson 5b)
	• 6.2 Lab Instructions for Uneven-Heating Demonstration (Teacher Master) (from SEC lesson 6a)
	• 6.3 Climb to Cold (from SEC lesson 6b)
	• 7.1 Team Challenges: Why Are Some Places on Earth Hotter Than Others at Different Times of the Year? (from SEC lesson 7a)
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• For lessons 5a/b investigations:
	  • Colored pencils (3 colors per participant)
	• For lessons 6a/b investigations:
	  • 1 heat lamp
	  • 1 cup filled 2/3 with soil
	  • 1 cup filled 2/3 with water
	  • 2 thermometers	

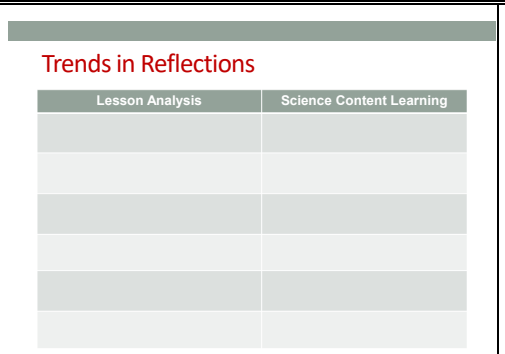
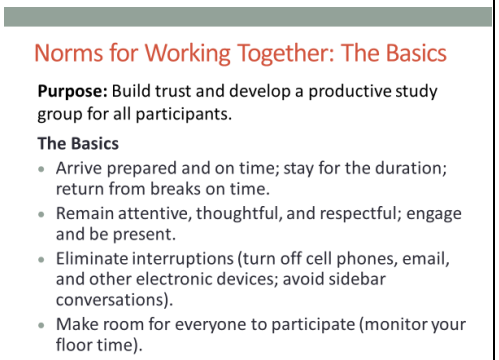
	• Masking tape • 1 watch or clock with a second hand • Colored pencils (2 per participant) **PD Resources** • STeLLA strategies booklet • RESPeCT PD program binder • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** *Resources section:* • The Sun's Effect on Climate Content Background Document • Common Student Ideas about the Sun's Effect on Climate and Seasons	

DAY 7 SESSION OUTLINE

Time	Activities	Purpose
8:00–8:25 25 min	**Getting Started: Housekeeping, Agenda, Day-6 Reflections, Norms, Focus Questions**	• Build community by sharing participants' reflections from day 6. • Set the stage for a day of learning.
8:25–9:00 35 min	**Introducing SCSL Strategy D**	• Deepen participants' knowledge of the purpose and key features of SCSL strategy D.
9:00–10:20 80 min (Includes 10-min break)	**Sample Analysis of Content Representations**	• Develop participants' ability to analyze content representations to determine how well they match the main learning goal. • Deepen participants' science-content knowledge as it emerges from analyzing content representations.
10:20–12:00 100 min	**Lesson Analysis: SCSL Strategy D**	• Develop participants' ability to analyze content representations to determine how well engaged students are in their use. • Use lesson analysis of classroom videos to better understand STeLLA strategy D. • Deepen participants' science-content knowledge of the Sun's effect on climate through lesson analysis.
12:00–12:45 45 min	**LUNCH**	
12:45–3:15 150 min (Includes 10-min break)	**Content Deepening: The Sun's Effect on Climate**	• Deepen participants' science-content knowledge of the Sun's effect on climate by conducting investigations from SEC lessons 5–7.
3:15–3:30 15 min	**Wrap-Up: Summary, Homework, and Reflections**	• Summarize and reflect on key ideas about SCSL strategies A, B, C, D, and I and the SEC science content, lesson plans, and lesson analysis work.

DAY 7

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
8:00–8:25 25 min **Getting Started** Slides 1–7	**Purpose** • Build community by sharing participants' reflections from day 6. • Set the stage for a day of learning. **What Participants Do** • Review the day's agenda. • Discuss reflections from day 6. • Review and discuss progress on the RESPeCT program norms. • Read today's focus questions. **Posters and Charts** • STeLLA Framework and Strategies poster • Day-7 Agenda (chart) • Norms for Working Together (chart) • Day-7 Focus Questions (chart)		**Display Slide 1.** RESPeCT PD Program (5 min) a. Take care of any housekeeping issues.
			**Display Slide 2.** Agenda for Day 7 (5 min) a. Talk through the agenda for the day.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 3.** Trends in Reflections (5 min) a. Give participants time to review your feedback on their reflections from day 6 and offer reactions, comments, or follow-up questions.
			**Display Slide 4.** Norms for Working Together: The Basics (2 min) a. Review the norms and ask participants to think about areas where they could improve individually or as a group. b. "How do you think we're doing individually and as a group applying these norms? Do you have any comments or suggestions about areas where we could improve?"

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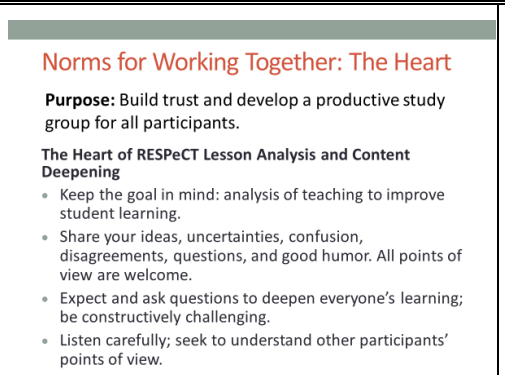
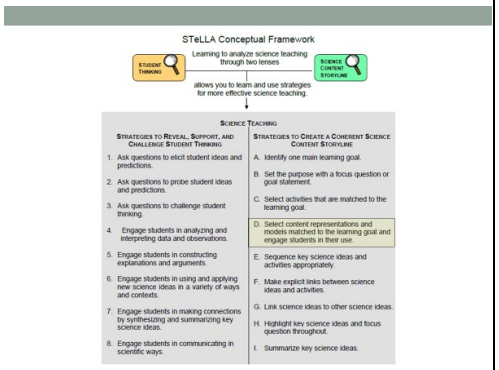
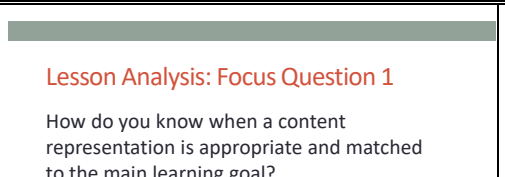
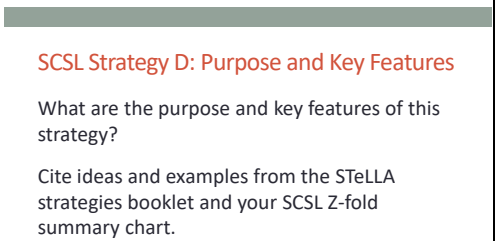
			**Display Slide 5.** Norms for Working Together: The Heart (5 min) a. Review the norms that are at the heart of the RESPeCT program and ask participants to think about areas where they could improve individually or as a group. b. **Emphasize:** "We're doing quite well with our norms, but as we approach the fall, I hope to see our interactions evolving so that you feel comfortable interacting less through your PD leaders as the 'teachers' and direct more of your questions and comments to one another, challenging each other, piggybacking on each other's ideas, and listening carefully to one another so that everyone is contributing to the kind of productive analysis that will help us figure out ways to strengthen our students' science learning." c. Offer an opportunity for participants to comment on how the group is doing with these norms. Ask, "Are there any areas where we could improve? Any suggested changes?"

