RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	6	**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**	Genetics
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? • How can we represent trait-variation patterns among individuals of a species? • What are some of the causes of trait variation and inheritance 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. • Genes and the environment cause most trait variations. • In some cases, trait-inheritance patterns are simple, and learning to explain these patterns enables us to make sense of more complicated patterns.						

Preparation	**Materials**	**Videos**
Daily Setup Tasks • Check that video clips are correctly linked to PowerPoint (PPT) slides. • Set up PowerPoint. • Make sure video clips play correctly with good sound. • Arrange furniture and food. • Arrange participant materials. • Put up posters and charts. **Day-1 Setup Tasks** • Arrange participant materials on tables in grade-level meeting rooms: • Tabletop name cards	**Posters and Charts** • STeLLA Framework and Strategies poster • Day-1 Agenda (chart) • Norms for Working Together (chart) • Day-1 Focus Questions (chart) • 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)	• 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

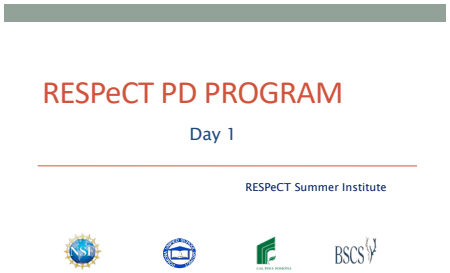
• STeLLA strategies booklet
• RESPeCT PD program binder
• RESPeCT lesson plans binder
• Science notebooks
• Materials kit (1 per topic)
 	
Planning and Preparation Tasks
• Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to PPTs, if needed. Modify text highlighted in 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:
  • If groups won't be going outside to collect trait data from plant species, purchase 20 samples of a fruit or vegetable for each group to examine.
  • Cut apart the trait cards from handout 1.7 and distribute one set to each pair of participants.
	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 "Synthesis of Research from *How Students Learn: Science in the Classroom*" (HSL)
	• 1.6 Celebrate Variation!
	• 1.7 Trait Cards
	• 1.8 Data on Traits
	• 1.9 Extended Homework: RESPeCT Lesson Plan Analysis
	• 1.10 Daily Reflections—Day 1
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• Rulers, 1 ft length with centimeter and millimeter markings (1 per pair)
	• Chart paper with grids
	
	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:
	• Genetics Content Background Document
	• Common Student Ideas about Variation and Inheritance of Traits
	Pretabs section:
	• Genetics Learning Goals for Students and Teachers	

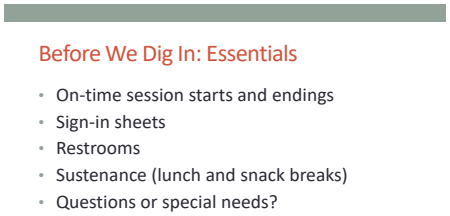
DAY 1 SESSION OUTLINE

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: Genetics**	• Collect and explore data on trait variations in plants and animals. • Recognize the continuum of genetic and environmental influences in traits passed from parents to offspring.
12:00–12:45 45 min	**LUNCH**	
12:45–2:10 85 min (Includes 10-min break)	**Content Deepening (Continued)**	• Recognize the continuum of genetic and environmental influences in traits passed from parents to offspring. • Explore the strong influence of genetics on trait-variation 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.

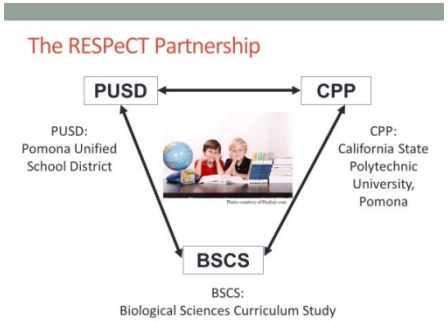
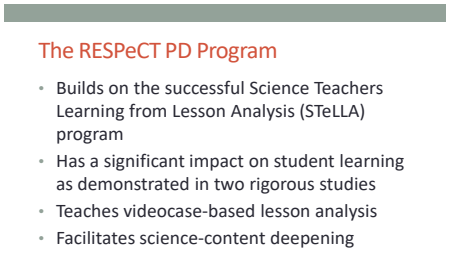
DAY 1

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

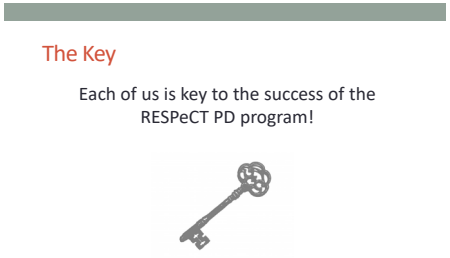
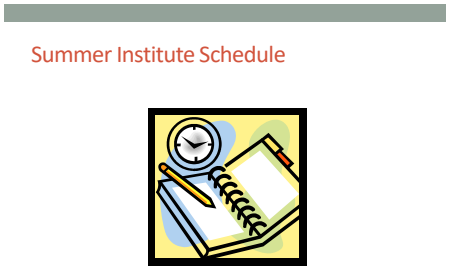
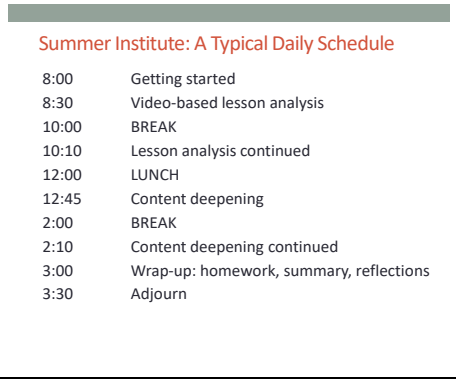
8:00–8:25
25 min
 	
Whole-Group Gathering: What Is RESPeCT?
 	
Slides 1–14
	Purpose
	• Orient participants to the overall project.
	• Introduce participants to the main goals of the project.
	• Provide details about schedules and logistics that will address participants' immediate concerns.
	
