RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	K	**Day**	1	**STeLLA Strategy**	The Two Lenses: Student Thinking Lens (STL) and Science Content Storyline Lens (SCSL) STL Strategies 1, 2, and 3: Elicit, Probe, and Challenge Questions	**Subject Matter Focus**	Weather and Seasons
Focus Questions	• What is RESPeCT? • What are the STeLLA lenses and teaching strategies, and what is the evidence that they will make a difference in your science teaching? • What is weather? • How is weather different from climate? • What are weather patterns?						
Main Learning Goals	Participants will understand the following: • The RESPeCT project originally included a professional development program, a leadership development program, and a research study. The district is sustaining the PD professional development program. • The goals of the RESPeCT PD program are to deepen teachers' science-content knowledge and knowledge of effective science teaching; to develop their analytical skills to improve lesson-plan development and the teaching of science; to support teachers in the practical use of new knowledge and analytical skills in their classrooms; to improve students' science learning; and to achieve sustainability by eventually reaching all K–6 teachers. • Research on teacher and student learning has shown that the STeLLA Student Thinking Lens and the Science Content Storyline Lens are important analytical tools for effective teaching and are often neglected in science teaching. • Student thinking can be made more visible in science classrooms when teachers ask questions that elicit and probe student ideas and predictions, as well as challenge student thinking. Each type of question has a specific purpose. • Weather describes the conditions outside, including temperatures, sunlight, clouds, snow or rain, and wind. Weather can be observed and described. • Weather involves changes in local atmospheric conditions over short periods of time, such as hours, days, or weeks. Weather is dependent on geographic location, time of year, local heating and cooling processes, atmospheric moisture, and the movement of air masses. In contrast, climate is an average of atmospheric conditions in broader geographic areas over longer periods of time, such as a month, a year, a decade, or a century. • When weather is observed and recorded over time in a specific place, we can identify patterns. These patterns can include the number of sunny and cloudy days, the amount of rain or snow a place receives at certain times of the year, and changes in temperature. • Weather patterns describe what the weather in a given location is like most of the time.						

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	**Posters and Charts** • STeLLA Framework and Strategies poster • Day-1 Agenda (chart) • Norms for Working Together (chart) • Day-1 Focus Questions (chart)	• Video Clip 1.1: TIMSS US Lesson 3; 1.1_TIMSS_US_lesson3_c1 • Video Clip 1.2: TIMSS Japan Lesson 1; 1.2_TIMSS_Japan_lesson1_c1_1 • *Minds of Our Own Lessons From Thin Air* video, segments 3:30–5:40; 7:50–16:45

good sound.
- Arrange furniture and food.
- Arrange participant materials.
- Put up posters and charts.

Day-1 Setup Tasks

- Arrange participant materials on tables in grade-level meeting rooms:
  - Tabletop name cards
  - STeLLA strategies booklet
  - RESPeCT PD program binder
  - RESPeCT lesson plans binder
  - Science notebooks
  - Materials kit (1 per topic)

Planning and Preparation Tasks

- Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to PPTs, if needed. Modify text highlighted in light-blue font on slides and/or in PDLG to make it specific for your group.
- Make sure you know how to find the *Minds of Our Own Lessons From Thin Air* video segments: 3:30–5:40; 7:50–16:45.
- Assemble science notebooks and materials.
- Prepare charts for the agenda, focus questions, and norms.
- Content deepening phase:
  - Preload the seven video clips for the group activity into a web browser and make sure the web links and video clips work correctly. If any of the links or clips have been moved or deactivated, find an updated link for the video or a suitable replacement.
  - Skip any advertisements and set the video to begin immediately following them.
  - Ensure volume is set correctly on computer, browser, and master volume control.
  - Make sure you know how to toggle between PowerPoint and the web browser, as well as how to move in and
- Effective Science Teaching chart (blank except for title)
- Parking Lot poster

Handouts in RESPeCT PD Binder Front Pocket

- Half-page sheet of norms for participants to paste into their science notebooks
- Z-fold summary chart: Student Thinking Lens Strategies (blank)

Handouts in RESPeCT PD Binder, Day 1

- 1.1 Norms for Working Together
- 1.2 Transcript for Video Clip 1.1
- 1.3 Transcript for Video Clip 1.2
- 1.4 TIMSS *Educational Leadership article*
- 1.5 Research Summary Principles HSL
- 1.6 Angles of Light Energy
- 1.7 Homework Lesson Plan
- 1.8 Daily Reflections—Day 1

Supplies

- Science notebooks
- Chart paper and markers
- Content deepening (per pair):
  - Tray
  - Flashlight
  - 2–3 sheets of graph paper
  - Tape
  - Scissors
  - 2 colored pencils or pens

PD Resources

- STeLLA strategies booklet
- RESPeCT PD program binder
- RESPeCT lesson plans binder
- Setting Up Your Summer Institute Notebook (pretabs section in PD binder)

Resources in Lesson Plans Binder

Resources section:

- Weather and Seasons Content Background Document
- Common Student Ideas about Weather and Seasons
- Seven video clips for content deepening:
  - *Climax, Kansas Supercells* (Stephen Locke, 2:57 min); https://www.youtube.com/watch?v=Y4EK2r9JJ1k
  - TV weather forecast (Jackie Johnson, *CBS2 News*, 2:37 min); https://www.youtube.com/watch?v=zsdQE275PvA
  - *LA Is on Storm Watch* (*Jimmy Kimmel Live*, 3:03 min); https://www.youtube.com/watch?v=z_pTv-qvRI0
  - *El Niño Explained* (Climatedogs, 1:19 min); https://www.youtube.com/watch?v=yCsMmajLYG4
  - *Drilling for Ice* (*Horizon*, BBC, 3:21 min); https://www.youtube.com/watch?v=fuT8Appwak8
  - *Earth: Climate and Weather* (National Geographic, 3:22 min); https://www.youtube.com/watch?v=zz_CRzcIT-Q
  - *Weather versus Climate Change* (Neil deGrasse Tyson, National Geographic, *Cosmos, A Spacetime Odyssey*, 2:09 min); https://www.youtube.com/watch?v=cBdxDFpDp_k

out of full-screen view. • Review the instructions in handout 1.6 (Angles of Light Energy) to prepare for the flashlight-and-tray investigation.	*Pretabs section:* • Weather and Seasons: Learning Goals for Students and Teachers	

DAY 1 SESSION OUTLINE

Time	Activities	Purpose
8:00–8:25 25 min	**Whole-Group Gathering: What Is RESPeCT?**	• Orient participants to the overall project. • Introduce participants to the main goals of the project. • Provide details about schedules and logistics that will address participants' immediate concerns.
8:25–8:30 5 min	**Transition to Grade-Level Study-Group Settings**	
8:30–9:20 50 min	**Getting Started: Introductions, Goals, Norms, Agenda, Focus Questions, Ideas about Effective Science Teaching**	• Build community within grade-level study groups. • Set the stage for a day of learning about the RESPeCT PD program (formerly the STeLLA PD program), the STeLLA conceptual framework, and tools for lesson analysis. • Access participants' prior knowledge/beliefs about science teaching and learning: What do participants include in their image of effective science teaching? What's missing?
9:20–10:10 50 min (Includes 10-min break)	**The Case for the Science Content Storyline Lens (SCSL)**	• Draw from the TIMSS video study to build the case for the Science Content Storyline Lens as a core analytical tool in the STeLLA conceptual framework.
10:10–10:40 30 min	**The Case for the Student Thinking Lens (STL)**	• Draw from research on science learning to build the case for the Student Thinking Lens as a core analytical tool in the STeLLA conceptual framework.
10:40–12:00 80 min	**Content Deepening: Weather and Seasons**	• Deepen participants' science-content knowledge of what weather is and how it differs from climate.
12:00–12:45 45 min	**LUNCH**	
12:45–2:10 85 min (Includes 10-min break)	**Content Deepening (Continued)**	• Deepen participants' science-content understandings of weather and weather patterns.
2:10–3:00 50 min	**STL Strategies: Elicit, Probe, and Challenge Questions**	• Begin to develop shared understandings of the Student Thinking Lens (STL) and STeLLA strategies 1, 2, and 3 (elicit, probe, and challenge questions).
3:00–3:30 30 min	**Wrap-Up: Summary, Homework, and Reflections**	• Summarize and reflect on key ideas from today's learning and foreshadow what will be addressed tomorrow and later in the week.

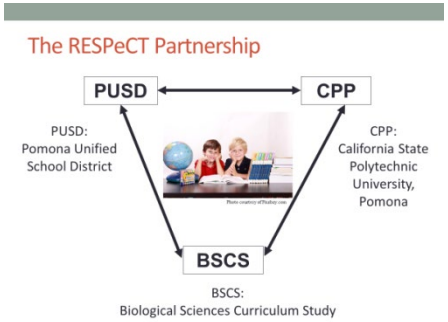
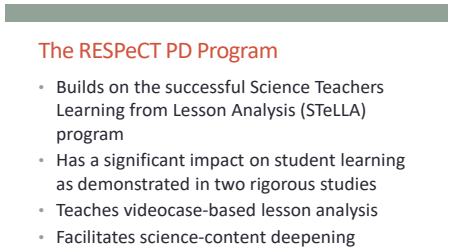
DAY 1

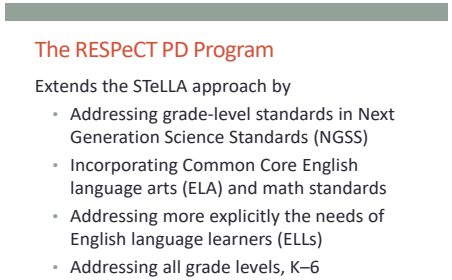
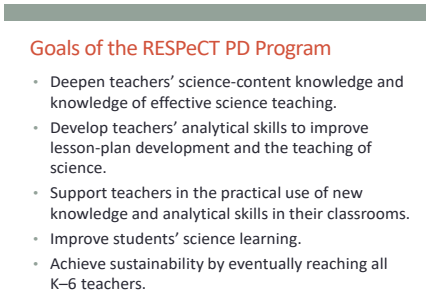
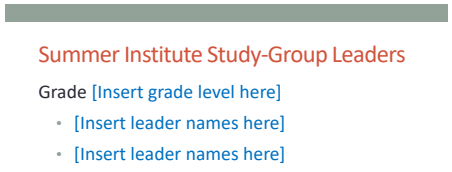
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process

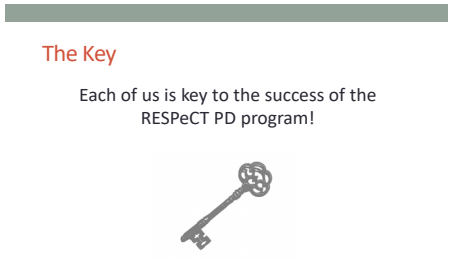
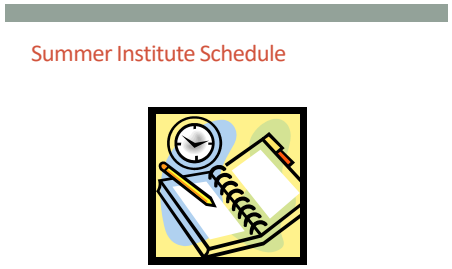
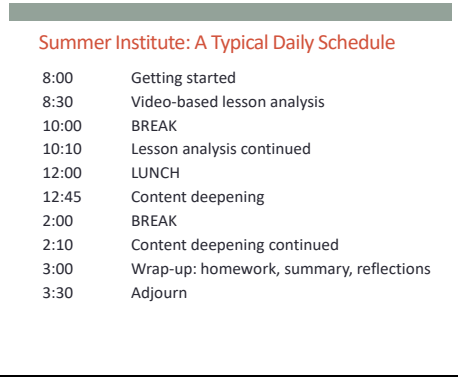
8:00–8:25
25 min
 	
Whole-Group Gathering: What Is RESPeCT?
 	