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		6 **Today's Focus Questions** • How do you know when a content representation is appropriate and matched to the main learning goal? • How can we engage students in using content representations and models in meaningful ways? • Why do some places at the same latitude have different temperature patterns? • How does being near the ocean or another large body of water affect air temperature? • How does being near the ocean or at a higher elevation affect air temperature? • How can we use what we've learned about the Sun's effect on climate to answer the unit central question, *Why are some places on Earth hotter than others at different times of the year?*	**Display Slide 6.** Today's Focus Questions (1 min) a. Introduce the focus questions on the slide.
		 STeLLA Conceptual Framework Learning to analyze science teaching through two lenses STUDENT THINKING SCIENCE CONTENT STORYLINE allows you to learn and use strategies for more effective science teaching. SCIENCE TEACHING STRATEGIES TO REVEAL, SUPPORT, AND CHALLENGE STUDENT THINKING 1. Ask questions to elicit student ideas and predictions. 2. Ask questions to probe student ideas and predictions. 3. Ask questions to challenge student thinking. 4. Engage students in analyzing and interpreting data and observations. 5. Engage students in constructing explanations and arguments. 6. Engage students in using and applying new science ideas in a variety of ways and contexts. 7. Engage students in making connections by synthesizing and summarizing key science ideas. 8. Engage students in communicating in scientific ways. STRATEGIES TO CREATE A COHERENT SCIENCE CONTENT STORYLINE A. Identify one main learning goal. B. Set the purpose with a focus question or goal statement. C. Select activities that are matched to the learning goal. D. Select content representations and models matched to the learning goal and engage students in their use. E. Sequence key science ideas and activities appropriately. F. Make explicit links between science ideas and activities. G. Link science ideas to other science ideas. H. Highlight key science ideas and focus question throughout. I. Summarize key science ideas.	**Display Slide 7.** STeLLA Conceptual Framework (2 min) a. "We'll be focusing on STeLLA strategy D today. Notice that this SCSL strategy has two parts. The first part—select content representations and models matched to the learning goal—sounds similar to strategy C—select activities that are matched to the learning goal. The second part focuses on *engaging* students in the use of content representations. This ensures that students aren't just *looking* at diagrams or models but are *actively engaging* with them."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
8:25–9:00 35 min **Introducing SCSL Strategy D** Slides 8–10	**Purpose** • Deepen participants' knowledge of the purpose and key features of SCSL strategy D. **Content** • Strategy D content representations can be especially useful in helping students see how the science content storyline fits together. Content representations (such as diagrams, analogies, graphs, concept maps, models, videos, simulations, and role-plays) can make science ideas more concrete and real for students. • Content representations are most meaningful when students are engaged in constructing and critiquing them. • Content representations support English language learners by providing a variety of ways for them to understand science ideas that extend beyond words. **What Participants Do** • Make, share, and discuss charts summarizing the purpose and key features of SCSL strategy D. • Discuss questions about strategy D. **Supplies** • Chart paper and markers		**Display Slide 8.** Lesson Analysis: Focus Question 1 (Less than 1 min) a. "Now let's explore the first part of strategy D and our first focus question." b. Read the focus question on the slide.
			**Display Slide 9.** SCSL Strategy D: Purpose and Key Features (25 min) a. **Small groups (13 min):** Divide participants into two groups and have each group make a chart identifying the purpose and key features of strategy D described in their SCSL Z-fold summary charts and the STeLLA strategies booklet. b. **Whole group (12 min):** Have groups report out. Then ask, "What differences do you notice between the two charts?" **Key ideas:** • Content representations can help students envision things that are too big or too small for them to see firsthand in the classroom, or processes that take place too quickly or slowly for them to perceive. • Content representations give students access to different ways of making sense of key science ideas. • If content representations or models are

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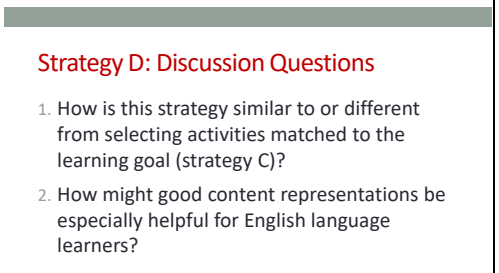
	PD Resources • STeLLA strategies booklet • SCSL Z-fold summary chart (front pocket of PD binder)		closely matched to the main learning goal, they can be especially useful in helping students see how the science content storyline fits together. • There are many different types of content representations (analogies, metaphors, and visual representations, such as diagrams, charts, graphs, concept maps, models, and role-plays). • Content representations can reveal and challenge student thinking if students are involved in creating, modifying, and analyzing the representations (instead of just listening to the teacher explain them).
			**Display Slide 10.** Strategy D: Discussion Questions (10 min) a. **Whole group:** Discuss the questions on the slide. **Key ideas:** • **Slide question 1:** Both strategy C and strategy D emphasize that all activities must be matched to the main learning goal. Strategy D, however, emphasizes a very important kind of activity: content representations. It also emphasizes that teachers should actively engage students in creating, modifying, and using content representations. • **Slide question 2:** Good content representations can benefit all students, but they especially benefit ELL students because they present science ideas in pictures, images, and other visual formats

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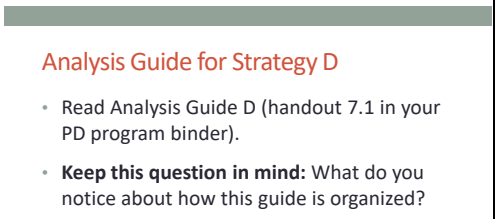
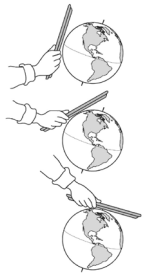
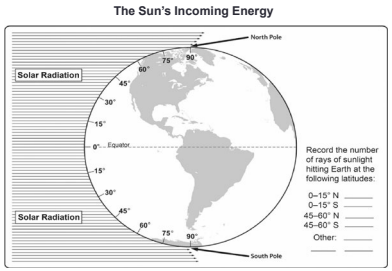
			in addition to words.
9:00–10:20 80 min (Includes 10-min break) **Sample Analysis of Content Representations** Slides 11–20	**Purpose** • Develop participants' ability to analyze content representations to determine how well they match the main learning goal. • Deepen participants' science-content knowledge as it emerges from analyzing content representations. **Content** • Six criteria are used in analyzing and selecting a content representation that is matched to the main learning goal. • Content representations in SEC lesson 2 demonstrate how Earth's curved surface causes differential heating. This can help students understand why, in general, it gets colder moving from the equator to the poles, but it can also lead to some confusion. Both teachers and students need to clearly understand that Earth's curved surface, *not* its 23.5-degree axis tilt, causes sunlight to strike the surface at different angles based on latitude. The impact of Earth's tilt and orbit around the Sun on seasonal temperature variations aren't introduced until lessons 3 and 4.		**Display Slide 11.** Analysis Guide for Strategy D (6 min) a. Have participants locate Analysis Guide D in their PD program binders (handout 7.1). b. **Individuals:** "As you read the analysis guide, keep in mind the discussion question on the slide." c. **Whole group:** Discuss the question on the slide. **Key ideas:** • This analysis guide focuses on the main learning goal by having participants write that down first. • The guide is divided into three parts. Part 1 focuses on how well matched the content representation is to the main learning goal. Part 2 focuses on how well engaged students are in using the content representation. • The guide ends with identifying ways to improve the content representation and its use in a lesson (part 3).

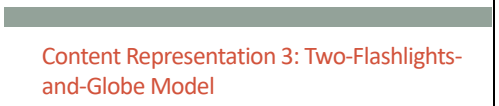
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	• In today's lesson analysis work, the content representations for lesson 2 are analyzed to determine how well they match the lesson's main learning goal. Content representations for lessons 3 and 4 are analyzed in classroom video clips. **What Participants Do** • Study how Analysis Guide D is organized. • Use the analysis guide to analyze three examples of SEC content representations (drawn from content deepening sessions or SEC lessons). **Handouts in PD Binder** • 7.1 Analysis Guide D (three copies—one for the tray-and-globe model, one for the Sun's incoming energy diagram, and one for the two-flashlights-and-globe model) • 7.2 Tray-and-Globe Example **Handouts in Lesson Plans Binder** • 2.3 The Sun's Incoming Energy (from SEC lesson 2b) **PD Resources** • STeLLA strategies booklet • RESPeCT lesson plans binder	Content Representation 1: Tray-and-Globe Model Read the main learning goal and description of the content representation in **Analysis Guide D1** (page 1 of handout 7.1).	**Display Slide 12.** Content Representation 1: Tray-and-Globe Model (2 min) a. **Set the context:** "Now we're going to analyze a content representation to see how well it's matched to the stated learning goal." b. Have participants read the main learning goal and description of the content representation in **Analysis Guide D1** (page 1 of handout 7.1).
		Content Representation 1: Tray-and-Globe Model 	**Display Slide 13.** Content Representation 1: Tray-and-Globe Model (8 min) a. **Individuals:** Have participants work independently on part 1 of Analysis Guide D1. **Note:** Encourage participants to refer as needed to handout 7.2 (Tray-and-Globe Example) in their PD binders. b. **Pairs:** "Now pair up and discuss your answers to the analysis questions." c. Emphasize that the content representation participants are analyzing is *not just the image* but the *entire activity*, which involves measuring the surface area that falls within the circle of light striking the

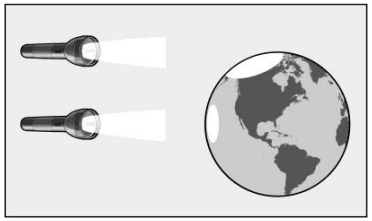
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			tray straight on or at an angle.
		Does Content Representation 1 Match the Main Learning Goal? How did you answer these questions from part 1 of the analysis guide? 1. Is the content representation scientifically accurate? 2. Is it closely matched to the main learning goal? 3. Does it present science ideas to students in comprehensible ways? 4. Does it reinforce/introduce any misconceptions? 5. Does it address common misconceptions? 6. Does it contain distracting details?	**Display Slide 14.** Does Content Representation 1 Match the Main Learning Goal? (10 min) a. **Whole group:** Discuss participants' responses to the questions in part 1 of Analysis Guide D1. b. **Ask:** "How might this content representation be improved? Would you use it with your students?" **Observations:** • This content representation is scientifically accurate in depicting the intensity of sunlight striking Earth (the tray) at a single latitude, but since Earth's surface is curved and the tray is flat, the model is flawed. You almost need to move the tray at the tangent of the globe to visualize the changing intensity of light (rather than at several static points around the globe). • This content representation can be misleading in the following ways: 1. The flashlight beam often casts a faint light around the edges of the circle, which can lead students to mistakenly conclude that sunlight is fainter farther from the equator because it's at the "edge" of the light rays. Higher-quality flashlights do a better job of shining light more uniformly throughout the circle, including around the edges. Related misconceptions are that sunlight strikes Earth *only* at the equator or makes a circle of light in