	Content
	• 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
		The RESPeCT PD Program Extends the STeLLA approach by • Addressing grade-level standards in Next Generation Science Standards (NGSS) • Incorporating Common Core English language arts (ELA) and math standards • Addressing more explicitly the needs of English language learners (ELLs) • Addressing all grade levels, K–6	**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.
		Goals of the RESPeCT PD Program • Deepen teachers' science-content knowledge and knowledge of effective science teaching. • Develop teachers' analytical skills to improve lesson-plan development and the teaching of science. • Support teachers in the practical use of new knowledge and analytical skills in their classrooms. • Improve students' science learning. • Achieve sustainability by eventually reaching all K–6 teachers.	**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.
		Summer Institute Study-Group Leaders Grade [Insert grade level here] • [Insert leader names here] • [Insert leader names here]	**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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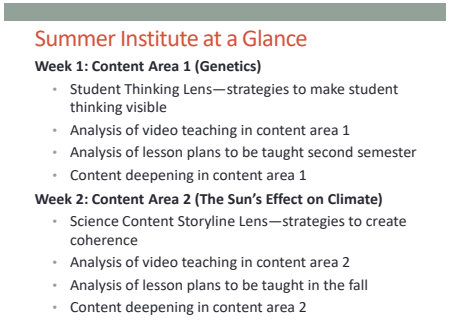
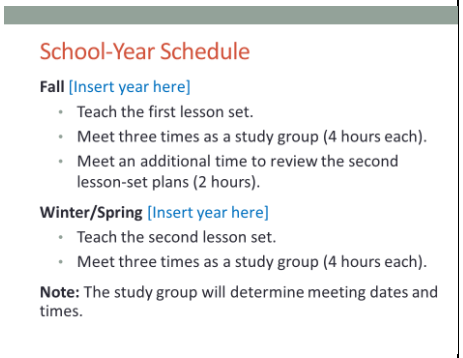
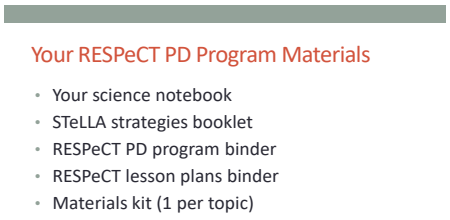
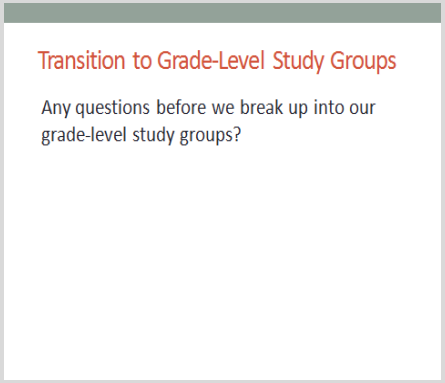
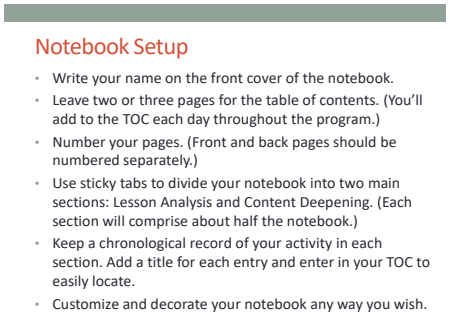
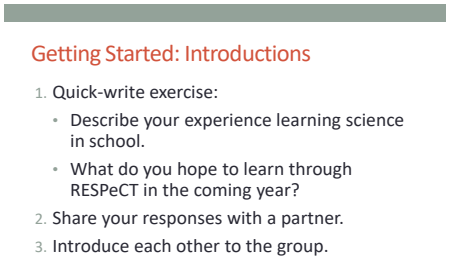
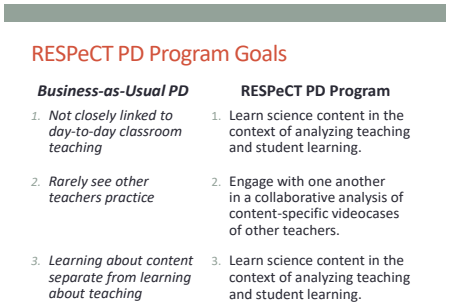
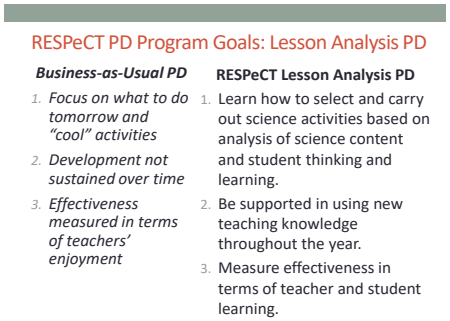
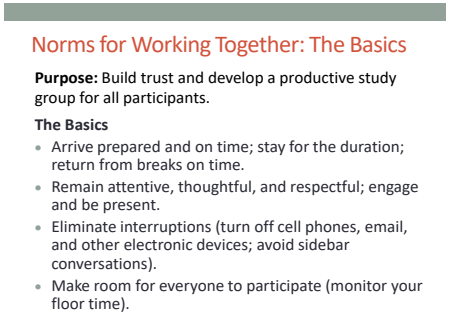
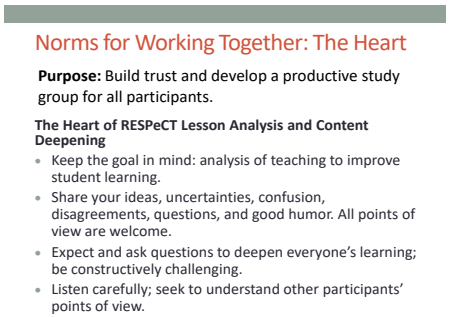
			**Display Slide 12.** Summer Institute at a Glance (Approximately 1 min) a. During the Summer Institute, each grade level will focus on two content areas, with one week devoted to each area. Participants will deepen their science-content knowledge, study lesson plans in each content area, and analyze 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 • RESPeCT lesson plans 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
	• 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.