Slides 1–14
	Purpose
	• Orient participants to the overall project.
	• Introduce participants to the main goals of the project.
	• Provide details about schedules and logistics that will address participants' immediate concerns.
	
	Content
	• Discuss the following with participants:
	  • Essential logistics
	  • Components of the RESPeCT project
	  • Members of the RESPeCT partnership
	  • The RESPeCT PD program and goals
	  • Summer Institute schedule and overview
	  • School-year schedule and overview
	
	What Participants Do
	• Listen to a brief introduction to the program and how it began.
			**Display Slide 1.** RESPeCT PD Program (5 min)
			
			a. Greet participants as they enter the room
			b. Help them find their notebooks and table tents.

			**Display Slide 2.** Before We Dig In: Essentials (20 min for slides 2–14, averaging approximately 1 min per slide) a. Give everyone a big welcome to the RESPeCT PD program! b. Fill participants in on the essential details listed on the slide.

			**Display Slide 3.** What Is RESPeCT? (Approximately 1 min)
			
			a. **Emphasize:** The RESPeCT project began with three main components:
			  • A professional development program
			  • A leadership development program
			  • A research study
			b. The district now sustains RESPeCT as a professional development program.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 4.** The RESPeCT Partnership (Approximately 1 min) a. The original RESPeCT partners included the following: • **Cal Poly:** science, science education, and mathematics faculty, as well the Center for Excellence in Mathematics and Science Teaching (CEMaST) • **PUSD:** district central administrators, principals, teacher specialists, and teachers • **BSCS:** an additional partner located in Colorado that provides expertise on science curriculum development, science teacher professional development, and research on science teaching and learning. **Note:** Established in 1958, BSCS stands for Biological Sciences Curriculum Study, but the organization now deals with all sciences, not just biology. • **Students:** Emphasize that students are at the center of this partnership. Their learning is what the project is all about.
			**Display Slide 5.** The RESPeCT PD Program (Approximately 1 min) a. Let participants know they'll be learning more about the RESPeCT PD program and STeLLA teaching strategies as they experience firsthand what it means to perform videocase-based lesson analysis.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 6.** The RESPeCT PD Program (Approximately 1 min) a. Read the information on the slide. b. Emphasize the importance of these additions to the STeLLA approach. By integrating Common Core English language arts (ELA) and math standards into the science curriculum, the RESPeCT PD program enables teachers to invest more time in teaching science. The teaching strategies developed in the RESPeCT PD program are also valuable tools in other subject areas.
			**Display Slide 7.** Goals of the RESPeCT PD Program (Approximately 1 min) a. **The bottom line:** improving students' science learning—a goal that has been reached in two previous research studies of this approach.
			**Display Slide 8.** Summer Institute Study-Group Leaders (Approximately 1 min) a. Modify this slide to include the grade level of your study group and the names of the Teacher Leaders who will be facilitating the study-group sessions. b. Formally introduce yourselves to the group.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 9.** The Key (Approximately 1 min) a. Many people are involved in organizing, planning, and leading this program, but the teacher-participants are the key to its success.
			**Display Slide 10.** Summer Institute Schedule **Note:** This is a transition slide.
			**Display Slide 11.** Summer Institute: A Typical Daily Schedule (Approximately 1 min) a. A typical daily schedule includes the following: • Time spent on videocase lesson analysis • Time focused on content deepening • Short homework assignments • A morning and an afternoon break, with a 45-minute lunch break.

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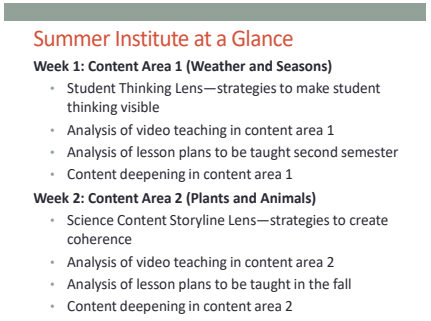
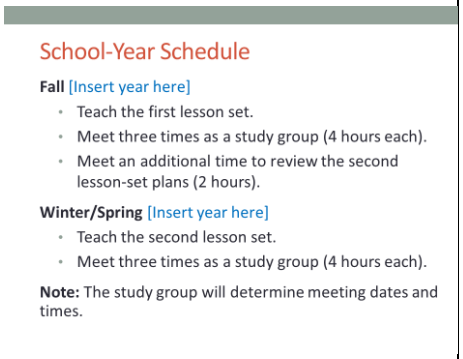
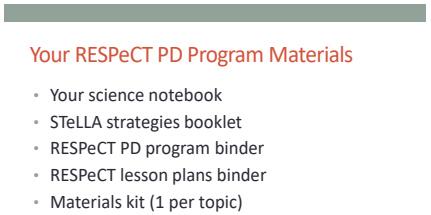
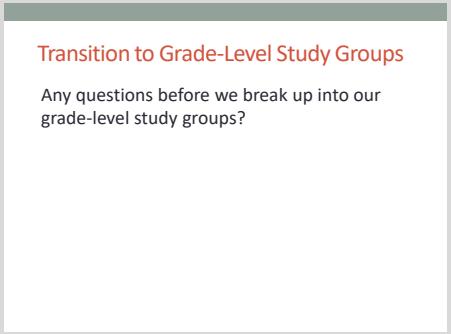
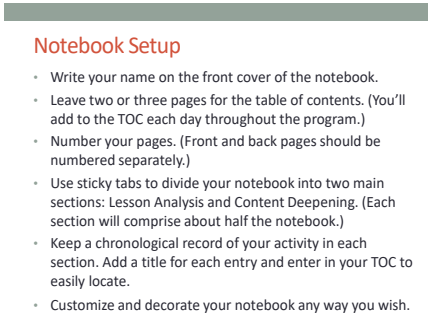
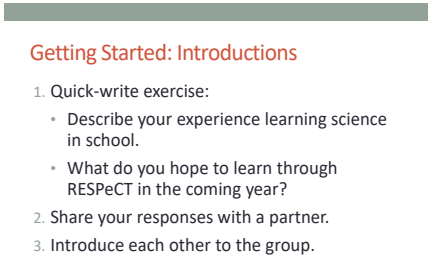
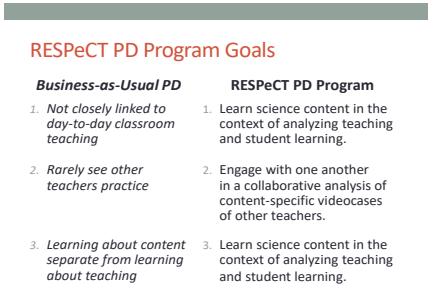
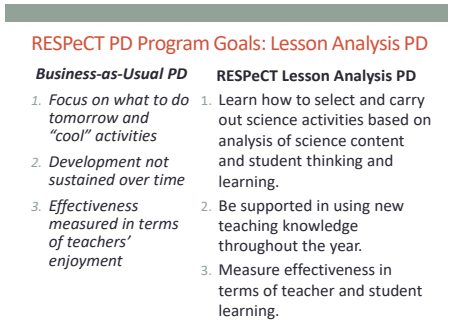
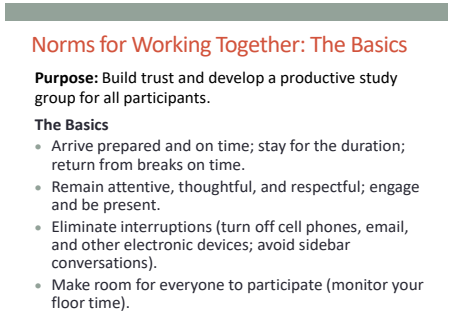
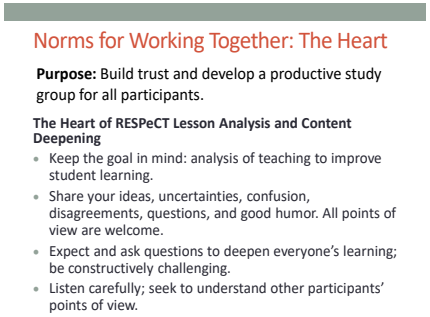
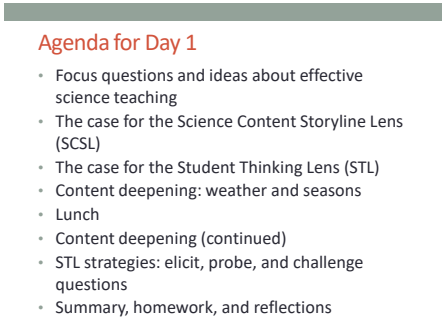
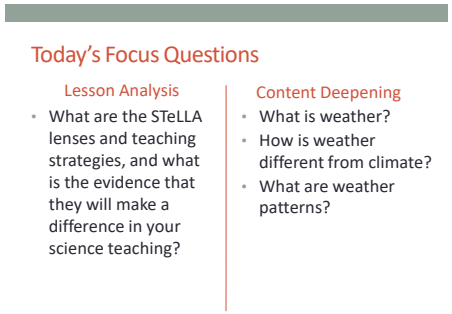
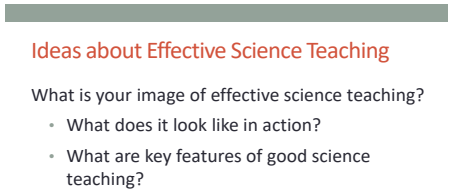
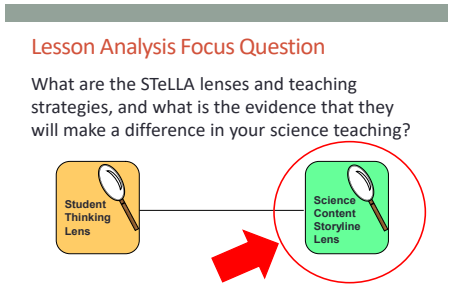
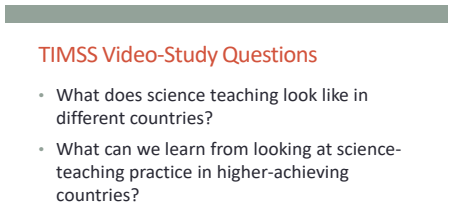
			**Display Slide 12.** Summer Institute at a Glance (Approximately 1 min) a. During the Summer Institute, each grade level will focus on two content areas, with one week devoted to each area. Participants will deepen their science-content knowledge, study lesson plans in each content area, and analyze videocases of teachers presenting this content.
			**Display Slide 13.** School-Year Schedule (Approximately 1 min) a. "The Summer Institute is just the beginning! During the school year, you'll continue meeting with your grade-level study group."
			**Display Slide 14.** Your RESPeCT PD Program Materials (Approximately 1 min) a. **Transition slide:** "In a moment we'll break up into grade-level study groups and dig into the RESPeCT PD program! But first let's review this list of materials you'll receive in your designated meeting rooms."