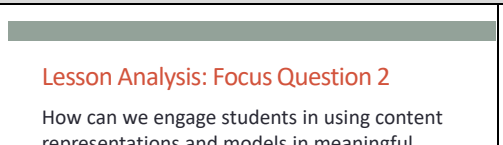
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			much the same way a flashlight pointed directly at the equator creates a circle of light that spreads out as it moves toward the poles. Students think that the poles don't get as much light as the equator because they're farther from where the circle of sunlight strikes the surface. 2. Students falsely equate the tilted tray with Earth's tilted axis and miss the point that variations in light intensity resulting in warmer temperatures at the equator and cooler temperatures at the poles are related *not* to Earth's tilt but to the angle at which sunlight strikes Earth's curved surface. 3. The scale of the objects in this content representation and the distances between Earth and the Sun are misleading. The Sun isn't close to Earth, nor does it shine on just one spot. It's actually very far away from Earth and shines not only on Earth but on other celestial bodies. **Take-home message:** Trying to address all six criteria in the analysis guide is a balancing act or trade-off. To make complex science ideas meaningful and comprehensible to students, the content representation needs to be simplified, but simplifications can sometimes be misleading in terms of scientific accuracy. The important thing is for teachers to be aware of such problems so they can be addressed.

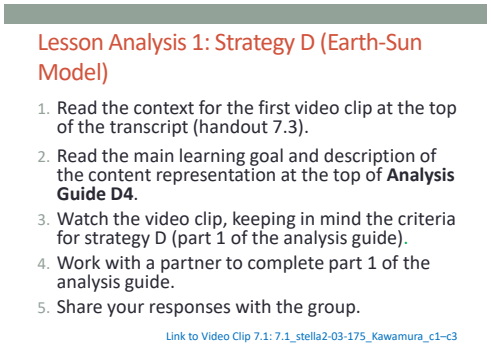
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Content Representation 2: The Sun's Incoming Energy • Read the main learning goal and description of the content representation in **Analysis Guide D2** (page 2 of handout 7.1). • Use your experience with this content representation to complete part 1 of the analysis guide.	**Display Slide 15.** Content Representation 2: The Sun's Incoming Energy (5 min) a. Set the context for analyzing another content representation. b. Have participants turn to **Analysis Guide D2** (page 2 of handout 7.1) and read the main learning goal and description of the content representation.
		Content Representation 2: The Sun's Incoming Energy 	**Display Slide 16.** Content Representation 2: The Sun's Incoming Energy (7 min) a. **Individuals:** Have participants work independently on part 1 of Analysis Guide D2. Let them know they can find this slide diagram in their lesson plans binders (handout 2.3, The Sun's Incoming Energy). **Note:** If time is short, just do partner work. b. **Pairs:** "Now pair up and discuss your answers to the analysis questions."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Does Content Representation 2 Match the Main Learning Goal? How did you answer these questions from part 1 of the analysis guide? 1. Is the content representation scientifically accurate? 2. Is it closely matched to the main learning goal? 3. Does it present science ideas to students in comprehensible ways? 4. Does it reinforce/introduce any misconceptions? 5. Does it address common misconceptions? 6. Does it contain distracting details?	**Display Slide 17.** Does Content Representation 2 Match the Main Learning Goal? (10 min) a. **Whole group:** Discuss participants' responses to the questions in part 1 of Analysis Guide D2. b. **Ask:** "How might this content representation be improved? Would you use it with your students?" **Observations:** • This content representation is a different way of depicting how light that strikes Earth's curved surface at an angle spreads out and is less intense. Students can count more lines per latitude interval closer to the equator and fewer lines per latitude interval near the poles. The representation is scientifically accurate for the most part; however, Earth's position on the diagram gives the impression that the equator receives the most-direct rays of sunlight. The fact is, the Sun's rays strike the equator directly (straight on) only twice a year: during the spring and autumn equinoxes. Earth's tilt and orbit around the Sun (which students learn about in later lessons) cause the focal point of most-direct sunlight to shift between 23.5° south latitude (during the winter solstice) and 23.5° north latitude (during the summer solstice). • One misconception this content representation introduces and/or reinforces is that the Sun's rays are *literal* lines of light, which is inaccurate. The

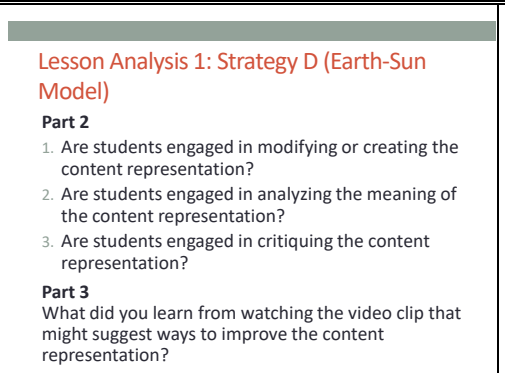
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Sun's rays don't actually form literal lines. The lines simply represent the general movement of the Sun's rays as they travel through Earth's atmosphere. **Take-home message:** Trying to address all six criteria in the analysis guide is a balancing act or trade-off. To make complex science ideas meaningful and comprehensible to students, the content representation needs to be simplified, but simplifications can sometimes be misleading in terms of scientific accuracy. The important thing is for teachers to be aware of such problems so they can be addressed.
			**Display Slide 18.** Content Representation 3: Two-Flashlights-and-Globe Model (5 min) **Note**: If time is running short, this content representation can be skipped. a. Have participants turn to **Analysis Guide D3** (page 3 of handout 7.1) and read the main learning goal and description of the content representation. b. Emphasize that in this simulation, students point one of the flashlight beams directly at the equator, and the other toward one of the poles.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Content Representation 3: Two Flashlights-and-Globe Model 	**Display Slide 19.** Content Representation 3: Two-Flashlights-and-Globe Model (7 min) a. **Individuals:** Have participants work independently on part 1 of Analysis Guide D3. **Note:** If time is short, just do partner work. b. **Pairs:** "Now pair up and discuss your answers to the analysis questions."
		Does Content Representation 3 Match the Main Learning Goal? How did you answer these questions from part 1 of the analysis guide? 1. Is the content representation scientifically accurate? 2. Is it closely matched to the main learning goal? 3. Does it present science ideas to students in comprehensible ways? 4. Does it reinforce/introduce any misconceptions? 5. Does it address common misconceptions? 6. Does it contain distracting details?	**Display Slide 20.** Does Content Representation 3 Match the Main Learning Goal? (10 min) a. **Whole group:** Discuss participants' responses to the questions in part 1 of Analysis Guide D3. b. **Ask:** "How might this content representation be improved? Would you use it with your students?" **Observations:** • This content representation helps students visualize how light spreads out at higher (and lower) latitudes. It also helps them connect the flat-tray representation to a curved Earth. The representation is closely matched to the main learning goal, but the two lights can lead to student misconceptions. Some students may think there are two Suns or that the lights represent the Sun and the Moon. This content representation also poorly depicts

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			the scale of the objects and the distance between Earth and the Sun. **Take-home message:** Trying to address all six criteria in the analysis guide is a balancing act or trade-off. To make complex science ideas meaningful and comprehensible to students, the content representation needs to be simplified, but simplifications can sometimes be misleading in terms of scientific accuracy. The important thing is for teachers to be aware of such problems so they can be addressed.
10:10–10:20 10 min	**BREAK**		
10:20–12:00 100 min **Lesson Analysis: SCSL Strategy D** Slides 21–28	**Purpose** • Develop participants' ability to analyze content representations to determine how well engaged students are in their use. • Use lesson analysis of classroom videos to better understand STeLLA strategy D. • Deepen participants' science-content knowledge of the Sun's effect on climate through lesson analysis. **Content** • Six criteria are used in analyzing and selecting a content representation that is well matched to the main learning goal.		**Display Slide 21.** Lesson Analysis: Focus Question 2 (Less than 1 min) a. **Transition slide:** "Next we'll watch three video clips of strategy D in use during an SEC lesson on Earth's orbit around the Sun. In addition to completing part 1 of Analysis Guide D4, we'll focus on parts 2 and 3: *How well engaged are students in using the content representation? And what suggestions do you have for improving the content representation and its use with students?"* b. "In these video clips, three different teachers engage their students in using a Hula Hoop, a Styrofoam ball, and a lightbulb setup to simulate Earth's orbit around the Sun. These lessons were taught using slightly different lesson plans, but the science ideas are found in lessons