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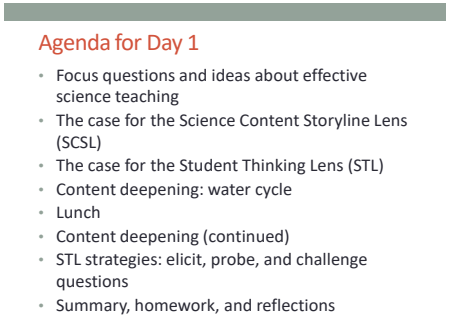
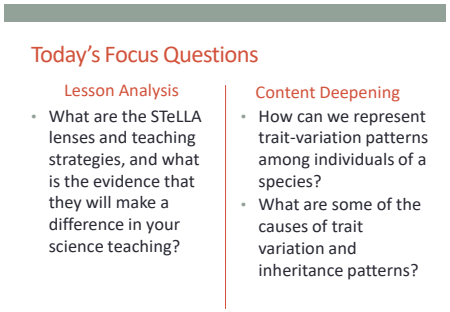
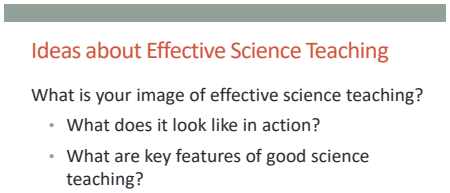
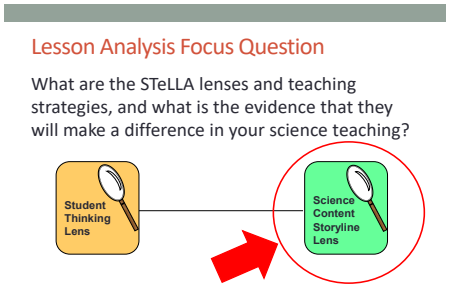
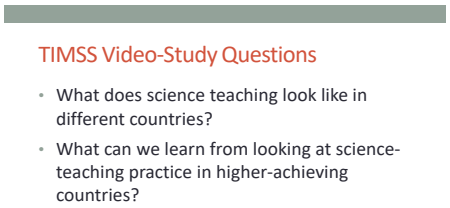
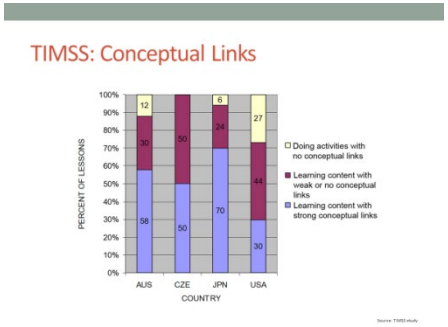
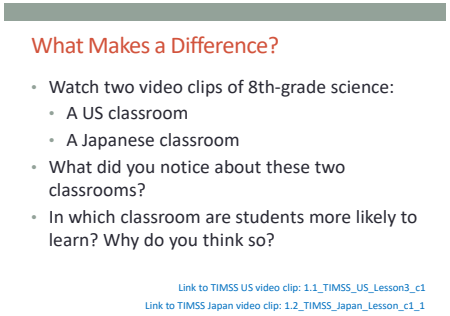
			**Display Slide 22.** Agenda for Day 1 (Less than 1 min) a. Talk through the agenda for the day.
			**Display Slide 23.** Today's Focus Questions (1 min) a. "Each day we're going to have at least one lesson analysis focus question and one content deepening focus question. These are today's focus questions." 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

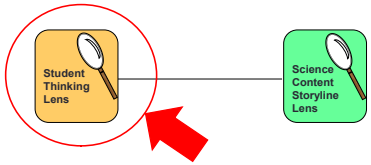
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			other modifications."
9:20–10:10 50 min (Includes 10-min break) **The Case for the Science Content Storyline Lens (SCSL)** Slides 25–34	**Purpose** • Draw from the TIMSS video study to build the case for the Science Content 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.

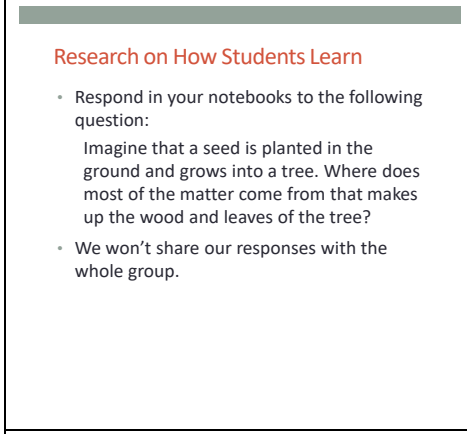
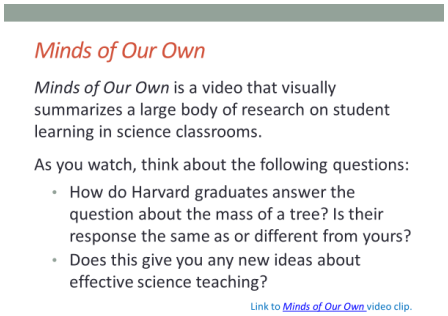
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	Posters and Charts • Effective Science Teaching chart **Videos** • Video Clip 1.1, TIMSS US Lesson 3 • Video Clip 1.2, TIMSS Japan Lesson 1 **Handouts in PD Binder** • 1.2 Transcript for Video Clip 1.1 • 1.3 Transcript for Video Clip 1.2 • 1.4 TIMSS *Educational Leadership* article	TIMSS Video-Study Comparisons The study compared science teaching in the United States with science teaching in these higher-achieving countries: • Australia • Czech Republic • Japan	**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."
		TIMSS Video-Study Results • Although each higher-achieving country had its own approach, they all had strategies for engaging students with core science concepts and ideas. • In US lessons, content played a less central role, and sometimes no role at all. Instead, lessons engaged students in carrying out a variety of activities.	**Display Slide 28.** TIMSS Video-Study Results (2 min) a. "The TIMSS video study showed these results."
		TIMSS Video-Study Results • Although each higher-achieving country had its own approach, they all had strategies for engaging students with core science concepts and ideas. • In US lessons, content played a less central role, and sometimes no role at all. Instead, lessons engaged students in carrying out a variety of activities.	**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.

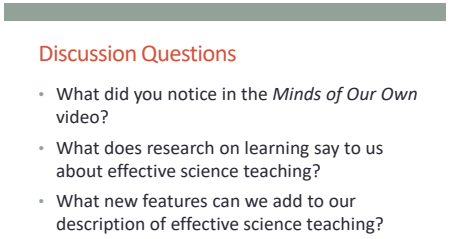
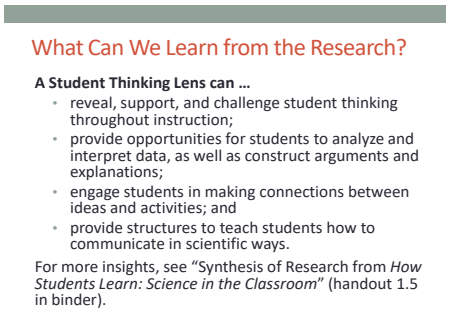
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 30.** TIMSS: Conceptual Links (3 min) a. **Ask:** "What do you notice from this graph? What do you make of this data?" b. **Emphasize:** "In the US, more than a quarter of the lessons had no science content; 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
		Discussion Questions • What new features can we add to our earlier description of effective science teaching? • Are there any ideas we should add to our list, modify, or delete?	**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	Lesson Analysis Focus Question What are the STeLLA lenses and teaching strategies, and what is the evidence that they will make a difference in your science teaching? 	**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."