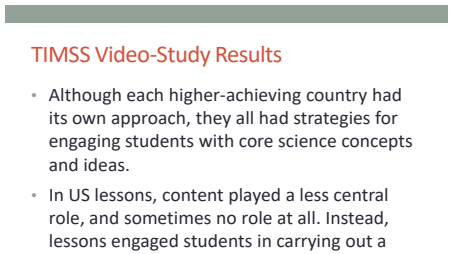
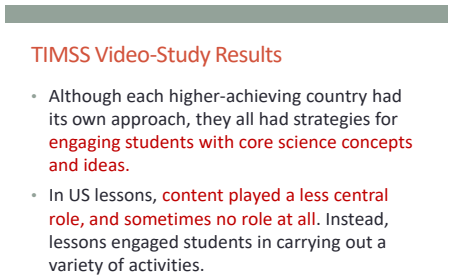
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
8:25–8:30 5 min **Transition** Slide 15	**Transition to Grade-Level Study-Group Settings**		**Display Slide 15.** Transition to Grade-Level Study Groups (5 min) a. "Any questions before we head to our grade-level study groups?" b. **Send-off:** "Have a great day and be sure to let us know if there is anything we can do to support you in getting the most out of this experience!"
8:30–9:20 50 min **Getting Started** Slides 16–24	**Purpose** • Build community within grade-level study groups. • Set the stage for a day of learning about the RESPeCT PD program (formerly the STeLLA PD program), the STeLLA conceptual framework, and tools for lesson analysis. • Access participants' prior knowledge/beliefs about science teaching and learning: What do participants include in their image of effective science teaching? What's missing? **Content** • RESPeCT PD is different from typical PD in a number of ways. • Agreed-upon norms for working together will support our learning. • Focus questions will guide our work in lesson analysis and content deepening activities. • We bring to this work a variety		**Display Slide 16.** Notebook Setup (8 min) a. Welcome participants to the study group and introduce yourself as they arrive. b. Help participants find their table tents and materials so they can get settled. c. Direct them to the instructions for setting up their notebooks (Setting Up Your Summer Institute Notebook in the pretabs section of their PD program binders) and get them started working on this task. Interact informally with them and allow them to chitchat as they work.
			**Display Slide 17.** Getting Started: Introductions (15 min) a. **Individuals (3 min):** Have participants write their responses to the questions on the slide in their notebooks. Emphasize that this is an independent writing exercise. b. **Pairs (3 min):** Have participants pair up and share their responses to the questions. Encourage them to learn other things about their partners as well (e.g., school, years of teaching,

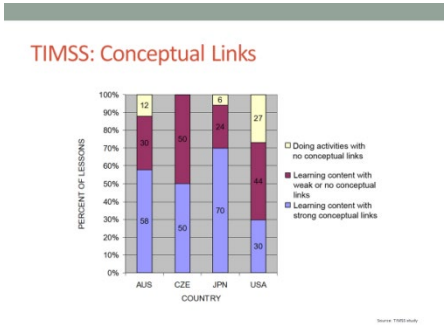
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	of ideas about effective science teaching. **What Participants Do** • Set up their Summer Institute notebooks. • Quick-write about their school experiences in science and their hopes for learning in this program. • Share their writing with a partner. • Introduce their partners to the group. • Discuss suggested norms for working together. • Brainstorm and discuss ideas about effective science teaching. **Posters and Charts** • STeLLA Framework and Strategies poster • Norms for Working Together (chart) • Day-1 Agenda (chart) • Day-1 Focus Questions (chart) • Parking Lot poster **Handouts in PD Binder** • 1.1 Norms for Working Together **Supplies** • Table tents with names • Science notebooks • Chart paper and markers **PD Resources** • RESPeCT PD program binder		favorite subjects to teach, hobbies). **Note:** If the group has an odd number of participants, pair up with one of them. c. **Whole group (9 min):** Have each participant introduce her or his partner, highlighting what that partner hopes to learn from the RESPeCT PD program. Model the first pair of introductions to demonstrate that they should be brief. **Note:** If you weren't able to pair up with someone, simply introduce yourself. **Monitor the time:** Introductions should be longer than a sentence, but not the length of a full essay!
			**Display Slide 18.** RESPeCT PD Program Goals (2 min) a. Talk through this slide, emphasizing how RESPeCT PD is different from many other professional development opportunities.
			**Display Slide 19.** RESPeCT PD Program Goals: Lesson Analysis PD (1 min) a. Highlight the goals of RESPeCT lesson analysis PD and how it differs from other professional development opportunities.

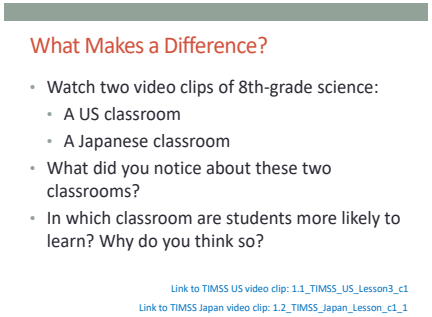
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	• RESPeCT lesson plans binder • STeLLA strategies booklet • Setting Up Your Summer Institute Notebook (pretabs section in PD binder) • Half-page copy of the norms (front pocket of PD binder)		**Display Slide 20.** Norms for Working Together: The Basics (3 min) a. "To do this kind of work together, we need to develop a strong study group where everyone feels safe sharing their ideas, questions, confusion, successes, and stumbles. Having a set of agreed-upon norms will help us build such a learning community." b. Read over these basic norms. c. "What do you think? Are there any changes or additions you'd like to suggest?"
			**Display Slide 21.** Norms for Working Together: The Heart (5 min) a. "This set of norms moves beyond the basics and targets the heart of RESPeCT PD program goals." b. Read the list. c. "Is anything unclear? Do you have any changes or additions you'd like to suggest? Do you have any concerns about these norms?" d. Direct participants to handout 1.1 (Norms for Working Together) and pass out the half-page copy of the norms for them to paste on the inside front cover of their notebooks. e. Ask participants if they're willing to live with these norms today; then tell them they'll have an opportunity to revise them tomorrow.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 22.** Agenda for Day 1 (Less than 1 min) a. Talk through the agenda for the day.
			**Display Slide 23.** Today's Focus Questions (1 min) a. "Each day we're going to have at least one lesson analysis focus question and one content deepening focus question. These are today's focus questions." b. Read the focus questions on the slide.
			**Display Slide 24.** Ideas about Effective Science Teaching (15 min) a. "Before we explore these questions, let's create a list of ideas about effective science teaching." b. **Individuals (3 min):** "Take a few minutes to think and write about the questions on the slide." c. **Whole group (10 min):** Go around the group (round-robin) asking everyone to contribute an idea. Write the ideas on chart paper and title the chart "Effective Science Teaching." d. "Throughout the sessions, we'll revisit this list to add new ideas, clarify our thinking, and make

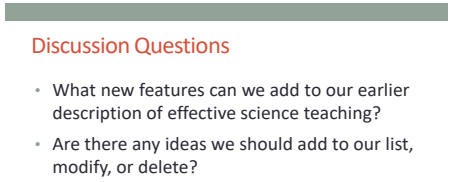
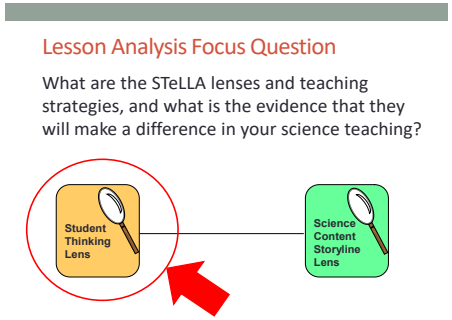
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			other modifications."
9:20–10:10 50 min (Includes 10-min break) **The Case for the Science Content Storyline Lens (SCSL)** Slides 25–34	**Purpose** • Draw from the TIMSS video study to build the case for the Science Content Storyline Lens as a core analytical tool in the STeLLA conceptual framework. **Content** • The TIMSS video study showed the importance of connecting lesson activities to science ideas to form a coherent science content storyline in science lessons. **What Participants Do** • Analyze a results graph from the TIMSS video study. • Watch video clips from US and Japanese classrooms and discuss observed differences. • Discuss key findings from the TIMSS video study and how they relate to the idea of a science content storyline. • Review the chart of participant ideas about effective science teaching in light of the TIMSS video study.		**Display Slide 25.** Lesson Analysis Focus Question (2 min) a. "This PD program will focus on two lenses as analytical tools to guide our learning: the Student Thinking Lens and the Science Content Storyline Lens." b. "Today we're going to examine why these two lenses were chosen for our focus." c. "Let's begin with the Science Content Storyline Lens."
			**Display Slide 26.** TIMSS Video-Study Questions (2 min) a. "A large video study of science teaching in different countries revealed the importance of the Science Content Storyline Lens." b. "The TIMSS video study explored the research questions on this slide." **Background info:** • TIMSS stands for Trends in Mathematics and Science Study. • TIMSS is known for its achievement studies comparing student performance in math and science internationally.

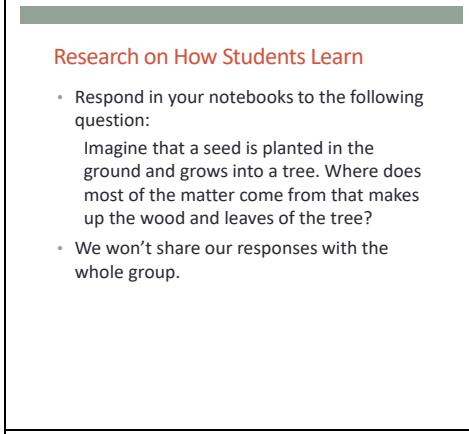
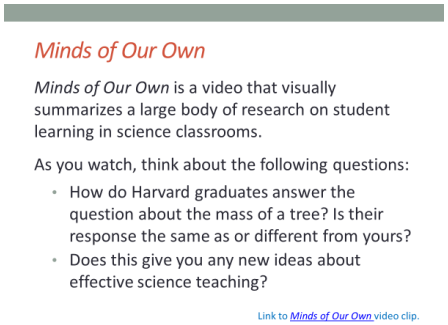
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	Posters and Charts • Effective Science Teaching chart **Videos** • Video Clip 1.1, TIMSS US Lesson 3 • Video Clip 1.2, TIMSS Japan Lesson 1 **Handouts in PD Binder** • 1.2 Transcript for Video Clip 1.1 • 1.3 Transcript for Video Clip 1.2 • 1.4 TIMSS *Educational Leadership* article		**Display Slide 27.** TIMSS Video-Study Comparisons (2 min) a. "Australia, the Czech Republic, and Japan are higher-achieving countries in science compared to the United States." b. "In these countries, 100 eighth-grade lessons were randomly video recorded. The goal was to describe typical science teaching in each country."
			**Display Slide 28.** TIMSS Video-Study Results (2 min) a. "The TIMSS video study showed these results."
			**Display Slide 29.** TIMSS Video-Study Results (2 min) a. Call attention to the text highlighted in red to emphasize the difference between US science lessons and science lessons in higher-achieving countries.

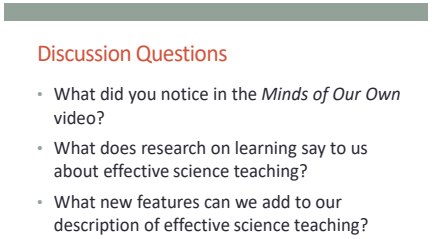
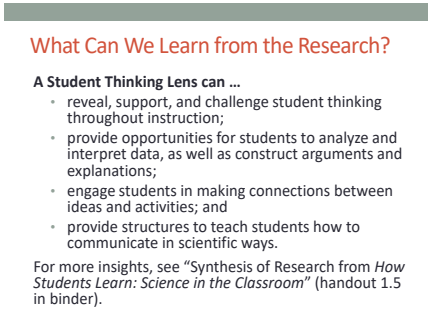
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 30.** TIMSS: Conceptual Links (3 min) a. **Ask:** "What do you notice from this graph? What do you make of this data?" b. **Emphasize:** "In the US, more than a quarter of the lessons had no science content; whereas in the other countries, the majority of the randomly selected lessons (or typical lessons) had content with strong conceptual links." c. **Example of a lesson with no science content:** "What's a science lesson with no content? In this research, a lesson with at least one complete statement of a science idea was scored as 'learning content.' Lessons with 'no content' had **only** topic-level mentions of science concepts. For example, one teacher started a lesson by telling students to take out their rockets and get to work. They had directions to follow, but the teacher's only focus in his interactions with students was on how to build the rockets. At the end of the lesson, he told students to clean up and then dismissed them. This is a lesson with no science content!" **Other key ideas to highlight:** • Each higher-achieving country engaged students with core science concepts and ideas (more consistently than the US). • All the higher-achieving countries linked ideas and activities (more consistently than the US). • In US lessons, the focus was on performing activities with less attention to content and even less attention to linking activities and science ideas.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 31.** What Makes a Difference? (20 min) a. Direct participants to the transcripts for Video Clips 1.1 and 1.2 (handouts 1.2 and 1.3) before showing each clip. b. **Show US classroom video:** Ask participants to focus on what is going on with the science content and storyline. c. **Discuss:** "What did you notice?" **Key ideas to emphasize and link back to the results include the following:** • The teacher focuses on the activity and the procedure needed to complete the activity. • The teacher and students place no real focus on important science ideas. • There's only a topic-level mention of science ideas ("pulleys," "effort distance," "resistance force"). d. **Show Japanese classroom video:** Ask participants to focus on what is going on with the science content. e. **Discuss:** "What did you notice?" **Key ideas to emphasize and link back to the results include the following:** • Content ideas are made clear to students (focus question, pairs talk) before doing any activity. • Students are asked to talk about science ideas, not just procedures. • The lesson purpose is made clear to students. f. **Ending discussion:** "In which classroom are students more likely to learn science concepts? Why?"