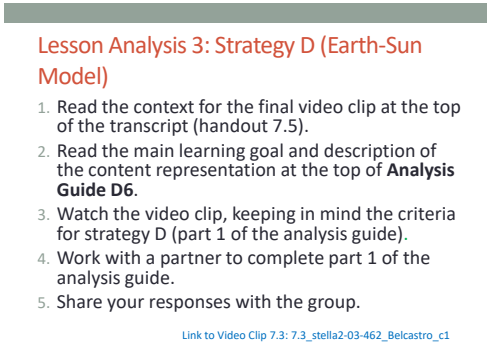
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	• Three criteria are used in analyzing how well teachers engage students in using content representations. • Two temperature patterns are addressed in SEC lessons 2–4: (1) Earth's curved surface causes variations in the angle of sunlight striking the surface, which explains the pattern of cooler temperatures closer to the poles; and (2) Earth's orbit and consistent 23.5° tilt explains seasonal variations in temperature patterns in the Northern and Southern Hemispheres. **What Participants Do** • Use Analysis Guide D to analyze student engagement with content representations in three video clips. • Use the analysis guide to analyze how well the content representation matches the main learning goal in the third video clip. • Identify key ideas participants have learned about strategy D and the science content from the lesson analysis work. **Videos** • Video Clip 7.1, Kawamura classroom • Video Clip 7.2, Hannigan		3 and 4 of our current RESPeCT lesson series."  **Display Slide 22.** Lesson Analysis 1: Strategy D (Earth-Sun Model) (20 min) a. Orient participants to **Analysis Guide D4** and the transcript for video clip 1 (handout 7.3 in PD binder). b. Have participants read the main learning goal and description of the content representation at the top of the analysis guide. **Note:** The teacher in this clip is reviewing the main learning goal from previous lessons. c. Show the video clip. d. **Pairs:** Have participants pair up and complete part 1 of the analysis guide. e. **Whole group:** Discuss participants' responses to the questions in part 1 of the guide. **Observations:** • Students are engaged in comparing the content representation with their understandings of what the positions and movements of Earth and the Sun really involve. The teacher challenges students to describe what's good and not so good about the content representation. They also discuss similarities and differences between the model and the actual Earth-Sun system. The following student ideas (misconceptions) are made visible during

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	classroom • Video Clip 7.3, Belcastro classroom **Handouts in PD Binder** • 7.1 Analysis Guide D • 7.3 Transcript for Video Clip 7.1 • 7.4 Transcript for Video Clip 7.2 • 7.5 Transcript for Video Clip 7.3 **PD Resources** • STeLLA strategies booklet • RESPeCT lesson plans binder • SCSL Z-fold summary chart (front pocket of PD binder) **Resources in Lesson Plans Binder** *Resources section:* • Content background document		this discussion: • Earth's orbit around the Sun is more like an oval than a circle. • The Sun isn't in the center of Earth's orbit but is skewed to one side. • The distance between the Sun and Earth vary over the course of the year, causing seasonal temperature changes and differences in the size of shadows based on the position of the Sun. • While student thinking is revealed during this discussion, it also provides a sensemaking opportunity. When the teacher asks a student to draw on the board his concept of the Earth-Sun system and explain his thinking, she raises a key question: "Whose summer did you represent?" (video segment 0:03:35.4). The student's attempts to talk his way around the inconsistencies in his thinking allow other students to consider the proposed model in greater depth and present ideas and evidence for why it's wrong. • Rather than summarizing what she *thinks* this final student was trying to express, the teacher could have asked probe questions to make his thinking visible.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 23.** Lesson Analysis 1: Strategy D (Earth-Sun Model) (15 min) a. "Now we're going to turn our attention to part 2 of strategy D, which engages students in using content representations. We'll also consider ways the content representation could be improved." b. **Individuals:** "Study the video transcript again and think about parts 2 and 3 of **Analysis Guide D4**. Be ready to share evidence that supports your conclusions." c. **Pairs:** "Compare your conclusions about student engagement with the content representation." d. **Whole group:** Review participants' responses to parts 2 and 3 of the analysis guide. Challenge participants to support their answers with evidence from the video transcript. e. If it didn't already come up in the discussion, ask participants, "How might the teacher have engaged these students in analyzing or critiquing the representation?"

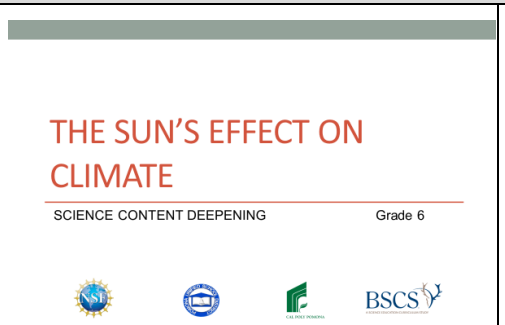
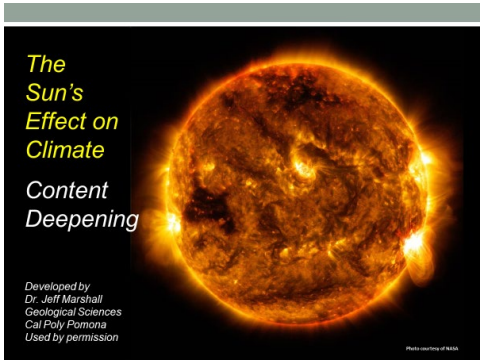
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Lesson Analysis 2: Strategy D (Earth-Sun Model) 1. Read the context for the second video clip at the top of the transcript (handout 7.4). 2. Review the main learning goal and description of the content representation at the top of **Analysis Guide D5**. 3. Watch the video clip, keeping in mind the criteria for part 2 of the analysis guide and looking for ways the content representation might be improved (part 3). 4. **Pairs:** Complete parts 2 and 3 of the analysis guide. Link to Video Clip 7.2: 7.2_stella2-03_hannigan6-L6_c6	**Display Slide 24.** Lesson Analysis 2: Strategy D (Earth-Sun Model) (20 min) a. Orient participants to **Analysis Guide D5** and the transcript for the second video clip (handout 7.4 in PD binder). b. Have participants read the main learning goal and description of the content representation at the top of the analysis guide. **Emphasize** that they'll focus only on parts 2 and 3 of the guide for this clip. c. "For this analysis, we're going to look at a new classroom video and examine how students are (or are not) engaged in using the content representation." d. Show the video clip. e. **Pairs:** Have participants pair up and complete parts 2 and 3 of the analysis guide.
		Lesson Analysis 2: Strategy D (Earth-Sun Model) **Part 2** 1. Are students engaged in modifying or creating the content representation? 2. Are students engaged in analyzing the meaning of the content representation? 3. Are students engaged in critiquing the content representation? **Part 3** What did you learn from watching the video clip that might suggest ways to improve the content representation?	**Display Slide 25.** Lesson Analysis 2: Strategy D (Earth-Sun Model) (10 min) a. **Whole group:** Discuss participants' responses to parts 2 and 3 of **Analysis Guide D5**. Challenge participants to support their answers with evidence from the video transcript. b. If it didn't already come up in the discussion, ask participants, "How might the teacher have engaged these students in analyzing or critiquing the representation?"

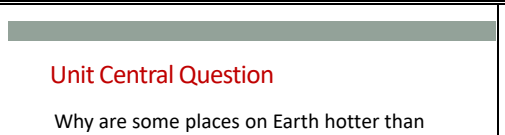
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Observations: • As in the first clip from Ms. Kawamura's class, students in Ms. Hannigan's class have been struggling with the idea that Earth's orbit is a circle, not an oval. They're convinced that Earth is closer to the Sun at certain points in its orbital path, so Ms. Hannigan relates their current content representation (the round Hula Hoop) to the diagrams commonly seen in textbooks that might lead to this misconception. • The discussion in this clip should focus on how engaging students in using the content representation helped them analyze and critique it and specifically addressed a common student misconception. Ms. Hannigan helps students make sense of Earth's circular orbit by explaining the flaws in two-dimensional representations that reinforce the misconception that Earth's orbit is elliptical. While the teacher doesn't address the main learning goal directly, she does address a persistent misconception related to the learning goal and thus gives students a reason to reject their previous understandings of Earth's orbit and adopt a more-scientific understanding.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 26.** Lesson Analysis 3: Strategy D (Earth-Sun model) (15 min) a. Orient participants to **Analysis Guide D6** and the transcript for the final video clip (handout 7.5 in PD binder). b. Have participants read the main learning goal and description of the content representation at the top of the analysis guide. c. Show the video clip. d. **Pairs:** Have participants pair up and complete part 1 of the analysis guide. e. **Whole group:** Discuss participants' responses to the questions in part 1 of the guide. **Observations:** • For a full 20 seconds before asking any questions or making any comments, the teacher simply listens to students trying to make sense of the model. • The teacher then uses both probe and challenge questions to help students clarify their understandings of the relationship between Earth's movements, areas that receive the most-direct sunlight, and seasonal changes. She often encourages students to pause during their simulation of Earth's orbit around the Sun in different positions and really think (and talk) through how they're making sense of the model in relation to temperature patterns and seasonal changes in the Northern and Southern

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Hemispheres. • Students talk about “more sunlight” and “not as much sunlight” without making a clear connection to the ideas from lesson 2 about the angle of sunlight striking Earth’s curved surface. One student refers to “more direct light” (video segment 0:02:16.9) but doesn’t articulate exactly what that means. Another student refers to a “circle of light” shining on the Styrofoam ball (segment 0:02:24.6). This makes me wonder whether students are associating “more light” or “less light” with where the circle shines on the globe (and conversely, where there is no light, such as near the North Pole during the long, sunless days of winter). If their focus is more on the circle of light, students may not be thinking about the angle of sunlight at different times of the year at all. • The “circle of light” reference raises interesting analysis questions about the misconceptions this content representation reinforces. Modifications to the content representation and alternative teaching moves might challenge students to interpret the content representation in more-scientific ways.