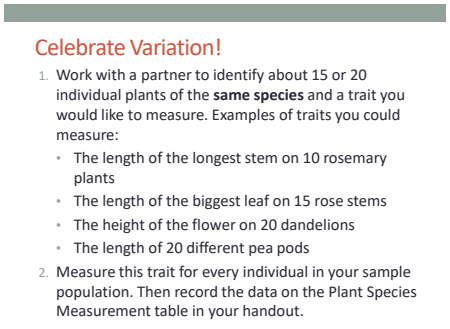
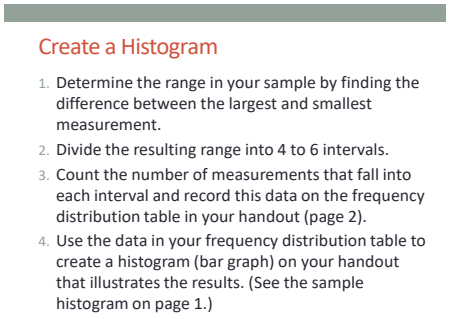
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	misconceptions even after what we usually consider to be good hands-on science instruction. • To help students change their ideas and truly understand science concepts, we need to engage them in more thinking and sensemaking. • 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.

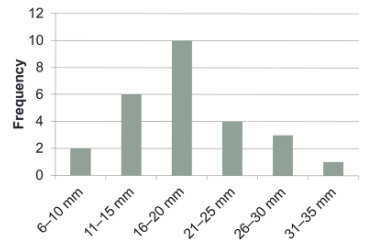
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	question. • Discuss ideas about research on student thinking addressed in the video. • Review the chart of participant ideas about effective science teaching in light of this research. **Posters and Charts** • Effective Science 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

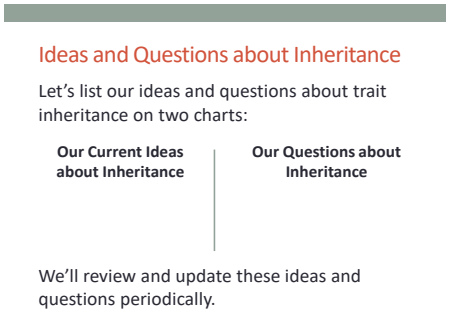
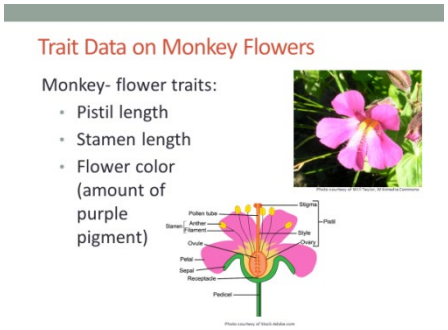
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			conceptual framework addresses the need uncovered in this and other studies on how people learn and, more specifically, how students learn science. 1. If students' initial knowledge is not engaged, they may fail to grasp 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: Genetics** Slides 40–53	**Purpose** • Collect and explore data on trait variations in plants and animals. • Recognize the continuum of genetic and environmental influences in traits passed from parents to offspring. **Content** • There is a continuum of genetic and environmental influences in traits passed from parents to offspring. • The strong influence of genetics on trait-variation patterns can		**Display Slide 40.** Content Deepening: Genetics (Less than 1 min) a. "Now let's begin our content deepening work on genetics." **Note:** Throughout this content deepening phase, refer as needed to Genetics Learning Goals for Students and Teachers, the Genetics Content Background Document, and Common Student Ideas about Variation and Inheritance of Traits.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	lead to useful predictions. **What Participants Do** • Collect and explore data on trait variations in plants and animals • Explore the strong influence of genetics on trait-variation patterns. **Handouts in PD Binder** • 1.6 Celebrate Variation! • 1.8 Data on Traits **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 *Pretabs section:* • Genetics Learning Goals for Students and Teachers		
	Purpose • Help participants get a feel for measuring and exploring trait-variation patterns. The graphs produced in this session will be useful for content deepening throughout the week.	Genetics Unit Central Question Why are individuals of a species different from one another?	**Display Slide 41.** Genetics Unit Central Question (Less than 1 min) a. Introduce participants to the unit central question that students will answer in the Genetics lesson sequence. b. "Today we'll explore the key science ideas that will help us answer this question." c. "Write this question in your notebooks and draw a double-lined box around it."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Note: Copying the unit central question into their notebooks will reinforce an important practice participants should follow with their students.
		Content Deepening Focus Questions 1. How can we represent trait-variation patterns among individuals of a species? 2. What are some of the causes of trait variation and inheritance patterns?	**Display Slide 42.** Content Deepening Focus Questions (Less than 1 min) a. Read the focus questions on the slide. b. "Let's see if we can figure out the answer to the first focus question."
		What Is a Trait?  1. As you look at this dachshund, what traits do you see? What are some traits that aren't visible? 2. Work with a partner to come up with a definition of a trait. Write this definition in your notebook. 3. Read the section about traits in your content background document and revise your definition.	**Display Slide 43.** What Is a Trait? (8 min) a. "What are some of this dachshund's visible traits?" b. "What are some traits that aren't visible?" c. As participants share their observations, summarize them on chart paper. d. After participants list five or six traits, have them pair up to develop a working definition of a trait and write their ideas in their notebooks. e. Invite participants to share their definitions with the group. Ask probe questions to clarify their thinking. f. After 1 or 2 minutes of sharing, have participants locate the Genetics Content Background Document in their lesson plans binders and read the section on traits. Then have them revise their definitions based on this information. g. "As the reading pointed out, traits aren't just physical features; they can also be molecular

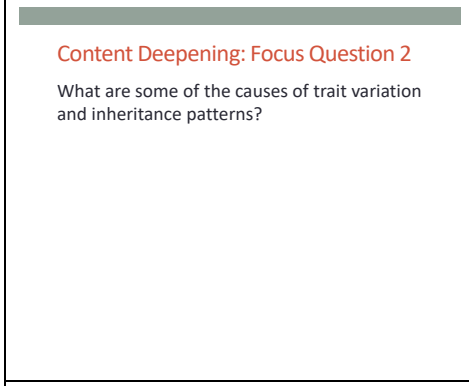
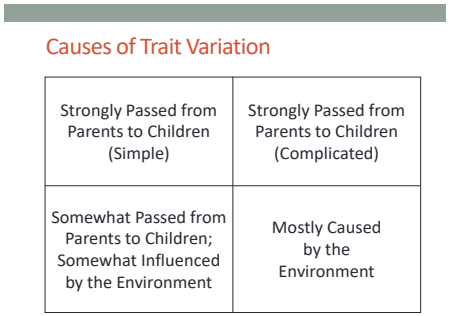
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			pathways, like DNA; chemical pathways; or developmental pathways, or even behaviors."
			**Display Slide 44.** Celebrate Variation! (15 min) a. "To find trait-variation patterns among individuals of a species, we need to work like scientists. This means collecting data on a specific trait from a sample population and then recording the data on a table. That's what we're going to do next." b. Walk participants through the steps on the slide; then distribute handout 1.6 (Celebrate Variation!). Have participants record their data on Plant Species Measurements table in their handouts. **Option to save time:** To save time, instead of having participants collect their data outside, bring in samples of the same kind of fruit, vegetable, or other plant (e.g., 20 bananas, 20 carrots, 20 green beans) for participants to measure.
			**Display Slide 45.** Create a Histogram (15 min) a. "Now that you and your partner have collected and recorded your data, let's go over the steps for creating a histogram." b. Walk participants through the steps on the slide. Then display the sample frequency distribution table and histogram on the next two slides. **Note:** As pairs work on their histograms, be available to answer questions and give direction as needed. c. After participants have created their histograms, ask them to copy them onto chart paper and then display all the histograms for participants to see.