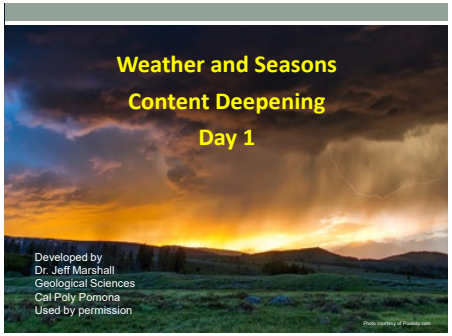
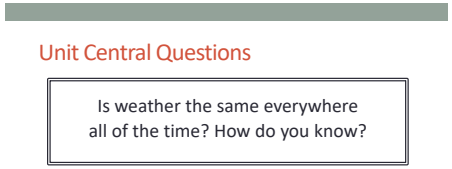
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Note: Participants may be critical of both classrooms because student thinking isn't made visible. This is true, but bring their focus back to the science content and storyline. They should see a clear distinction between the science content storylines in the Japanese and US lessons. Students in the Japanese classroom are more likely to learn because science-content ideas are made visible, and students are engaged in thinking about these ideas, not just science activities.
			**Display Slide 32.** The TIMSS Findings Show … (1 min) a. Use this slide and the next to summarize key ideas from the TIMSS video study.
			**Display Slide 33.** What Can We Learn from the Research? (1 min) a. After reading this slide, share with participants that the Science Content Storyline Lens addresses the need uncovered in the TIMSS video study: to strengthen the links between science ideas and lesson activities. b. Encourage participants to read handout 1.4 (TIMSS *Educational Leadership* article) for further insight.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 34.** Discussion Questions (5 min) a. "What features on our list of ideas about effective science teaching are consistent with the TIMSS video-study findings?" b. "Are there any ideas you'd like to add to our list, delete, or modify?" **Note: Use a different color** to add/delete/modify ideas. Encourage participants to keep an open mind about changing their ideas. Provide opportunities for them to reflect on any changes and the reasons for those changes. c. **Transition:** "During week 2 of the Summer Institute, we'll focus on strategies for creating a strong, coherent science content storyline. This week, we'll focus on the Student Thinking Lens. Right now, let's consider the reasons for this focus."
10:00–10:10 10 min	**BREAK**		
10:10–10:40 30 min **The Case for the Student Thinking Lens (STL)** Slides 35–39	**Purpose** • Draw from research on science learning to build the case for the Student Thinking Lens as a core analytical tool in the STeLLA conceptual framework. **Content** • Research on science teaching and learning shows that learners cling to important		**Display Slide 35.** Lesson Analysis Focus Question (Less than 1 min) a. "At this point, we'll transition from a focus on the Science Content Storyline Lens (SCSL) to the Student Thinking Lens (STL)." b. "We'll be focusing on the Student Thinking Lens the rest of the day and throughout this week."

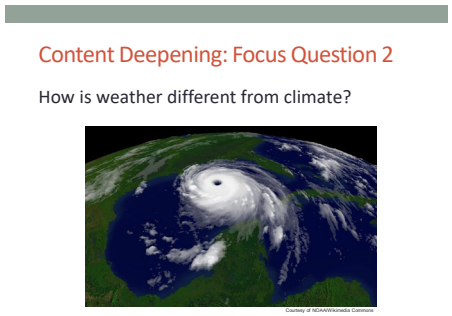
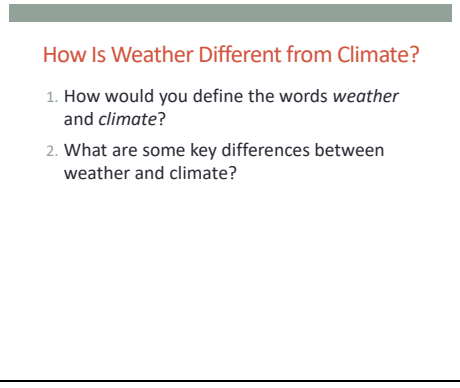
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	misconceptions even after what we usually consider to be good hands-on science instruction. • To help students change their ideas and truly understand science concepts, we need to engage them in more thinking and sensemaking. • Making students' ideas and misconceptions visible is essential to effective science teaching. • For teachers, knowledge of students' ideas can guide them in designing instruction to provide evidence and support that will help students change their ideas and find science ideas meaningful. • For students, making their thinking visible engages them actively in the learning process. **What Participants Do** • Write about where the added mass comes from when a tiny seed becomes a full-grown tree. • Watch *Minds of Our Own Lessons From Thin Air* video clips in which Harvard graduates and an 8th-grade student answer the same	 	**Display Slide 36.** Research on How Students Learn (3 min) a. **Individuals:** Have participants answer the question on the slide in their science notebooks. **Background for PD leaders:** Participants will likely have the same misconceptions revealed in the video, but they may not yet be comfortable sharing their confusion. At this point, don't ask them to share their ideas with the group. It will be interesting to see if some of them voluntarily share their "wrong" ideas after they see the video. **Display Slide 37.** *Minds of Our Own* (10 min) a. Read the information and instructions on the slide. b. Watch the *Minds of Our Own Lessons From Thin Air* video. Total viewing time is approximately 10 minutes. (https://www.learner.org/series/minds-of-our-own/2-lessons-from-thin-air/?jwsource=cl) • MIT/Harvard interview—start at segment 3:30 and end at 5:40. • John preinterview, class, and postinterview—start at segment 7:50 and end at 16:45. **Note:** If time is short, stop after Phil Sadler. If you have enough time, you can show the entire segment from 3:30 to 16:45.

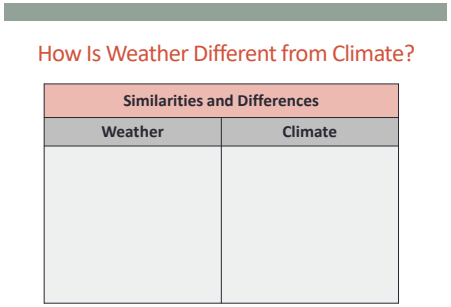
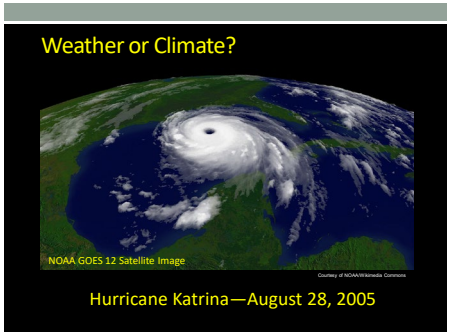
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	question. • Discuss ideas about research on student thinking addressed in the video. • Review the chart of participant ideas about effective science teaching in light of this research. **Posters and Charts** • Effective Science Teaching chart **Videos** • *Minds of Our Own* **Handouts in PD Binder** • 1.5 "Synthesis of Research from *How Students Learn: Science in the Classroom*" **Supplies** • Science notebooks		**Display Slide 38.** Discussion Questions (15 min) a. There's a lot to talk about in this video! Here are some additional questions you might pose: • Did John's ideas about photosynthesis change through instruction? • What did the teacher say about his instruction? • What did the experts say? • How do the Harvard students' responses compare with your own? What ideas does this give you about your own science learning experiences? **Key ideas to emphasize:** Research shows that we not only need to engage students in more thinking and sensemaking, but we also need to listen to their ideas—*especially when they're wrong*—and use them to guide our instruction. b. Modify the chart of ideas about effective science teaching as participants share features from the research.
			**Display Slide 39.** What Can We Learn from the Research? (2 min) a. "This slide nicely summarizes some of the ways we get students thinking and make their thinking visible." **Note:** Encourage participants to read handout 1.5 ("Synthesis of Research from *How Students Learn: Science in the Classroom*") for further insight. b. **Transition:** "Today we'll start learning some particular strategies for making student thinking more prominent in science lessons." **Background for PD leaders:** The STeLLA

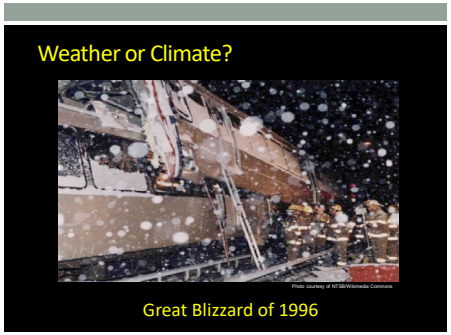
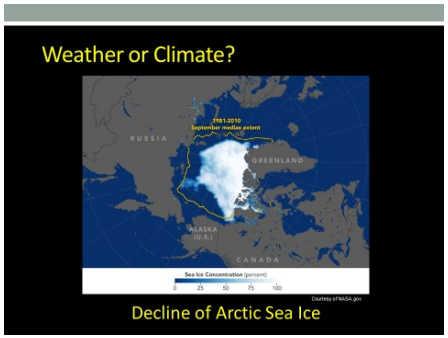
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			conceptual framework addresses the need uncovered in this and other studies on how people learn and, more specifically, how students learn science. 1. If students' initial knowledge is not engaged, they may fail to grasp the new concepts and information that are taught and may distort the new information to make it fit their prior experience. 2. This idea of learning with understanding has two parts: (1) factual knowledge *must* be placed in a conceptual framework (a big idea or a set of big ideas) organized in ways that enable students to use and apply that knowledge to make predictions, solve problems, explain new situations, and so forth; and (2) multiple representations that are rich in science ideas and details give concepts meaning. 3. This idea helps students monitor their developing understandings, engaging them in reflecting on their learning experiences, their changing ideas, and their remaining questions and musings.
10:40–12:00 80 min **Content Deepening: Weather and Seasons** Slides 40–68	**Purpose** • Deepen participants' science-content knowledge of what weather is and how it differs from climate. **Content** • Weather describes the conditions outside, including temperatures, sunlight, clouds, snow or rain, and wind. Weather can be observed and described. • When weather is observed and		**Display Slide 40.** Content Deepening: Weather and Seasons (Less than 1 min) a. "Now let's begin our content deepening work on weather and seasons." **Note:** Throughout this content deepening phase, refer as needed to the Weather and Seasons Content Background Document, Common Student Ideas about Weather and Seasons, and Weather and Seasons: Learning Goals for Students and Teachers.