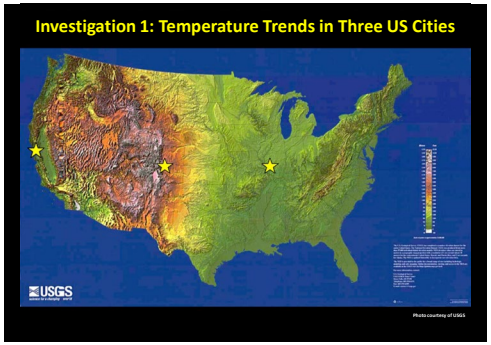
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Lesson Analysis 3: Strategy D (Earth-Sun Model) **Part 2** 1. Are students engaged in modifying or creating the content representation? 2. Are students engaged in analyzing the meaning of the content representation? 3. Are students engaged in critiquing the content representation? **Part 3** What did you learn from watching the video clip that might suggest ways to improve the content representation?	**Display Slide 27.** Lesson Analysis 3: Strategy D (Earth-Sun Model) (10 min) a. "Now let's focus on parts 2 and 3 of strategy D." b. **Individuals:** "Study the video transcript again and think about parts 2 and 3 of **Analysis Guide D6**. Be ready to share evidence that supports your conclusions." c. **Pairs:** "Compare your conclusions about student engagement with the content representation in the video clip." d. **Whole group:** Review participants' responses to parts 2 and 3 of the analysis guide. Challenge participants to support their answers with evidence from the video transcript. e. If it didn't already come up in the discussion, ask participants, "How might the teacher have engaged these students in analyzing or critiquing the representation?"
		Strategy D: Synthesize and Summarize 1. What new ideas do you have about these aspects of today's lesson analysis work? • How to select content representations • How to engage students in using content representations 2. Did our content-representation work give you any new insights about why the Northern and Southern Hemispheres have opposite seasons?	**Display Slide 28.** Strategy D: Synthesize and Summarize (10 min) a. **Individuals (5 min):** Have participants work on the slide questions. Encourage them to use their resources (e.g., the strategies booklet, their Z-fold summary charts, the content background document, notes they've taken). b. **Whole group (5 min):** Have participants share their new ideas for each question in

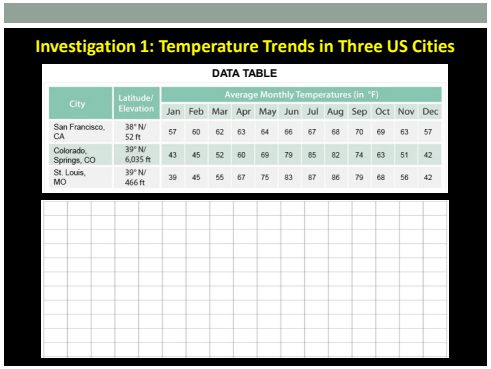
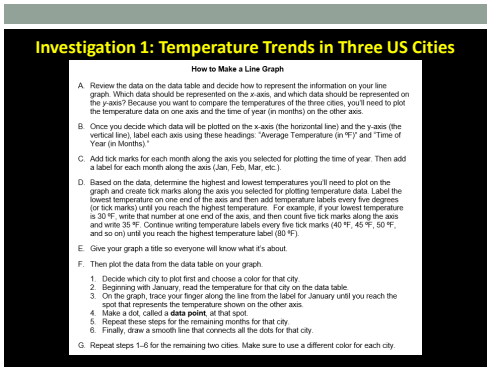
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			a round-robin format, if time allows. Otherwise, have a couple of volunteers share their ideas for each question.
12:00–12:45 45 min	**LUNCH**		
12:45–3:15 150 min (Includes 10-min break) **Content Deepening: The Sun's Effect on Climate** Slides 29–69	**Purpose** • Deepen participants' science-content knowledge of the Sun's effect on climate by conducting investigations from SEC lessons 5–7. **Content** • While the curved surface of Earth, its consistent tilt, and its orbital path around the Sun are key factors that produce climate variations at different latitudes, other factors, such as elevation and proximity to large bodies of water, influence climate as well. • Water and land absorb and reflect (release) the Sun's incoming energy at differing rates. These variations in heating and cooling rates impact regional climates by affecting average air temperatures. • Because of Earth's curved surface and consistent tilt, the angle of sunlight hitting the surface varies at different times		**Display Slide 29.** Content Deepening: The Sun's Effect on Climate (Less than 1 min) a. **Transition:** This slide marks the transition to the content deepening phase of the session.
			**Display Slide 30.** Today's Content Deepening (Less than 1 min) a. "Today our content deepening work will focus on science ideas about the Sun's effect on climate from SEC lessons 5 through 7." **Note:** Throughout this content deepening phase, refer as needed to the Sun's Effect on Climate Content Background Document and Common Student Ideas about the Sun's Effect on Climate and Seasons.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	of the year, causing uneven heating. While latitude is a key factor influencing climate, other factors are involved, such as elevation and proximity to large bodies of water. **What Participants Do** • Conduct investigations from SEC lessons 5–7. • Explore and discuss key science ideas behind the SEC lessons. • Apply content learning to answer the SEC unit central question and the focus questions from lessons 5–7. **Handouts in PD Binder** • 7.6 Investigating Temperatures at the Same Latitude (from SEC lesson 5a) • 7.7 Uneven Heating (from SEC lesson 6a) **Handouts in Lesson Plans Binder** • 5.3 Map of Three Cities in the		**Display Slide 31.** Unit Central Question (Less than 1 min) a. Review the unit central question on the slide.
			**Display Slide 32.** The Sun's Effect on Climate: Lesson 5a (Less than 1 min) a. "Next, we'll explore ideas about the Sun's effect on climate from SEC lesson 5a."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process

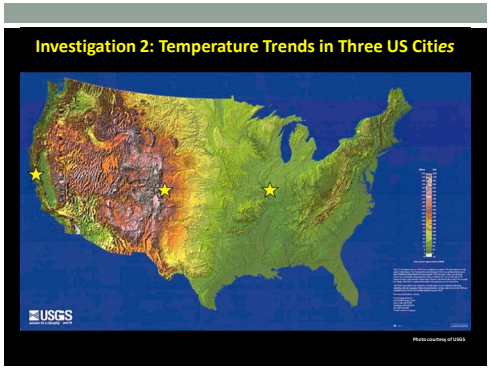
	United States (from SEC lesson 5b)
	• 6.2 Lab Instructions for Uneven-Heating Demonstration (Teacher Master) (from SEc lesson 6a)
	• 6.3 Climb to Cold (from SEC lesson 6b)
	• 7.1 Team Challenges: Why Are Some Places on Earth Hotter Than Others at Different Times of the Year? (from SEC lesson 7a)
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• For lessons 5a/b investigations:
	  • Colored pencils (3 per participant)
	• For investigations from lessons 6a/b:
	  • 1 heat lamp
	  • 1 cup filled 2/3 with soil
	  • 1 cup filled 2/3 with water
	  • 2 thermometers
	  • Masking tape
	  • 1 watch or clock with a second hand
	  • Colored pencils (2 per
		Content Deepening: Focus Question 1
		
		Why do some places at the same latitude have different temperature patterns?
			Display Slide 33. Content Deepening: Focus Question 1 (Less than 1 min)
			
			a. Read the focus question on the slide.
			b. Emphasize that this focus question will guide student learning throughout SEC lessons 5a and 5b.
			c. Ask participants to write the question in their science notebooks and draw a box around it. Make sure they leave space below the question to write a response later.