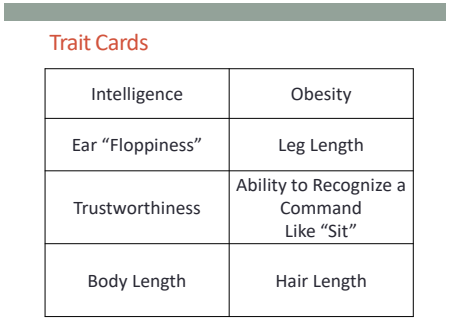
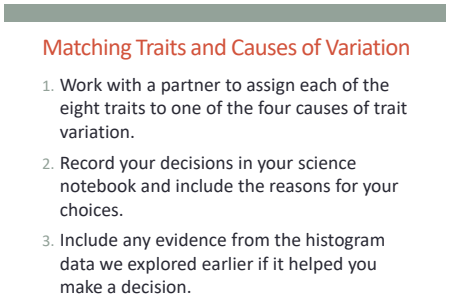
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Sample Frequency Distribution Table Length Range | Number of Individuals in That Range 6–10 mm | 2 11–15 mm | 6 16–20 mm | 10 21–25 mm | 4 26–30 mm | 3 31–35 mm | 1	**Display Slide 46.** Sample Frequency Distribution Table (Less than 1 min) a. Show participants the sample frequency distribution table and note that it also appears in their handouts.
		Sample Histogram 	**Display Slide 47.** Sample Histogram (Less than 1 min) a. Show participants this sample histogram and note that it also appears in their handouts. Highlight the information that should appear on the *x*- and *y*-axes.
		Interpreting the Results 1. Sketch a copy of your histogram in your science notebook or on your worksheet. 2. Draw lines pointing out what you see in the data and use short phrases to describe your observations. 3. Then draw lines and use short phrases describing what you think the results mean. 4. Answer the questions on page 3 of your handout independently.	**Display Slide 48.** Interpreting the Results (15 min) a. Have participants complete the first three steps on the slide. Then have a brief group discussion about their observations and explanations. b. During this discussion, keep participants focused on what they see in the data (observations of patterns) and what they think the results mean (inferences). Use probe questions to clarify their thinking as needed. c. Highlight that a common trait-variation pattern is a bell-shaped curve that scientists call *continuous variation*. Later in the session, participants will contrast this trait-variation pattern with another

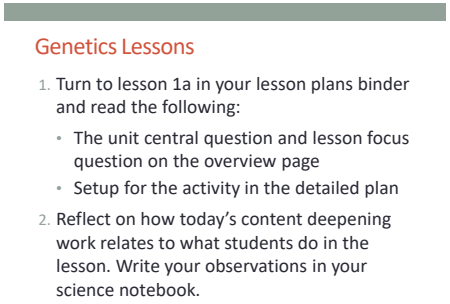
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			pattern. d. "Now I'd like you to answer the questions on page 3 of your handouts, using what you already know about traits. Work on this task independently."
	Purpose • Model a strategy from the lesson that will help participants keep track of their ideas and questions about how traits are inherited. **Supplies** • Chart paper and markers • Graph paper • Chart paper with grids		**Display Slide 49.** Our Ideas and Questions about Inheritance (5 min) a. "Let's list our ideas and questions about trait inheritance on two charts so we can review and update them periodically." b. "What do you think accounts for the differences in traits among individuals of the same species? Which types of traits are inherited, and what role might the environment play in some of the differences among individuals?" **Note:** The same charting strategy is used throughout the Genetics unit. c. Keep this discussion brief, since participants will revisit their initial ideas in another activity during the second half of the content deepening phase.
			**Display Slide 50.** Trait Data on Monkey Flowers (Less than 1 min) a. "Now let's put your new skills to use analyzing more trait data and identifying patterns. As before, you'll use the data to create a histogram showing the pattern of trait variation. Some of you will examine data on monkey-flower traits, and others will examine data on dachshund traits." **Note:** You may need to show participants where the pistil and stamen are on the slide images. Tell them that the monkey flowers can have purple or white flowers.

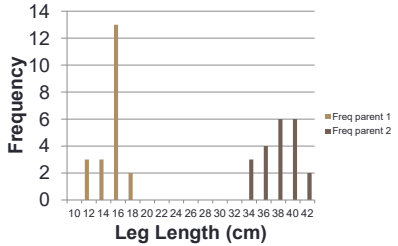
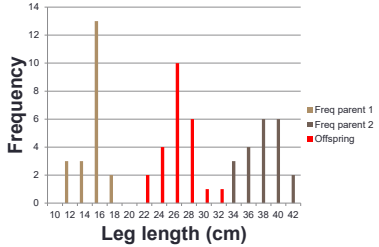
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Trait Data on Dachshunds Dachshund traits: • Hair length • Body length • Height 	**Display Slide 51.** Trait Data on Dachshunds (3 min) a. Distribute handout 1.8 (Data on Traits) and review the instructions. Then assign each participant a trait to analyze. Make sure to assign all six traits (three monkey-flower traits and three dachshund traits).
		Exploring Patterns of Trait Variation 1. Examine your assigned data set and complete the frequency distribution table on the handout. 2. Using this data, create a histogram on graph paper. 3. Then copy your histogram onto chart paper and post it where everyone can see it. 4. **Group discussion:** What trait-variation patterns do you see in these histograms? **Hint:** There are two major patterns.	**Display Slide 52.** Exploring Patterns of Trait Variation (15 min) a. Have participants examine their assigned data set and complete the frequency distribution table on the handout. b. Once participants have filled in their frequency tables, have them create a histogram for their assigned trait on graph paper and copy it onto chart paper with grids. Then ask participants to post their charts where they will be visible. c. "What trait-variation patterns do you see in these histograms?" d. During this discussion, draw out the observation that some traits show a continuous-variation pattern (a bell-shaped curve), but other traits show two hump patterns with little data in between. e. "Most traits show a continuous-variation or bell-shaped pattern, but analyzing inheritance patterns is more complicated than this. Other traits have only two common forms—like purple or white monkey flowers. These simple inheritance patterns are easier to understand and provide us with a basis for analyzing and