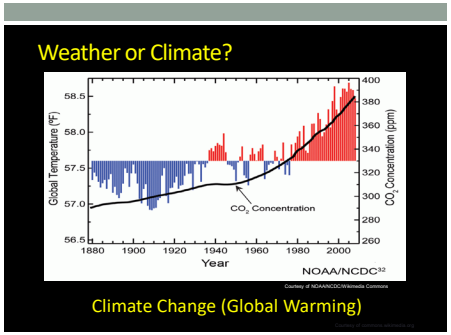
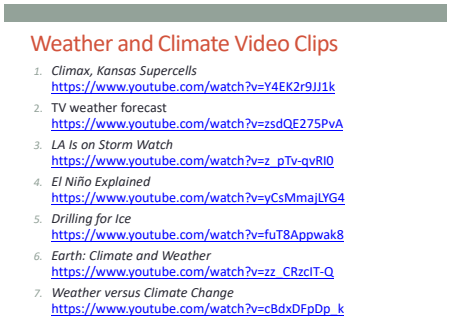
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	recorded over time in a specific place, we can identify patterns. These patterns can include the number of sunny and cloudy days, the amount of rain or snow a place receives at certain times of the year, and changes in temperature. • Weather involves changes in atmospheric conditions over short periods of time, such as hours, days, or weeks. Weather is dependent on geographic location, time of year, local heating and cooling processes, atmospheric moisture, and the movement of air masses. In contrast, climate is an average of atmospheric conditions in broader geographic areas over longer periods of time, such as a year, a decade, or a century. **What Participants Do** • Discuss the definition and characteristics of weather. • Investigate the differences and similarities between weather and climate. • Examine slide images and video clips and decide whether they're examples of weather or climate. **Videos** • *Climax, Kansas Supercells* • TV weather forecast • *LA Is on Storm Watch* • *El Niño Explained* • *Drilling for Ice* • *Earth: Climate and Weather* • *Weather versus Climate*		**Display Slide 41.** Content Deepening: Day 1 (Less than 1 min) a. "Today's content deepening work will focus on science ideas from prelessons and lesson 1 of the Weather and Seasons unit." b. "We'll discuss this content at a higher level than we expect from kindergartners to deepen your understandings of the foundational concepts that will be built upon in subsequent grades." c. "We'll also explore science concepts that are related to weather and seasons but aren't part of this unit."
			**Display Slide 42.** Unit Central Questions (4 min) a. Have participants locate prelesson 0a in their lesson plans binders and read the unit central questions and lesson focus question on the overview page (page 1). b. Ask participants, "What is the difference between a unit central question and a lesson focus question?" c. Elicit ideas from participants; then emphasize that a unit central question guides student thinking throughout the entire lesson series, while a lesson focus question guides student thinking in one or two lessons. d. "The science concepts we explore in our content deepening sessions this week will help us answer the unit central questions our students will think about during the Weather and Seasons unit." e. To reinforce the practice they'll follow with students, have participants write the unit central questions in their science notebooks and draw a double-lined box around them.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	Change **Supplies** • Science notebooks • Chart paper and markers **PD Resources** • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** *Resources section:* • Content background document • Common Student Ideas		**Display Slide 43.** Weather and Seasons: Lesson 0 (Less than 1 min) a. "First, we'll explore science ideas about weather from the prelessons that students will complete in the fall before the Weather and Seasons unit begins in the spring. Students will begin making outdoor weather observations the first week of school and record their data on a class weather calendar."
		Content Deepening: Focus Question 1 What is weather?	**Display Slide 44.** Content Deepening: Focus Question 1 (1 min) a. Read the focus question on the slide and emphasize that this question will guide student learning throughout lesson 0a. b. Have participants write this question in their science notebooks and draw a box around it to reinforce the practice they'll follow with students in the lessons. Make sure they leave space below the question to write a response later.
		What Is Weather? 1. How would a kindergartner define the word *weather*? 2. What are some characteristics we use to describe weather?	**Display Slide 45.** What Is Weather? (8 min) a. Read the questions on the slide. b. **Pairs:** "Discuss these questions with an elbow partner; then work together to develop concise answers. Be prepared to share your ideas with the group." c. **Whole group:** Call on several pairs to share their responses to the questions. Elicit differing points of view and ask questions to probe and challenge participants' thinking. d. As participants share their ideas, record them on

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			chart paper. **Key ideas:** • Weather is what it looks like and feels like outside. • Weather includes temperature, sunlight, clouds, wind, and rain or snow.
			**Display Slide 46.** Content Deepening: Focus Question 2 (1 min) a. Read the focus question on the slide. b. "This question will launch us into an investigation that isn't part of the Weather and Seasons lesson series but is designed to deepen our understandings of the key distinctions between weather and climate." c. Have participants write this question in their science notebooks and leave space to write a response later.
			**Display Slide 47.** How Is Weather Different from Climate? (5 min) a. Read the questions on the slide. b. **Pairs:** Discuss these questions with an elbow partner; then work together to develop concise answers. Be prepared to share your definitions and ideas with the group.

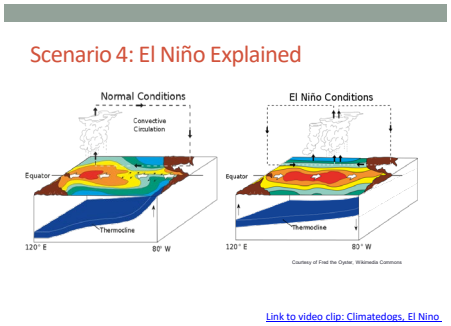
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 48.** How Is Weather Different from Climate? (5 min) a. Create a two-column table on chart paper like the one on the slide. b. Invite pairs to share their responses to the questions from the previous slide. Elicit differing points of view and ask questions to probe and challenge participants' thinking. c. As participants identify similarities and differences between weather and climate, record them on the table. d. Ask the following questions during the discussion: • What are the key similarities between weather and climate? • What are the key differences?" • Why is it important for students to understand the differences between weather and climate?
			**Display Slide 49.** Weather or Climate? (4 min) a. "Next, we'll explore the differences between weather and climate." b. "This slide shows a satellite image of Hurricane Katrina just before landfall on August 28, 2005." c. Ask participants, "Is this an example of weather or climate? Why do you think so? d. **Individuals (1 min):** "Look at our table to see how we defined and described weather and climate and think about which definition matches the characteristics of this event." e. **Whole group (3 min):** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one

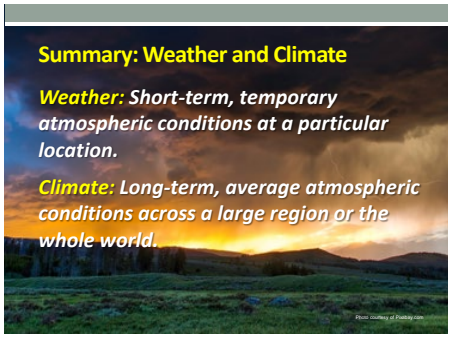
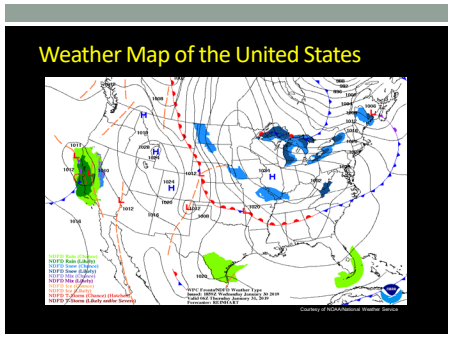
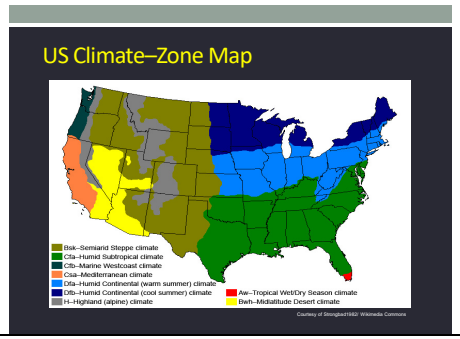
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. f. Work toward a consensus regarding whether Hurricane Katrina is an example of weather or climate.
			**Display Slide 50.** Weather or Climate? (3 min) a. "This is a photograph of the great blizzard of 1996. Is this an example of weather or climate? Why do you think so?" b. **Individuals (1 min):** "Think about which definition on our table matches the characteristics of this event." c. **Whole group (2 min):** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether a blizzard is an example of weather or climate.
			**Display Slide 51.** Weather or Climate? (3 min) a. "This NASA image taken on September 19, 2018, shows the decline in arctic sea ice over the past few decades. Is this an example of weather or climate?" b. **Individuals (1 min):** "Think about which definition on our table matches the characteristics of this event." c. **Whole group (2 min):** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas.

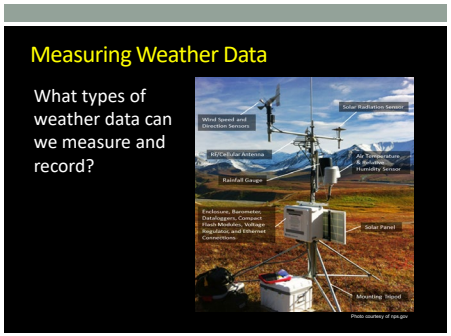
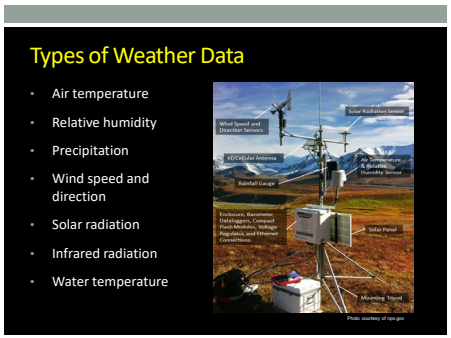
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			d. Work toward a consensus regarding whether a decline in arctic ice is an example of weather or climate.
			**Display Slide 52.** Weather or Climate? (3 min) a. "This graph shows rising average global temperatures and atmospheric carbon-dioxide concentrations for the past century. Is this an example of weather or climate? Why do you think so?" b. **Individuals (1 min):** "Think about which definition on our table matches the characteristics of this event." c. **Whole group (2 min):** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether climate change or global warming is an example of weather or climate.
			**Display Slide 53.** Weather and Climate Video Clips (Less than 1 min) a. "Next, we'll watch a sequence of five short video clips showing different weather-or-climate scenarios. After each clip, you'll discuss with your elbow partner whether the scenario was an example of weather or climate. Then we'll discuss the scenario as a group, and I'll record the consensus on chart paper." b. "After the first five clips, we'll watch two more clips that cover key science ideas related to this activity." c. Briefly review the list of seven video clips

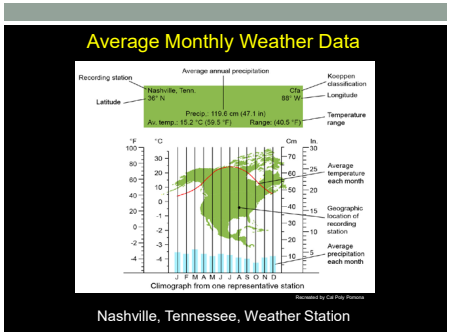
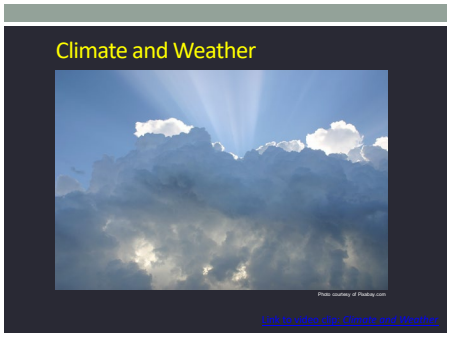
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			participants will be watching. **Note:** To facilitate preloading the video clips, all seven web links are displayed on this slide. Links are also included on the following slides. Loading these videos into a web browser before starting this segment will make it easier and more efficient to switch back and forth between this PowerPoint presentation and each of the Internet videos. (See overview page for advance preparation instructions.)
			**Display Slide 54.** Scenario 1: Midwest Thunderstorm (5 min) **Note:** For slides 54–58, introduce the video scenario and then switch to the web browser to show the video. Afterward, switch back to the PowerPoint slide. a. Introduce the scenario and show the video clip. b. **Turn and Talk:** "Now pair up with an elbow partner and briefly discuss whether the scenario is an example of weather or climate. Which definition on our table matches the characteristics of this event?" c. **Whole group:** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether a thunderstorm is an example of weather or climate. Record the group's decision on chart paper.