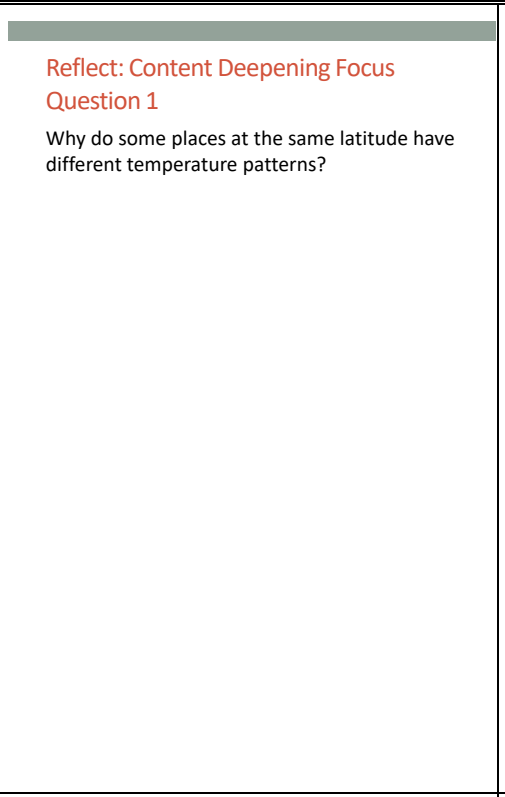
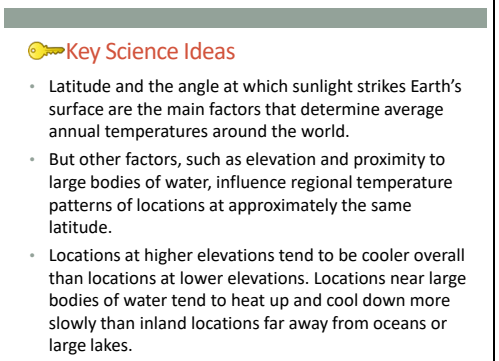
			**Display Slide 34.** Investigation 1: Temperature Trends in Three US Cities (Less than 1 min) a. "The map on this slide shows the location of three US cities that are at approximately the same latitude: San Francisco, California; Colorado Springs, Colorado; and St. Louis, Missouri." b. Have participants locate handout 5.3 in their lesson plans binders and refer to it throughout the investigation.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	participant) **PD Resources** • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** *Resources section:* • Content background document • Common Student Ideas		**Display Slide 35.** Investigation 1: Temperature Trends in Three US Cities (Less than 1 min) a. "The data table on this slide lists average monthly temperatures for 12 months in each of the three US cities. The first column shows the names of the cities, the second column notes their latitude and elevation above sea level, and the remaining columns show the average monthly temperatures." b. Have participants locate handout 7.6 (Investigating Temperatures at the Same Latitude) in their PD program binders and explain that they'll work with an elbow partner to graph the temperature data on this handout. Make sure participants have three different-colored pencils for graphing their data.
			**Display Slide 36.** Investigation 1: Temperature Trends in Three US Cities (Less than 1 min) a. "This slide lists step-by-step instructions for creating a line graph showing the temperature data for the three cities. b. A copy of these instructions appears on the back of handout 7.6. Make sure to follow them carefully as you work on your graphs."

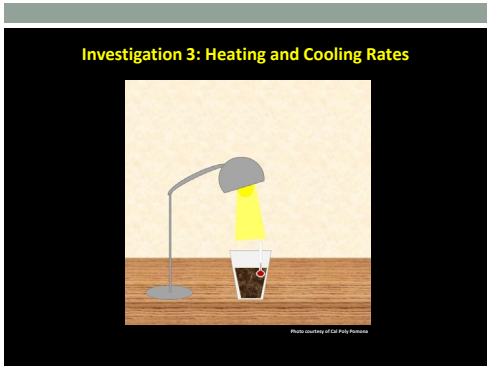
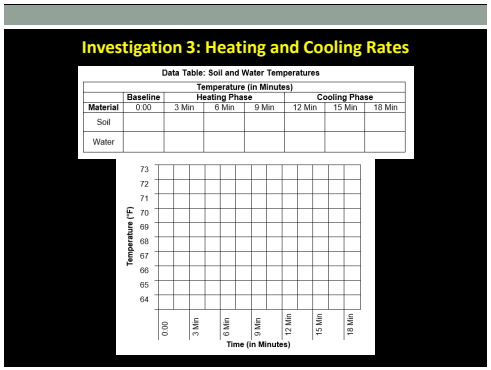
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Investigation 1: Temperature Trends in Three US Cities 1. Work with your partner to investigate temperature patterns in three US cities at about the same latitude: San Francisco, Colorado Springs, and St. Louis. 2. Examine the data table (handout 7.6) and the map (handout 5.3). Then plot the temperature data for each city on your own line graph. **Note:** Choose an appropriate scale to make sure the data for all three cities fits on the graph. (See graph instructions on handout 7.6.) 3. After completing your graphs, compare the temperature patterns for each city and answer the questions on the handout.	**Display Slide 37.** Investigation 1: Temperature Trends in Three US Cities (12 min) a. Read the instructions on the slide and highlight the note. Emphasize the importance of following the instructions carefully. b. **Pairs:** "Work with your partner to investigate temperature patterns in San Francisco, Colorado Springs, and St. Louis. Using the map and the data table on handout 7.6, plot the temperatures for each city on your own line graph. After completing your graphs, compare the temperature patterns for each city. Then discuss your observations and answer the questions on the handout as concisely as possible. Be prepared to share your ideas with the group." c. **Whole group:** Invite a few pairs to share their observations and answers to the questions. Probe and challenge participants' responses and elicit differing points of view.

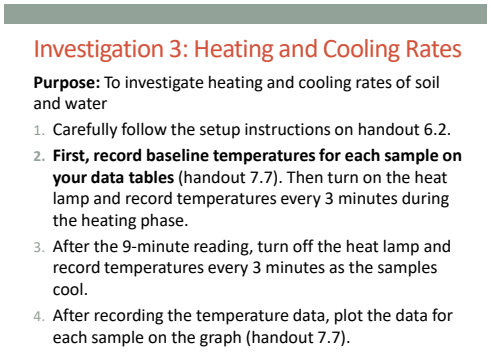
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 38.** The Sun's Effect on Climate: Lesson 5b (Less than 1 min) a. "Now let's explore ideas about the Sun's effect on climate from SEC lesson 5b."
		Content Deepening: Focus Question 1 Why do some places at the same latitude have different temperature patterns?	**Display Slide 39.** Content Deepening: Focus Question 1 (Less than 1 min) a. Review the focus question on the slide. b. "We'll continue thinking about this question during the next investigation." c. Remind participants that this focus question will guide student learning throughout lesson 5b.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 40.** Investigation 2: Temperature Trends in Three US Cities (Less than 1 min) a. "For this investigation, you and your partner will continue working with this map and the line graphs you created showing the monthly temperature trends for the three US cities."
		Investigation 2: Temperature Trends in Three US Cities 1. Examine your line graph for the three US cities and revisit the similarities and differences in temperature patterns between the cities. 2. Study the map showing the locations of these cities (handout 5.3) and look at the elevation data for each city on the data table (handout 7.6). 3. Discuss your observations with your partner and develop several working hypotheses to explain the temperature trends for each city. Be ready to share your ideas with the group.	**Display Slide 41.** Investigation 2: Temperature Trends in Three US Cities (7 min) a. Read the instructions on the slide and remind participants to follow them carefully. b. **Individuals:** "Examine your line graph, the map showing the location of each city, and the elevation data for each city on your data table." c. **Pairs:** "Discuss your observations with your partner and work together to develop several hypotheses to explain the temperature trends for each city. Be prepared to share your ideas with the group." d. **Whole group:** Invite a few pairs to share their observations and hypotheses. Ask probe and challenge questions and elicit differing points of view.

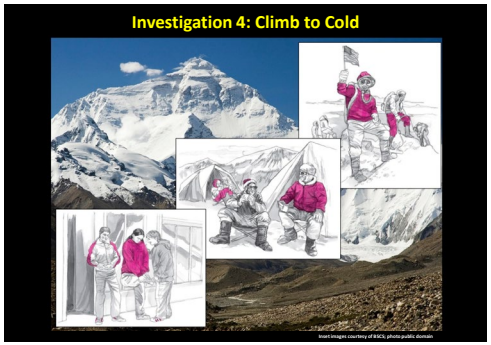
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 42.** Reflect: Content Deepening Focus Question 1 (5 min) a. Revisit the first content deepening focus question. b. Remind participants that this focus question from SEC lessons 5a and 5b appears in the scope and sequence and on the overview page for each lesson in their lesson plans binders. c. **Individuals:** Have participants answer the focus question in their science notebooks. d. **Whole group:** Ask a few participants to share their answers to this question with complete-sentence statements, using evidence from the investigations they just completed. e. As participants share their responses, record key ideas on chart paper. Direct others to listen carefully to the responses and be prepared to agree, disagree, or add ideas from the investigations.
			**Display Slide 43.** Key Science Ideas (5 min) a. Highlight the key science ideas on the slide that answer the first content deepening focus question. Emphasize that participants' observations from the investigations and the evidence they gathered helped to shape the answer to this question. b. **Whole group:** "Does everyone agree that

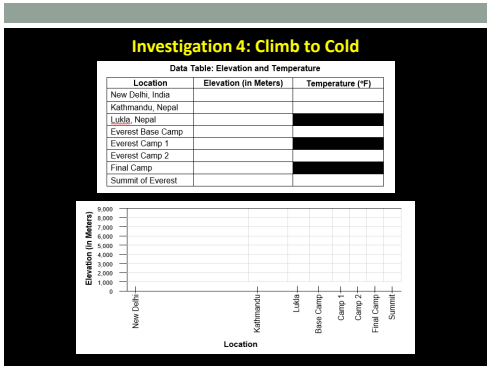
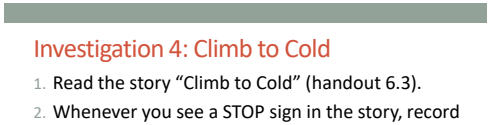
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			these key ideas answer our focus question? Would you like to add or revise anything?" c. Ask participants to write these key ideas under the focus question in their science notebooks.
			**Display Slide 44.** The Sun's Effect on Climate: Lesson 6a (Less than 1 min) a. "Our next investigation is from SEC lesson 6a."
		Content Deepening: Focus Question 2 How does being near the ocean or another large body of water affect air temperature?	**Display Slide 45.** Content Deepening: Focus Question 2 (Less than 1 min) a. Read the focus question on the slide. b. Emphasize that this focus question will guide student learning throughout lesson 6a. c. Ask participants to write the question in their science notebooks and draw a box around it. Make sure they leave space below the question to write a response later.