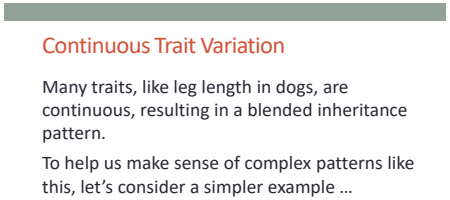
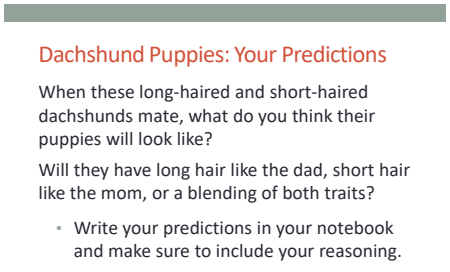
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			understanding more complex patterns. The goal of 6th-grade genetics content is to understand the simpler patterns of trait inheritance that have just two common forms."
		Reflect: Content Deepening Focus Question 1 How can we represent trait-variation patterns among individuals of a species?	**Display Slide 53.** Reflect: Content Deepening Focus Question 1 (2 min) a. Ask participants to reflect on the first content deepening focus question and write their best answers in their science notebooks. b. "Now let's break for lunch before we begin the second part of our content deepening work."
12:00–12:45 45 min	**LUNCH**		
12:45–2:10 85 min (Includes 10-min break) **Content Deepening (Continued)**	**Purpose** • Recognize the continuum of genetic and environmental influences in traits passed from parents to offspring. • Explore the strong influence of genetics on trait-variation patterns. **Content** • There is a continuum of genetic	Unit Central Question Why are individuals of a species different from one another? What progress have we made so far in answering this question?	**Display Slide 54.** Unit Central Question (3 min) a. "Let's revisit our unit central question for a moment. What progress we have made so far in answering this question?" b. Ask for one or two ideas from the group.

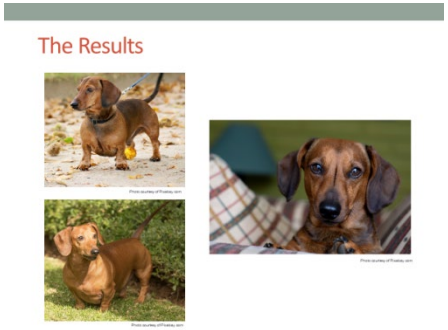
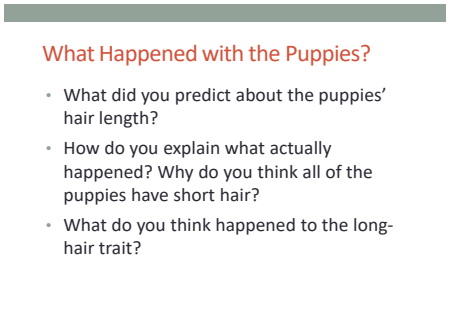
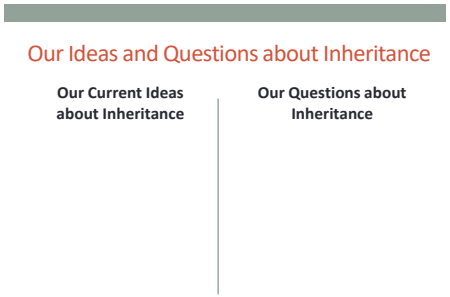
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
Slides 54–72	and environmental influences in traits passed from parents to offspring. **What Participants Do** • Sort trait cards based on the degree to which genetics and the environment influence trait variation and inheritance patterns. **Handouts in PD Binder** • 1.7 Trait Cards (cut apart; 1 set per pair of participants) **Supplies** • Science notebooks • Chart paper and markers **PD Resources** • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** • Common Student Ideas		**Display Slide 55.** Content Deepening: Focus Question 2 (Less than 1 min) a. Introduce the focus question for the afternoon session and remind participants that they began formulating an answer to this question in part 1 of the content deepening phase.
			**Display Slide 56.** Causes of Trait Variation (5 min) a. "Are you ready for a challenge? In this activity, you'll work with a partner to decide the causes of trait variations. First, let's break up into pairs, and then I'll give each pair a set of category cards showing four possible causes of variations within a trait." b. Divide the group into pairs and give each pair a set of four category cards representing the causes of trait variations. c. "As you can see on the slide, two of the categories have to do with traits that parents pass to their offspring, one involves both genetic and environmental causes, and one category involves primarily environmental causes."

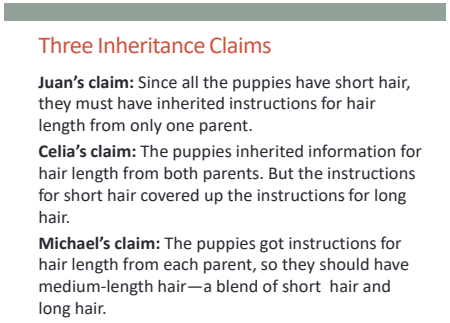
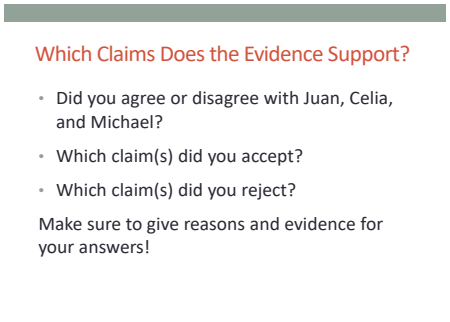
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 57.** Trait Cards (1 min) a. Next, give each pair a set of trait cards and review the list of traits.
			**Display Slide 58.** Matching Traits and Causes of Variation (20 min) a. "Work with your partner assigning each of the eight traits to one of the four causes of trait variation. When you've finished sorting your cards, record the reasons for your choices in your notebooks. Make sure to include any evidence from the histogram data we recorded earlier if it helped you make a decision." **Note:** The main purpose of this activity is to understand how participants view inheritance patterns and trait variations among individuals and what causes them. b. After participants complete this card-sorting challenge, tally the results and discuss participants' decisions and reasoning. c. During the group discussion, ask participants whether they want to add to or modify the charts that list their ideas and questions about inheritance. d. After the discussion, briefly share the following causes of variation attributed to the traits in this activity based on current ideas among scientists: • Intelligence: Somewhat passed from parents