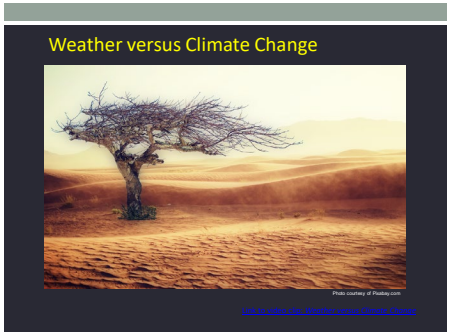
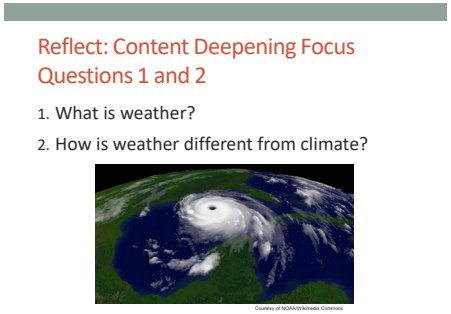
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 55.** Scenario 2: TV Weather Report (5 min) a. Introduce the scenario and show the video clip. b. **Turn and Talk:** "Now pair up with an elbow partner and briefly discuss whether the scenario is an example of weather or climate. Which definition on our table matches the characteristics of this event?" c. **Whole group:** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether a thunderstorm is an example of weather or climate. Record the group's decision on chart paper.
			**Display Slide 56.** Scenario 3: LA Is on Storm Watch! (5 min) a. Introduce the scenario and show the video clip. b. **Turn and Talk:** "Now pair up with an elbow partner and briefly discuss whether the scenario is an example of weather or climate. Which definition on our table matches the characteristics of this event?" c. **Whole group:** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether a thunderstorm is an example of weather or climate. Record the group's decision on chart

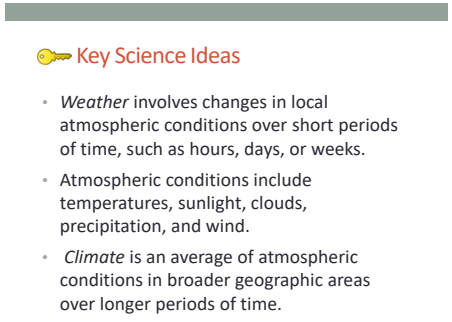
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			paper.
			**Display Slide 57.** Scenario 4: El Niño Explained (5 min) a. Introduce the scenario and show the video clip. b. **Turn and Talk:** "Now pair up with an elbow partner and briefly discuss whether the scenario is an example of weather or climate. Which definition on our table matches the characteristics of this event?" c. **Whole group:** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas. d. Work toward a consensus regarding whether a thunderstorm is an example of weather or climate. Record the group's decision on chart paper.
			**Display Slide 58.** Scenario 5: Ice-Core Research (5 min) a. Introduce the scenario and show the video clip. b. **Turn and Talk:** "Now pair up with an elbow partner and briefly discuss whether the scenario is an example of weather or climate. Which definition on our table matches the characteristics of this event?" c. **Whole group:** Invite several participants to share their ideas and reasoning with the group. Encourage participants to respond to one another's ideas by agreeing or disagreeing, asking questions, or offering alternative ideas.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			d. Work toward a consensus regarding whether a thunderstorm is an example of weather or climate. Record the group's decision on chart paper.
			**Display Slide 59.** Summary: Weather and Climate (Less than 1 min) a. Read the definitions on the slide and compare them with the group definitions on chart paper. b. Ask participants, "Does anyone have any lingering questions about these definitions or the differences between weather and climate?"
			**Display Slide 60.** Weather Map of the United States (Less than 1 min) a. "This map shows the weather forecast for the United States on January 31, 2019, at a specific time. It's a weather map because it shows short-term, temporary atmospheric conditions in many locations across the US."
			**Display Slide 61.** US Climate-Zone Map (Less than 1 min) a. "This map shows the climate zones of the continental United States. The color key in the bottom left-hand corner classifies the different climate zones based on the Köppen classification system." b. "This is a climate map because it shows long-

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			term, average atmospheric conditions across large regions of the United States."
			**Display Slide 62.** Measuring Weather Data (3 min) a. "In the prelessons, students go outside each day to collect weather data like weather scientists. First, they observe the weather to determine whether it's sunny, cloudy, rainy, or windy, and they use a thermometer to measure the temperature to determine whether it's hot, warm, cool, or cold outside. Then they record their observations and temperature readings on a monthly weather calendar." b. "Weather scientists measure and record many types of weather data using weather-station instruments like the ones on this slide." c. "What types of weather data can we measure and record?" d. Highlight the various sensors and gauges on the slide that scientists use to measure wind speed and direction, the amount of solar radiation, air temperature and relative humidity, and the amount of precipitation.
			**Display Slide 63.** Types of Weather Data (Less than 1 min) a. Summarize the types of weather data that scientists can measure.

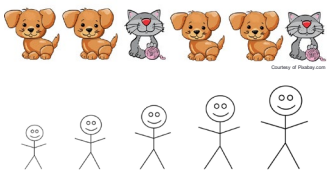
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 64.** Average Monthly Weather Data (Less than 1 min) a. "This slide shows average monthly weather data from a weather station in Nashville, Tennessee. The data include average temperatures and rainfall totals over a 12-month period." b. "When short-term, regional weather data are compiled and averaged over longer periods of time, this helps define long-term, regional climate." c. Point out the Köppen classification for this weather station at the top right-hand corner of the slide. (*Cfa* refers to a humid subtropical climate.) The Köppen climate classification is a system that describes different types of regional climates.
			**Display Slide 65.** Climate and Weather (4 min) a. "Next, we'll watch two more video clips that cover key science ideas related to our investigation." b. Introduce the National Geographic video *Climate and Weather*: "This National Geographic video presents a nice synopsis of the difference between weather and climate." c. Switch to the web browser and show the video clip. d. After showing the clip, switch back to this PowerPoint slide. e. Ask participants, "What aspects of this video stood out to you? Do you have any lingering questions about climate and weather?"

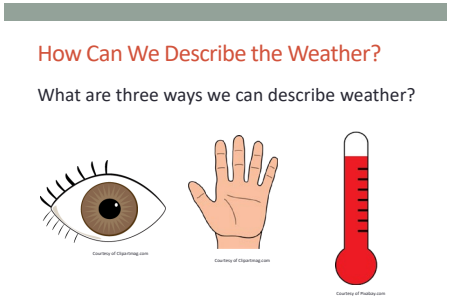
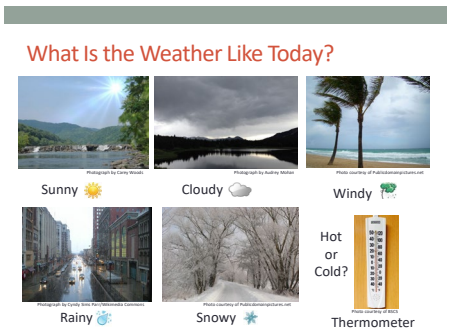
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 66.** Weather versus Climate Change (4 min) a. Introduce the National Geographic video *Weather versus Climate Change*, hosted by astrophysicist Neil deGrasse Tyson. b. Explain that this video offers another unique look at the difference between weather and climate. c. Switch to the web browser and show the video clip. d. After showing the clip, switch back to this PowerPoint slide. e. Ask participants, "What aspects of this video stood out to you? Do you have any lingering questions about climate and weather?"
			**Display Slide 67.** Reflect: Content Deepening Focus Questions 1 and 2 (5 min) a. Review the focus questions on the slide. b. **Individuals:** Have participants answer these questions in concise summary statements in their science notebooks. c. **Whole group:** Invite a few participants to share their answers, using ideas and evidence from the previous slides and videos. d. As participants share their answers, write down key ideas on chart paper.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 68.** Key Science Ideas (Less than 1 min) a. Review the key science ideas on the slide. b. Ask participants if they have any comments or questions.
12:00–12:45 45 min	**LUNCH**		
12:45–2:10 85 min (Includes 10-min break) **Content Deepening (Continued)** Slides 69–86	**Purpose** • Deepen participants' science-content knowledge of weather and weather patterns. **Content** • Weather patterns describe what the weather in a given location is like most of the time. • The angle of sunlight striking Earth's surface affects temperature patterns at different latitudes. • Solar radiation strikes Earth's surface more directly near the equator and at increasing angles traveling north and south toward the poles. • Temperatures tend to be warmer near the equator		**Display Slide 69.** Weather and Seasons: Lesson 1 (Less than 1 min) a. "Next, we'll investigate ideas about weather from lesson 1 of the Weather and Seasons unit." b. "We'll also explore how the Sun affects weather patterns on Earth."

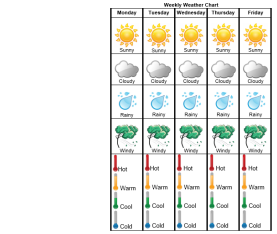
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process

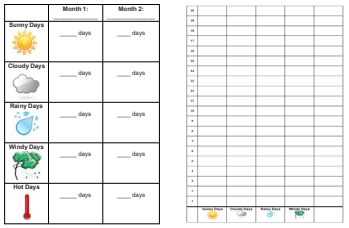
	because the light energy hitting Earth's surface is more concentrated and intense. Temperatures tend to be cooler moving toward the poles because the light energy hitting Earth's surface is less concentrated and intense.
	
	What Participants Do
	• Identify patterns in different sets of images and consider how kindergartners view patterns.
	• Identify patterns in weather data for Pomona in September.
	• Investigate how variations in the angle of sunlight striking Earth's surface affects temperature patterns.
	• Explain world temperature patterns based on the angle of sunlight striking Earth's surface.
	
	Handouts in PD Binder
	• 1.6 Angles of Light Energy
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• For angles-of-light-energy investigation (per pair):
	  • Tray
	  • 2–3 sheets of graph paper
	  • Flashlight
	  • Scissors
	  • Tape
	  • 2 pencils or colored pens
	
	PD Resources
	• RESPeCT lesson plans binder		

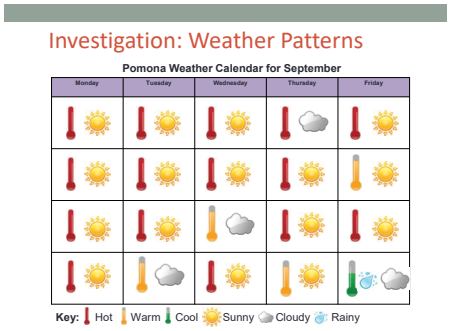
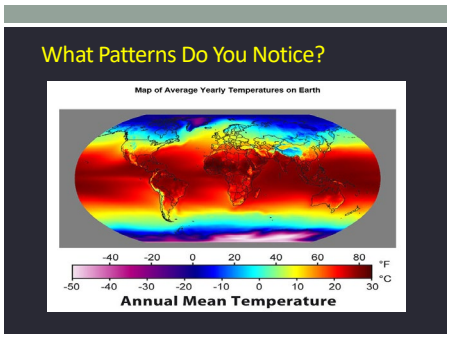
		Content Deepening: Focus Question 3 What are weather patterns?	**Display Slide 70.** Content Deepening: Focus Question 3 (1 min) a. Read the focus question on the slide. b. Emphasize that this question will guide student learning throughout lesson 1. c. Have participants write this question in their science notebooks and draw a box around it. Make sure they leave space below the question to write a response later.
		What Are Patterns? What patterns do you notice in the two sets of images below? 	**Display Slide 71.** What Are Patterns? (5 min) a. "What patterns do you notice in the two sets of images on this slide?" b. As participants share their ideas, record them on chart paper. c. "The concept of patterns is problematic for kindergartners, since they tend to think that patterns involve repetition or a trend among different objects like the patterns represented on this slide. This becomes even more complicated