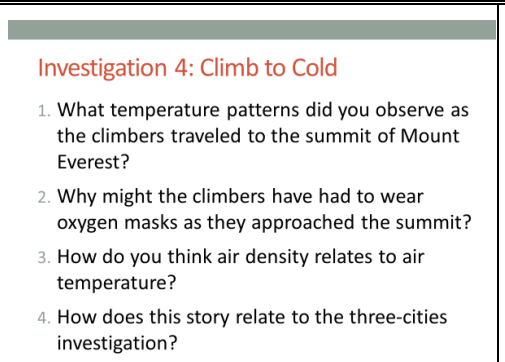
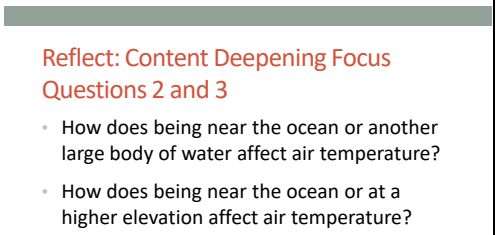
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 46.** Investigation 3: Heating and Cooling Rates (1 min) a. "For this activity, we'll work together as a group to investigate temperature patterns in soil and water samples when they're heated and then are allowed to cool." b. Have participants locate handout 7.7 (Uneven Heating) in their PD program binders and direct their attention to the list of supplies they'll need. c. Have participants check their supplies against the list on the handout. The should have a heat lamp; two plastic cups, one filled two thirds with fresh water, and one filled two thirds with soil; two thermometers; masking tape; a watch with a second hand; and two colored pencils for each participant.
			**Display Slide 47.** Investigation 3: Heating and Cooling Rates (1 min) a. "In this investigation, we'll measure the temperatures of water and soil samples at 3-minute intervals and record them on a data table like the one on this slide. First, we'll take a baseline temperature before turning on the heat lamp. Then we'll take readings every 3 minutes and record the temperatures in the corresponding columns on the data table. At 9 minutes, we'll measure and record the temperatures and then turn off the heat lamp. As the soil and water samples cool,

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			we'll continue measuring and recording temperatures every 3 minutes. After the experiment is over, you'll plot the data on graph paper." b. Direct participants to the instructions, data table, and graph in part 1 of handout 7.7.
			**Display Slide 48.** Investigation 3: Heating and Cooling Rates (20 min) a. Have participants locate handout 6.2 (Lab Instructions for Uneven-Heating Demonstration) in their lesson plans binders. b. Go over the instructions on the handout for setting up the experiment. Emphasize the importance of following the directions carefully. **Note:** Rather than asking volunteers to track the time for this investigation, it may be more efficient to track it yourself (using a wall clock with a second hand, a stopwatch, or the clock on your cell phone). However, you may want to ask for one or more volunteers to take the temperature readings. c. Before turning on the heat lamp, make sure participants record the baseline temperature of the soil and water samples on their data tables. d. After turning on the heat lamp, take temperature readings every 3 minutes. After the 9-minute reading, turn off the heat lamp and take three more readings

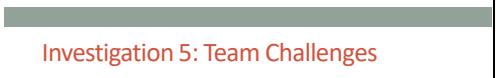
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			at 12, 15, and 18 minutes. e. After participants have recorded all the temperature readings on their data tables, have them plot the data on the graph in handout 7.7 (page 2).
		Investigation 3: Heating and Cooling Rates • What patterns do you observe when you compare the soil and water temperatures during the heating phase? What about during the cooling phase? • Which material (soil or water) heats up and cools down more quickly? Which material changes temperature more gradually? • How does water temperature or soil temperature relate to air temperature? • How do these observations relate to the three-cities investigations you conducted?	**Display Slide 49.** Investigation 3: Heating and Cooling Rates (6 min) a. Read the questions on the slide. b. **Pairs:** "Discuss your observations with your partner and answer these questions as concisely as possible. Be prepared to share your ideas with the group." c. **Whole group:** Invite a few pairs to share their observations and answers to the questions. Ask probe and challenge questions and elicit differing points of view.
	10-MINUTE BREAK		
			**Display Slide 50.** The Sun's Effect on Climate: Lesson 6b (Less than 1 min) a. "Now we'll explore ideas about the Sun's effect on climate from SEC lesson 6b."

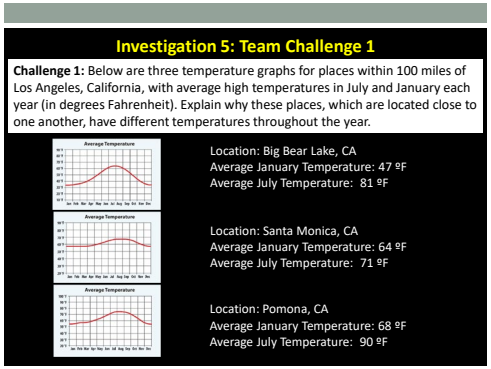
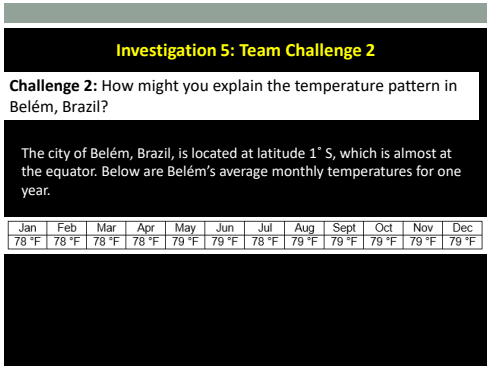
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Content Deepening: Focus Question 3 How does being near the ocean or at a higher elevation affect air temperature?	**Display Slide 51.** Content Deepening: Focus Question 3 (Less than 1 min) a. Read the focus question on the slide. b. Emphasize that this focus question will guide student learning throughout SEC lesson 6b. c. Ask participants to write the question in their science notebooks and draw a box around it. Make sure they leave space below the question to write a response later.
			**Display Slide 52.** Investigation 4: Climb to Cold (Less than 1 min) a. "In the next investigation, you and your partner will explore how elevation affects air temperature. Some of the illustrations on this slide are from the story you'll be reading about an expedition to Mount Everest." b. Have participants locate handout 6.3 (Climb to Cold) in their lesson plans binders.

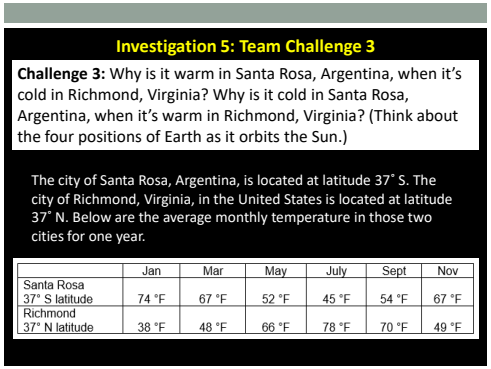
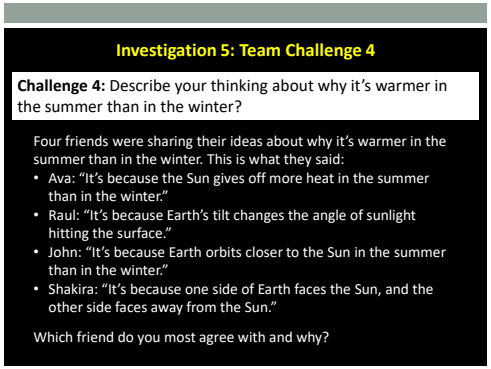
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 53.** Investigation 4: Climb to Cold (Less than 1 min) a. "This slide shows the data table and graph you'll use for this investigation." b. Direct participants to the data table and graph in part 2 of handout 7.7. Make sure each participant has three colored pencils (different colors) for making the graph.
			**Display Slide 54.** Investigation 4: Climb to Cold (10 min) a. Read the instructions and questions on the slide and remind participants to follow the handout instructions carefully. b. "Read the story about the expedition to Mount Everest. At every stop sign you encounter in the story, record the elevation and temperature data on your data tables. Keep in mind that some locations won't have temperature data." c. "After completing the data table, plot the elevation data points for each location on the elevation graph in your handouts and write any temperature readings next to the data point."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 55.** Investigation 4: Climb to Cold (6 min) a. Read the questions on the slide. b. **Pairs:** "Discuss your observations with your partner and answer these questions as concisely as possible. Be prepared to share your ideas with the group." c. **Whole group:** Invite a few pairs to share their observations and answers to the questions. Ask probe and challenge questions and elicit differing points of view.
			**Display Slide 56.** Reflect: Content Deepening Focus Questions 2 and 3 (5 min) a. Review the second and third content deepening focus questions. b. Remind participants that these questions from SEC lessons 6a and 6b appear in the scope and sequence and on the overview page for each lesson in their lesson plans binders. c. **Individuals:** Have participants answer the focus questions in their science notebooks. d. **Whole group:** Ask a few participants to share their answers to these questions with complete-sentence statements, using evidence from the investigations they just completed. e. As participants share their responses,