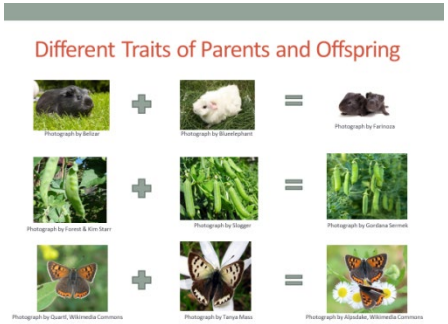
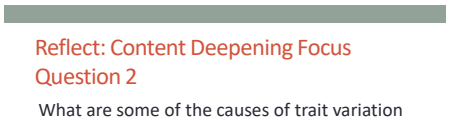
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			to children; somewhat influenced by the environment • Ear "floppiness": Strongly passed from parents to children (simple) • Trustworthiness: Somewhat passed from parents to children; somewhat influenced by the environment • Body length: Strongly passed from parents to children (complicated) • Obesity: Somewhat passed from parents to children; somewhat influenced by the environment • Leg length: Strongly passed from parents to children (complicated) • Ability to recognize a command like "sit": Mostly caused by the environment • Hair length: Strongly passed from parents to children (simple)
			**Display Slide 59.** Genetics Lessons (4 min) a. Ask participants to complete the tasks outlined on the slide.

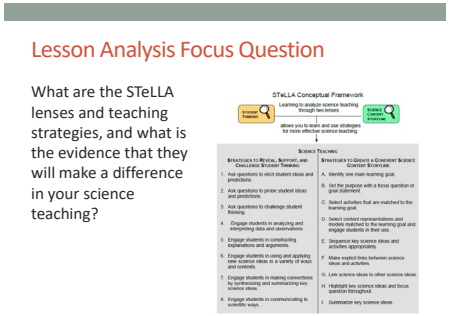
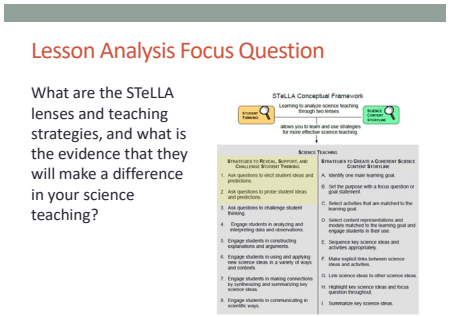
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Testing Our Ideas about Inheritance *How could we test our ideas about how traits are passed from parents to their offspring?* One possible way is to observe whether offspring exhibit the same traits as their parents. Let's investigate!	**Display Slide 60.** Testing Our Ideas about Inheritance (Less than 1 min) a. "How could we test some of our ideas about how traits are passed from parents to offspring? One way is to observe whether offspring exhibit the same traits as their parents."
		Leg Length in Dogs 	**Display Slide 61.** Leg Length in Dogs (1 min) a. "For example, what do you think would happen if a group of dogs with long legs mated with a group of dogs with short legs? This graph shows the leg lengths of the parents."
		Leg Length in Dogs: The Results 	**Display Slide 62.** Leg Length in Dogs: The Results (1 min) a. "In this case, the offspring exhibit a blending of the parents' traits in a bell-curve or continuous variation pattern. This is a common pattern when many genes are involved in causing trait variations. Even though the bell-curve is the most common trait-inheritance pattern in organisms, understanding what causes this pattern is more complicated."

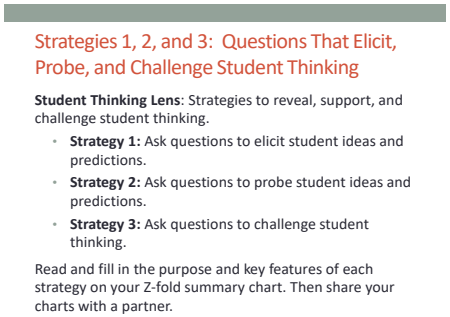
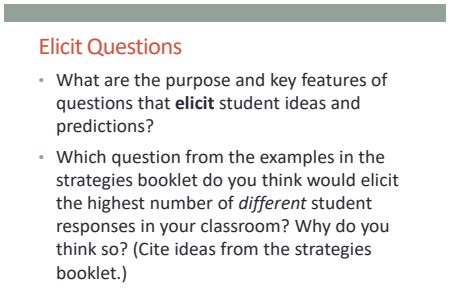
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 63.** Continuous Trait Variation (Less than 1 min) a. Remind participants that the goal of 6th-grade genetics content is to understand the simpler patterns of trait inheritance in which a trait has only two common forms. b. "It's easier to understand trait-inheritance patterns involving only two common forms, such as white flowers and purple flowers. Learning to explain these simpler patterns will help us make sense of more complex patterns later in the session."
	Purpose • Explore trait-variation patterns in offspring when a trait is controlled by one gene, and there are two basic forms of the trait. **What Participants Do** • Make predictions about dachshund offspring inheriting long or short hair from their parents and reflect on claims about the results. **Posters and Charts** • Inheritance charts (Our Current Ideas about Inheritance; Our Questions about Inheritance)		**Display Slide 64.** Two Dachshund Traits (Less than 1 min) a. Introduce the two dachshund hair-length traits: long haired and short haired.
			**Display Slide 65.** Dachshund Puppies: Your Predictions (2 min) a. "When these long-haired and short-haired dachshunds mate, what will their puppies look like? What hair length do you think they'll have? Write your predictions in your science notebooks and make sure to include your reasoning."

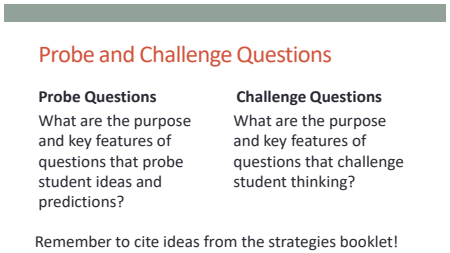
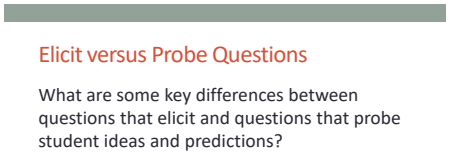
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 66.** The Results (Less than 1 min) a. "Here are the offspring of the long- and short-haired dachshund parents. Does it surprise you that all of the puppies have short hair like their mom?"
			**Display Slide 67.** What Happened with the Puppies? (3 min) a. Ask participants to think about the questions on the slide for a moment and then discuss their predictions and reasoning with a partner.
			**Display Slide 68.** Our Ideas and Questions about Inheritance (10 min) a. "Let's revisit the ideas and questions we recorded earlier on our charts. Based on the dachshund results, do you have any new ideas or questions you'd like to add to either chart? What about any changes?" b. Direct participants to locate the resource document Common Student Ideas about Variation and Inheritance of Traits in their PD program binders. Ask them to scan the student ideas and see if any of them match the current ideas about inheritance on the chart. Also reflect on common student ideas that have already been

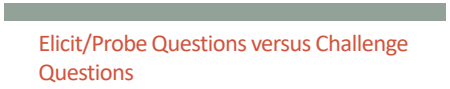
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			addressed, such as "Genes control only an individual's visible traits (like hair color, skin color, fur color), not the traits that aren't visible (like blood type, personality traits, and whether an individual will get cancer or other diseases)."
			**Display Slide 69.** Three Inheritance Claims (3 min) a. "Let's examine the claims of three fictional students that explain how the hair-length trait was passed from the dachshund parents to their offspring."
			**Display Slide 70.** Which Claims Does the Evidence Support? (7 min) a. "Which of the three students' claims does the evidence support? Which do you agree with, and which do you think should be rejected? Make sure to give reasons and evidence for your decisions." b. Ask probe and challenge questions to help participants recognize that the evidence doesn't support Michael's claim because the puppies don't have medium-length hair. The evidence does, however, fit both Juan's and Celia's claims.