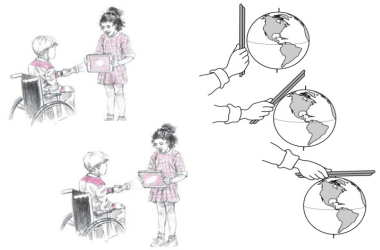
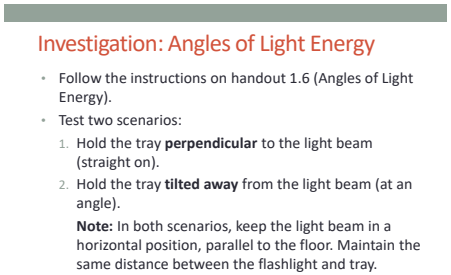
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	Resources in Lesson Plans Binder • Content background document • Common Student Ideas		when they're asked to identify weather patterns, since repetition isn't as obvious. For example, we don't typically see an alternating repetitive pattern of a rainy day and a sunny day followed by a rainy day and a sunny day followed by a rainy day and a sunny day." d. "The term *weather pattern* generally refers to what the weather is like most of the time in a given location." e. Write the definition on chart paper and ask participants to write it in their science notebooks.
			**Display Slide 72.** How Can We Describe the Weather? (3 min) a. Read the question on the slide. b. Ask participants to answer the question using the visual cues on the slide. Elicit a variety of ideas and record them on chart paper. **Answer:** We can *see* weather with our eyes, we can *feel* weather with our hands (or skin), and we can *measure* temperatures with a thermometer. c. "Students will use these three methods to describe the weather they observe and record each day."
			**Display Slide 73.** What Is the Weather Like Today? (Less than 1 min) a. "The pictures on this slide are part of the lesson materials kit for this unit on weather. Each picture card shows a different type of weather with a weather word and icon below the picture. b. "Students will use the picture cards to help them identify and describe the weather conditions they see, feel, and measure outside each day. For example, they may describe the weather as

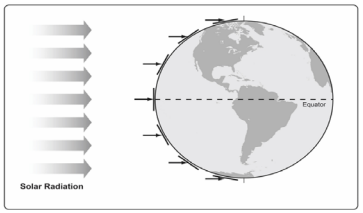
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			sunny and hot or cloudy and cool." **Display Slide 74.** Weekly Weather Chart (Less than 1 min) a. "This slide shows a weekly weather chart with weather and temperature icons that students can circle. This is an easy way to describe the weather they observe each day." b. "Teachers also record students' daily weather observations on a class weather calendar, using stickers to represent various weather conditions and temperatures. Data collection begins on the first day of the school year in the fall and continues each school day through January and/or February." **Display Slide 75.** Monthly Weather Data (1 min) a. "After weather data has been collected and recorded over a period of several months, students identify weather patterns and compare patterns from month to month." b. "Students count the number of sunny, cloudy, rainy, and windy days on their class weather calendar and record them on a monthly observation chart like the chart on the left side of the slide. They also count the number of hot, warm, cool, and cold days. Then they use this data to create picture or bar graphs like the sample on the right side of the slide. These graphs make it easier for students to identify weather and temperature patterns for each month

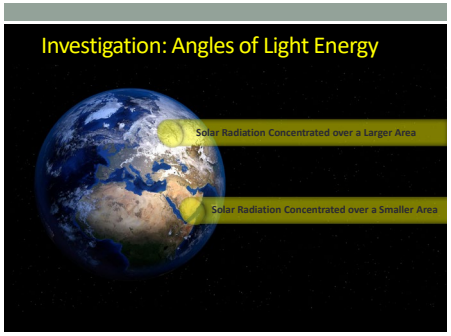
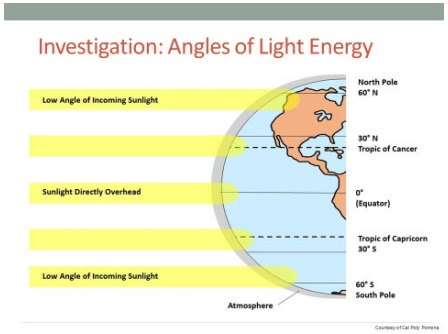


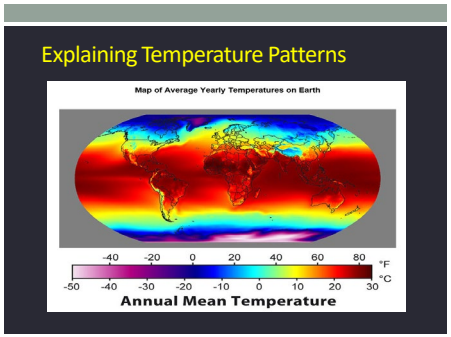


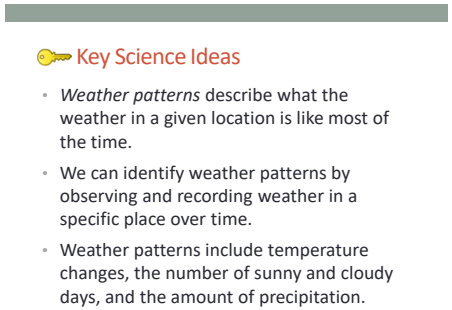
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			and compare the patterns for different months."
			**Display Slide 76.** Investigation: Weather Patterns (7 min) a. "The weather calendar on this slide shows hypothetical weather data for Pomona in September." b. Highlight the weather-icon key at the bottom of the slide. c. **Pairs:** "Pair up with an elbow partner and examine the weather data on the calendar. See if you can identify any weather and temperature patterns in the data. Be ready to share your observations with the group." d. **Whole group:** "What patterns did you identify in the September weather data for Pomona?" e. During the discussion, encourage participants to agree or disagree, ask questions, and add on. Elicit a variety of responses ask questions to probe and challenge participants' thinking. f. Work together to reach a consensus regarding the weather pattern for Pomona in September based on the weather data.
			**Display Slide 77.** What Patterns Do You Notice? (7 min) a. "Next, we'll deepen our understandings of temperature patterns around the world. These concepts are related to weather and seasons, but they aren't part of the kindergarten curriculum." b. "The map on this slide shows average annual temperatures around the world." c. **Pairs:** "What temperature patterns do you notice? Turn to an elbow partner and share your

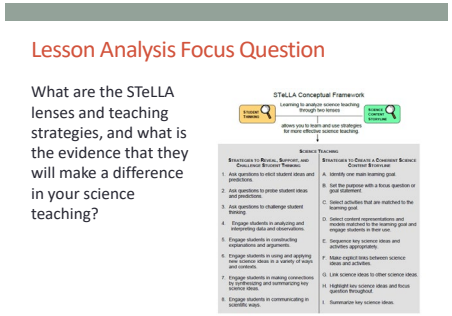
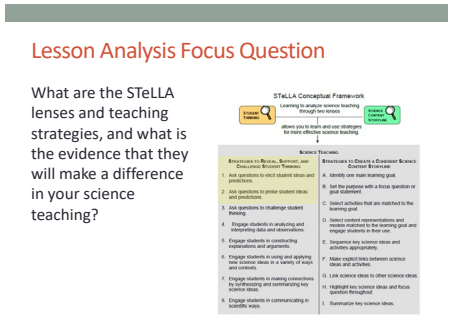
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			observations." d. **Whole group:** Invite participants to share their observations with the group. Elicit a variety of ideas and encourage participants to agree, disagree, ask questions, or add on. e. As participants share the patterns they observe, record them on chart paper. Work toward a group consensus.
			**Display Slide 78.** Investigation: Angles of Light Energy (Less than 1 min) a. "How can we explain the temperature patterns we observed on the map?" b. "For this investigation, we'll explore what happens when sunlight strikes the surface of Earth at different angles and how this affects temperature patterns in different locations."
			**Display Slide 79.** Investigation: Angles of Light Energy (15 min) a. Have participants pair up with an elbow partner and locate handout 1.6 (Angles of Light Energy) in their PD program binders. Then give each pair a tray, a flashlight, two or three sheets of graph paper, tape, scissors, and two colored pencils or pens. b. Walk participants through the instructions for part 1 on the handout. Emphasize that the goal of this activity is to investigate differences in the pattern of light striking the tray. c. Point out that the tray represents the surface of Earth and the flashlight represents sunlight. d. Note that participants will mark on the graph

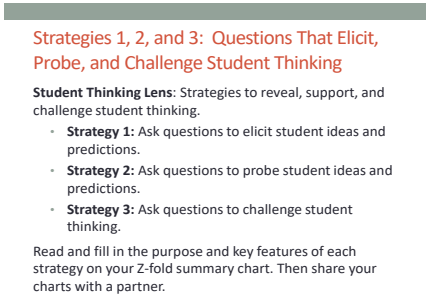
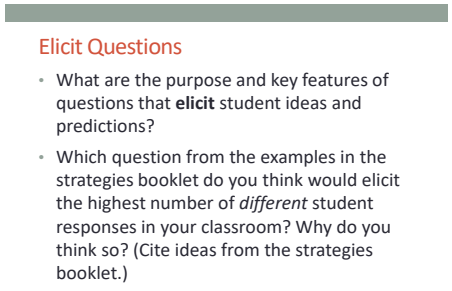
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			paper the circles of light hitting the tray at different angles. Then they'll compare the circles to determine the amount of sunlight striking Earth's surface at each angle and consider how this affects temperature patterns. e. As pairs work together on the activity, circulate around the room to provide support as needed. **Note:** If time is running short, pairs can skip to the discussion question on the handout.
		Investigation: Angles of Light Energy Complete steps 1 and 2 on handout 1.6 (Angles of Light Energy). Then answer these questions: 1. Which circle of light was smaller (straight on or at an angle)? 2. Which circle of light was larger (straight on or at an angle)? 3. Imagine that the flashlight represents sunlight hitting Earth's surface. Would you feel warmer standing in the smaller circle or the larger circle? Why? Be prepared to share your answer.	**Display Slide 80.** Investigation: Angles of Light Energy (10 min) a. Go over the instructions for part 2 on handout 1.6 (Angles of Light Energy). **Note:** Skip steps 3 and 4 on the handout. b. **Pairs:** Direct pairs to complete steps 1 and 2 on the handout and answer the questions on the slide. c. **Whole group:** Invite participants to share their responses with the group. Elicit differing points of view and ask questions to probe and challenge participants' thinking.
		Investigation: Angles of Light Energy The Sun's Incoming Energy–Angle Related to Latitude  	**Display Slide 81.** Investigation: Angles of Light Energy (4 min) a. "The content representation on this slide shows parallel rays of sunlight, or solar energy, striking Earth's surface. Notice that it doesn't show Earth tilted at 23.5-degrees on its axis relative to the Sun." b. Ask participants how this illustration relates to the flashlight-and-tray activity they just completed. c. Point out that like the flashlight and the tray, sunlight strikes Earth's surface at different angles

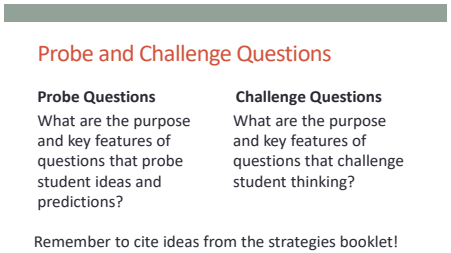
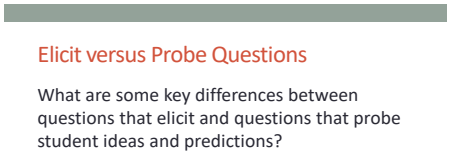
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			based on latitude. Sunlight hits Earth's surface straight on at the equator, such as when the tray is perpendicular to the flashlight beam. Sunlight hits the surface of Earth at increasing angles as it moves toward the poles, such as when the tray placed at an angle to the light beam.
			**Display Slide 82.** Investigation: Angles of Light Energy (4 min) a. "What do you notice about this image? b. "Where will temperatures tend to be warmer and cooler? Why?" c. Participants should recognize that solar radiation is more concentrated or intense when it covers a smaller area and less concentrated or intense when it covers a larger area. So temperatures are generally warmer near the equator because sunlight strikes the surface more directly (over a smaller area), and temperatures are generally cooler at latitudes north and south of the equator because sunlight strikes the surface at more of an angle (over a larger area).
			**Display Slide 83.** Investigation: Angles of Light Energy (4 min) a. "Does this representation give you any new insights into temperature patterns around the world?" b. Participants should observe that this diagram also shows incoming rays of sunlight striking Earth's surface, but it also includes latitudes on the right. They should also notice that the equator tends to receive the most concentrated light. c. Emphasize that like the first diagram, this representation doesn't show Earth tilted on its axis relative to the Sun. With a 23.5-degree tilt,