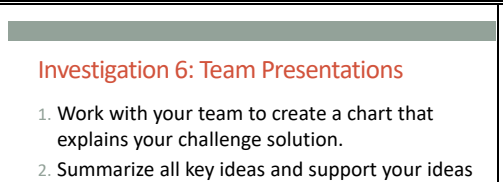
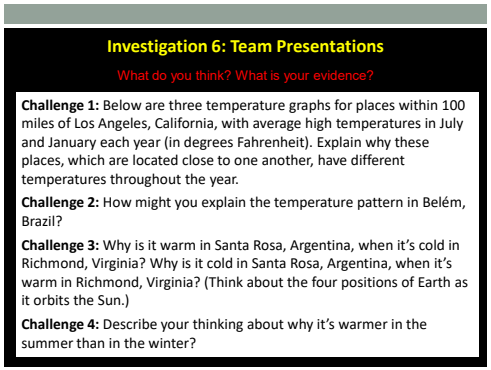
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			record key ideas on chart paper. Remind others to listen carefully to the responses and be prepared to agree, disagree, or add ideas from the investigations.
		Key Science Ideas • Water absorbs and releases heat (solar energy) at slower rates than land (soil). Because heat is transferred between air and water or land, air temperatures near large bodies of water heat and cool more slowly than air temperatures in locations that are far from large bodies of water. • Air density decreases as elevation increases. The capacity of air to store heat is directly related to air density, so atmospheric temperatures also decrease as elevation increases.	**Display Slide 57.** Key Science Ideas (5 min) a. Highlight the key science ideas on the slide that answer the second and third content deepening focus questions. Emphasize that participants' observations from the investigations and the evidence they gathered helped to shape the answers to these questions. b. **Whole group:** "Does everyone agree that these key ideas answer the focus questions? Would you like to add or revise anything?" c. Ask participants to write these key ideas under the focus questions in their science notebooks.
			**Display Slide 58.** The Sun's Effect on Climate: Lesson 7a (Less than 1 min) a. "Our next investigation is from SEC lesson 7a."

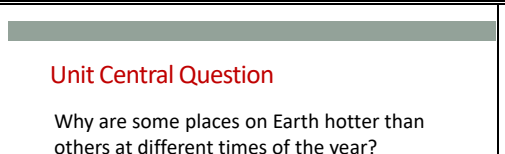
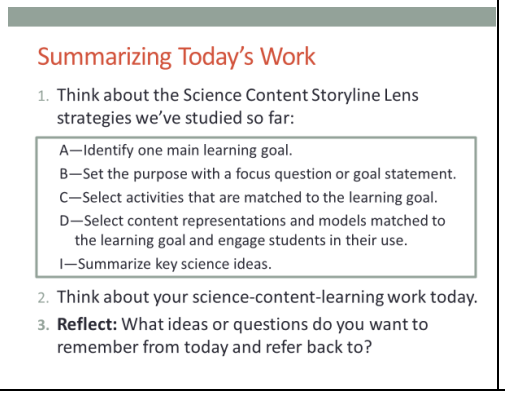
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 59.** Content Deepening: Focus Question 4 (Less than 1 min) a. Read the focus question on the slide. b. Emphasize that this focus question will guide student learning throughout SEC lessons 7a and 7b. c. Have participants write the question in their science notebooks and draw a box around it.
			**Display Slide 60.** Investigation 5: Team Challenges (1 min) a. "For this investigation, you and your partner will be assigned one of four team challenges that present different temperature scenarios. Each scenario will challenge you to apply what you've learned so far about the Sun's effect on climate. " **Note:** If you have an odd number of participants, a coleader could pair up with the extra person for the challenge. b. Have participants locate SEC lesson handout 7.1 (Team Challenges) in their lesson plans binders. c. Inform participants that following the challenge, each pair will briefly present their explanation to the group.

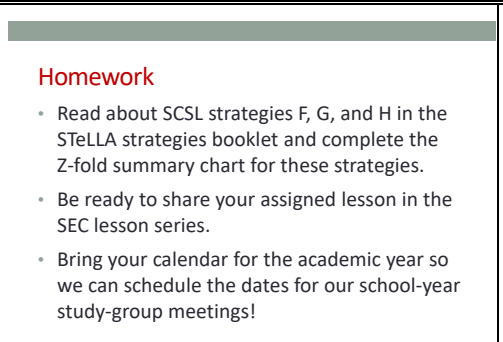
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 61.** Investigation 5: Team Challenge 1 (1 min) a. Introduce challenge 1 and assign this scenario to one of the teams.
			**Display Slide 62.** Investigation 5: Team Challenge 2 (1 min) a. Introduce challenge 2 and assign this scenario to one of the teams.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 63.** Investigation 5: Team Challenge 3 (1 min) a. Introduce challenge 3 and assign this scenario to one of the teams.
			**Display Slide 64.** Investigation 5: Team Challenge 4 (7 min) a. Introduce challenge 4 and assign this scenario to one of the teams. b. "Now let's begin the team challenge!" c. **Teams:** "First, review your assigned scenario on the handout and study the corresponding data. Then discuss your observations and develop a concise explanation to solve the challenge. Record your team's explanation in your science notebooks. Afterward you'll have time to prepare for your team presentations."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 65.** The Sun's Effect on Climate: Lesson 7b (Less than 1 min) a. "In this final investigation, you'll prepare for your team presentations and share your challenge solutions with the group."
		Content Deepening: Focus Question 4 How can we use what we've learned about the Sun's effect on climate to answer the unit central question, *Why are some places on Earth hotter than others at different times of the year?*	**Display Slide 66.** Content Deepening: Focus Question 4 (Less than 1 min) a. Review the focus question on the slide. b. "We'll continue thinking about this question during our investigation." c. Remind participants that this focus question will guide student thinking throughout lesson 7b.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 67.** Investigation 6: Team Presentations (10 min) a. Read the instructions on the slide and inform participants that each team will have 3 minutes to present their chart to the group. b. Give teams adequate time to create their charts and prepare for their presentations. Have teams hang their charts where everyone will be able to see them.
			**Display Slide 68.** Investigation 6: Team Presentations (20 min) a. Before beginning the presentations, draw participants' attention to the questions (in red) at the top of the slide and emphasize that keeping these questions in mind will help them stay on track during their presentations. b. Call on each team one at a time to stand next to their chart, read their challenge scenario aloud, and deliver a concise 3-minute presentation, highlighting the key ideas and evidence on their chart. c. After each team finishes their presentation, allow 2 minutes for questions or comments from the group.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 69.** Unit Central Question (5 min) a. "Ultimately, the goal of the team challenge is to give you an opportunity to use what you've learned so far about the Sun's effect on climate to answer the unit central question." b. Review the question on the slide and give participants a minute to write an answer in their science notebooks. c. **Whole group:** Invite a few participants to share their answers in a few concise statements, using evidence from the SEC investigations. d. As participants share their responses, record key ideas on chart paper. Remind others to listen carefully to the responses and be prepared to agree, disagree, or add ideas from the investigations. Ask probe and challenge questions and elicit differing points of view.
3:15–3:30 15 min **Wrap-Up: Summary, Homework, and Reflections** Slides 70–72	**Purpose** • Summarize and reflect on key ideas about SCSL strategies A, B, C, D, and I and the SEC science content, lesson plans, and lesson analysis work. **What Participants Do** • Write about and share key ideas from SCSL strategies A, B, C, D, and I. • Write about and share key ideas		**Display Slide 70.** Summarizing Today's Work (6 min) a. **Individuals (4 min):** Ask participants to think about the first two tasks on the slide and respond to the reflection question in their notebooks. b. **Whole group (2 min):** Ask for volunteers to share an idea or question from their responses to the reflection question.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	about today's content deepening work. • Copy down the homework assignment for day 8. • Write reflections on today's learning. **Handouts in PD Binder** • 7.8 Daily Reflections—Day 7 **Supplies** • Science notebooks		**Display Slide 71.** Homework (3 min) a. Review the homework assignment and have participants write it in their notebooks. b. Make sure participants understand the assignment. c. "We won't address strategy E about sequencing science ideas and activities until the school year, since you'll learn a lot about sequencing from teaching the RESPeCT lesson plans."
			**Display Slide 72.** Reflections on Today's Session (6 min) a. Allow **at least 5 minutes** for participants to think about today's session and write their reflections and feedback on the Daily Reflections sheet (handout 7.8 in PD program binder).