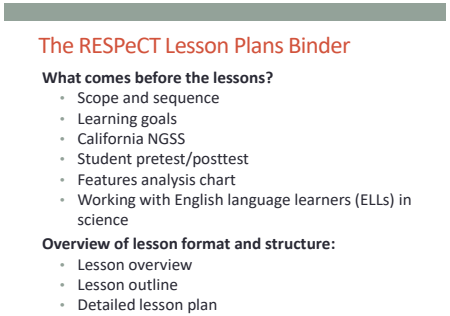
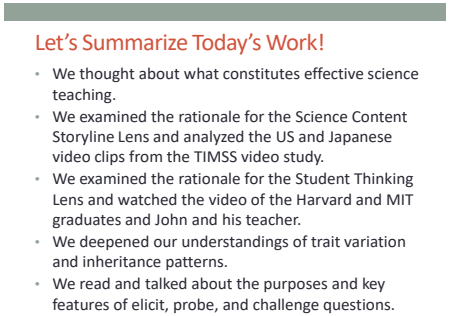
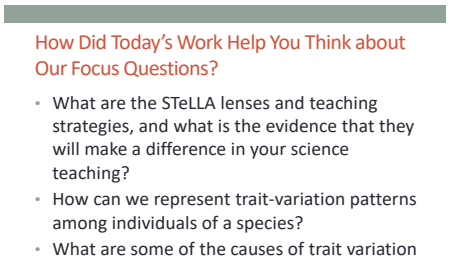
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 71.** Different Traits of Parents and Offspring (8 min) a. "What do you notice about the parents and offspring on this slide?" b. Participants should recognize that in each case, the parents exhibit two forms of the same trait. The offspring, however, exhibit only one form of the trait. So the pattern that participants observed with the dachshunds is found in other species as well. **Note:** The trait that varies in the pea plants is pod shape. The parents have pods that are either inflated (puffy) or flat. All the offspring have inflated pods. c. After the discussion, point out that participants just completed the activities their students will work on in Genetics lesson 1b. Have participants look over the lesson plan, and challenge them to identify key science ideas about inheritance in the dachshund activity. d. "Offspring may have the same trait as one parent, but not the other. For these traits, offspring don't show a blend of their parents' traits."
			**Display Slide 72.** Reflect: Content Deepening Focus Question 2 (5 min) a. To wrap up the content deepening work, ask participants to answer the focus question in their notebooks, summarizing what they've learned so far about trait variation and inheritance patterns. b. "In the next session, we'll continue our investigation of the dachshund traits."

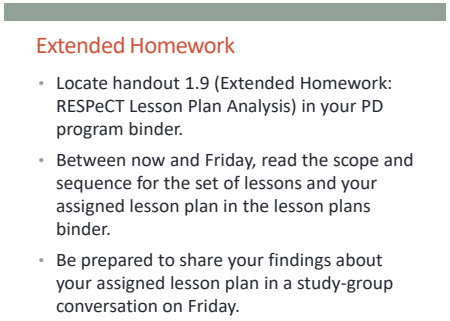
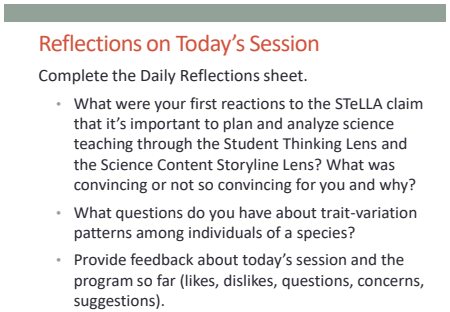
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
2:00–2:10 10 min	**BREAK**		
2:10–3:00 50 min **STL Strategies: Elicit, Probe, and Challenge Questions** Slides 73–79	**Purpose** • Begin to develop shared understandings of the Student Thinking Lens (STL) and STeLLA strategies 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		**Display Slide 73.** Lesson Analysis Focus Question (1 min) a. Read the focus question on the slide. 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 74.** 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
	toward more-scientific understandings by making new connections and changing their thinking. **What Participants Do** • Read about STeLLA strategies 1, 2, and 3 and write summaries on their blank 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 75.** 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 76.** Elicit Questions (5 min) a. As a group, discuss the purpose and key features of questions that elicit student ideas and predictions. Write these features 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:**

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			• Asked anytime, but often at the beginning of a 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 77.** 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 entire 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 78.** Elicit versus Probe Questions (5 min) a. **Turn and Talk:** "Discuss this question with an elbow partner." b. **Whole-group share-out:** Invite participants to share their ideas with the group. **Key ideas about elicit questions versus probe questions:**

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			• Elicit questions are addressed to the whole 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 79.** Elicit/Probe Questions versus Challenge Questions (5 min) a. **Turn and Talk:** "Discuss this question with your elbow partner." b. **Whole-group share-out:** 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 80–84	**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 Genetics lesson plans (content area 1). • Write reflections on today's session. **Handouts in PD Binder** • 1.9 Extended Homework: RESPeCT Lesson Plan Analysis • 1.10 Daily Reflections—Day 1 **PD Resources** • RESPeCT lesson plans binder		**Display Slide 80.** 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 81.** 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 82.** 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 83.** Extended Homework (5 min) a. Assign each participant one of the lessons in the Genetics lesson-plan sequence. There are six 2-part lessons in this content area. Each teacher should take responsibility for one 2-part lesson. That is, Teacher 1 will study lessons 1a and 1b; Teacher 2 will study lessons 2a and 2b; and so forth. 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 1.9) with participants. If time allows, have them read the assignment sheet before discussing.
			**Display Slide 84.** Reflections on Today's Session (5 min) a. Review the questions on the Daily Reflections sheet (handout 1.10). b. Ask participants to think about these questions and write down their reflections.