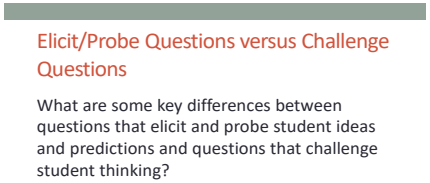
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			the amount of light striking Earth's surface at different latitudes changes with the seasons. The Tropic of Cancer receives the most concentrated light during the summer in the Northern Hemisphere, while the Tropic of Capricorn receives the most concentrated light during the summer in the Southern Hemisphere. The tilt of Earth on its axis causes opposite seasons in the Northern and Southern Hemispheres. When the Northern Hemisphere is experiencing summer, the Southern Hemisphere is experiencing winter, and vice versa.
			**Display Slide 84.** Explaining Temperature Patterns (7 min) a. "Now that we understand the relationship between global temperatures and the angle of sunlight striking Earth's surface, let's revisit our map of average annual temperatures around the world. How does this new information help us explain the patterns we observed on the map?" b. **Pairs:** Have participants pair up again and explain the temperature patterns on the map using ideas about the angle of sunlight striking Earth's surface. c. **Whole group:** Invite participants to share their explanations with the group. Elicit a variety of ideas and encourage participants to agree, disagree, ask questions, or add on.

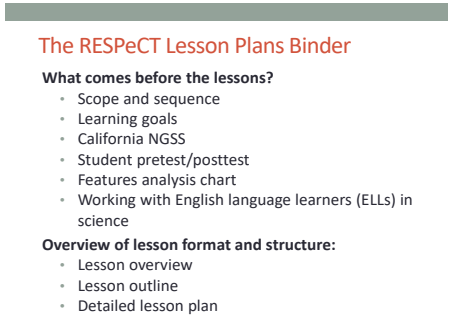
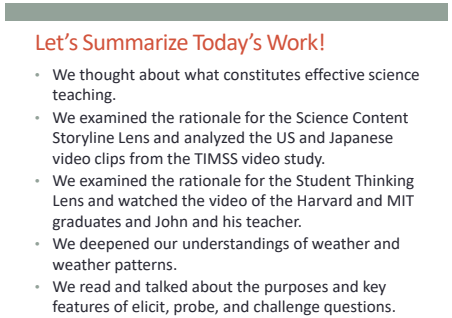
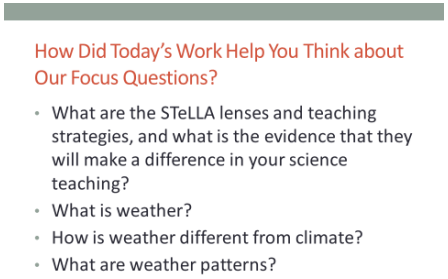
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 85.** Reflect: Content Deepening Focus Question 3 (5 min) a. Review the focus question on the slide. b. **Individuals:** Have participants answer the question in their science notebooks. c. **Whole group:** Invite a few participants to share their answers, using ideas and evidence from previous investigations. d. As participants share their answers, write down key ideas on chart paper.
			**Display Slide 86.** Key Science Ideas (1 min) a. Review the key science ideas on the slide. b. Ask participants if they have any comments or questions.
2:00–2:10 10 min	**BREAK**		

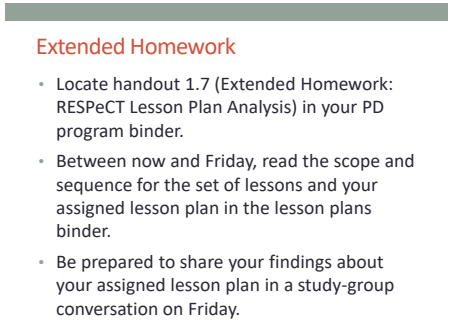
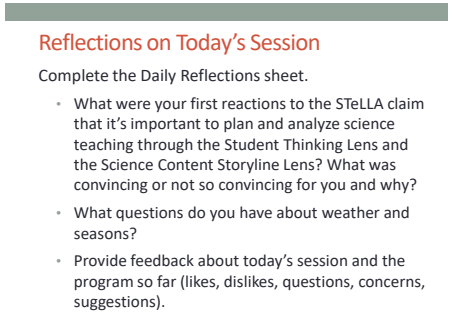
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
2:10–3:00 50 min **STL Strategies: Elicit, Probe, and Challenge Questions** Slides 87–93	**Purpose** • Begin to develop shared understandings of the Student Thinking Lens (STL) and STeLLA strategies 1, 2, and 3 (elicit, probe, and challenge questions). **Content** • Participants are introduced to the purposes and key features of Student Thinking Lens strategies 1, 2, and 3 (elicit, probe, and challenge questions). This is the first step in learning about these strategies. Learning will continue on day 2 when participants watch video footage of these strategies in action. • Elicit questions are designed to reveal a variety of student ideas, misconceptions, and experiences before they learn new content. • Probe questions follow up on something a student has already said to find out more. • Challenge questions are designed to push students toward more-scientific understandings by making new connections and changing their thinking.		**Display Slide 87.** Lesson Analysis Focus Question (1 min) a. Read the focus question. b. "The visual on this slide tells us a little about the first part of our focus question: What are the STeLLA lenses and teaching strategies? As you can see, there are eight specific science teaching strategies to support the Student Thinking Lens." c. **Acknowledge:** "I know you have existing frameworks (ideas and language) regarding teaching and learning, and I expect you'll continuously draw from them throughout the Summer Institute."
			**Display Slide 88.** Lesson Analysis Focus Question (1 min) a. "Today we'll begin learning about three of the Student Thinking Lens teaching strategies." b. Read the strategies highlighted on the slide. c. "These three types of questions will help reveal, support, and challenge student thinking." d. **Emphasize:** "Even though we're studying the strategies this summer, you'll better understand them as you start trying them out in your teaching next fall."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	What Participants Do • Read about STeLLA strategies 1, 2, and 3 and write summaries on STL Z-fold summary charts. • Chart and discuss the purposes and key features of strategies 1, 2, and 3. • Discuss key similarities and differences among the three strategies. **Supplies** • Chart paper and markers **PD Resources** • STeLLA strategies booklet • STL Z-fold summary chart (blank copy in front pocket of PD binder)		**Display Slide 89.** Strategies 1, 2, and 3: Questions That Elicit, Probe, and Challenge Student Thinking (20 min) a. Orient participants to the STeLLA strategies booklet. Forecast that you'll come back to this resource repeatedly to ensure consistent use of ideas, meaning, and language that match the STeLLA conceptual framework. b. **Individuals:** Have participants read about all three strategies and write on their blank STL Z-fold summary charts the purpose(s) and key features of each strategy. State that in the future, they'll do this kind of reading and writing as homework. c. **Pairs:** Have participants pair up and share their Z-fold summary charts. Encourage them to provide evidence from the readings to support their ideas and ask each other questions consistent with the norms for working together, such as "Where did you find that?" or "I interpreted that differently."
			**Display Slide 90.** Elicit Questions (5 min) a. As a group, discuss the purpose and key features of questions that elicit student ideas and predictions. Write these ideas on chart paper and hang the chart where it can be referenced later. b. Sample chart: **Key Ideas about Elicit Questions** **Purpose:** To reveal students' ideas, predictions, misconceptions, and experiences *before* they learn about the content. **Key features:** • Asked anytime but often at beginning of

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			lesson • Phrased in everyday language that students can understand even before studying the related content • Addressed to multiple students (usually the whole class) • Reveals a variety of student ideas • Useful to teachers in adapting instruction • Useful to students so they see that others have different ideas • Can be a prediction • Can set up a discrepant event
			**Display Slide 91.** Probe and Challenge Questions (13 min) a. **Small groups (5 min):** Split participants into two groups—one group for probe questions and one group for challenge questions. Have each group create a chart of the purpose and key features of the assigned strategy *from the STeLLA strategies booklet (*not from experience). b. **Whole group (8 min):** Share the charts with the group. Encourage participants to add to, delete from, and modify them as needed to ensure they're accurate and match the language in the strategies booklet.
			**Display Slide 92.** Elicit versus Probe Questions (5 min) a. **Turn and Talk:** "Discuss this question with an elbow partner." b. **Whole group:** Invite participants to share their ideas with the group. **Key ideas about elicit questions versus probe questions:** • Elicit questions are addressed to the whole

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			class; probe questions are addressed to individual students. • Elicit questions are used before students have studied a concept; probe questions can be asked at any time. • Elicit questions start a discussion; probe questions follow up on something a student has already said.
			**Display Slide 93.** Elicit/Probe Questions versus Challenge Questions (5 min) a. **Turn and Talk:** "Discuss this question with your elbow partner." b. **Whole group:** Invite participants to share their ideas with the group. **Key ideas about elicit/probe questions versus challenge questions:** • Elicit and probe questions focus on understanding students' existing ideas rather than trying to change students' thinking. • In contrast, challenge questions are designed to push students' thinking toward more-scientific understandings and support them in changing their thinking.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
3:00–3:30 30 min **Wrap-Up: Summary, Homework, and Reflections** Slides 94–98	**Purpose** • Summarize and reflect on key ideas from today's learning and foreshadow what will be addressed tomorrow and later in the week. **What Participants Do** • Review the lesson plans binder. • Summarize today's learning and discuss the focus questions. • Go over directions for an extended homework assignment related to the Weather and Seasons lesson plans (content area 1). • Write reflections on today's session. **Handouts in PD Binder** • 1.6 Extended Homework: RESPeCT Lesson Plan Analysis • 1.7 Daily Reflections—Day 1 **PD Resources** • RESPeCT lesson plans binder		**Display Slide 94.** The RESPeCT Lesson Plans Binder (5 min) a. **Foreshadow:** "In a moment, we'll review the details of a homework assignment related to the lesson plans you'll be teaching in the upcoming school year." b. "But before we look at the assignment, let's review the organization and contents of the lesson plans binder." c. Use the slide to guide participants through the binder contents.
			**Display Slide 95.** Let's Summarize Today's Work! (5 min) a. Remind participants of the various activities they've been involved in today. b. **Foreshadow:** Let participants know that you're going to ask them to reflect on what they've learned from these activities.
			**Display Slide 96.** How Did Today's Work Help You Think about Our Focus Questions? (10 min) **Note:** If time is running short, you may want to skip the Turn and Talk or the entire slide. a. **Turn and Talk:** "Discuss these questions with an elbow partner." b. **Whole-group share-out:** Invite participants to share their ideas with the group.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 97.** Extended Homework (5 min) a. Assign each participant one of the lessons in the Weather and Seasons lesson-plan sequence. That is, Teacher 1 will study lessons 0a, 0b, 0c, and 0d; Teacher 2 will study lessons 1a, 1b, and 1c; and so forth. **Note:** The first set of lessons in the Weather and Seasons lesson sequence are prelessons (0a–0d), since they occur in the fall when students collect the weather data they'll analyze in lessons 1–5 in the spring. b. If the study group is small, figure out who will be assigned an extra lesson (or when you, as the PD leader, will cover any extra lessons). c. If the study group is large, assign lessons to more than one teacher later in the sequence. d. Go over the homework sheet (handout 1.7) with participants. If time allows, have them read the assignment sheet before discussing.
			**Display Slide 98.** Reflections on Today's Session (5 min) a. Review the questions on the Daily Reflections sheet (handout 1.8). b. Ask participants to think about these questions and write down their reflections.