# RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Grade Level** | 4 | **Day** | 1 | **STeLLA Strategy** | The Two Lenses: Student Thinking Lens (STL) and Science Content Storyline Lens (SCSL)<br>STL Strategies 1, 2, and 3: Elicit, Probe, and Challenge Questions | **Subject Matter Focus** | Earth's Changing Surface |

| | |
|---|---|
| **Focus Questions** | • What is RESPeCT?<br>• What are the STeLLA lenses and teaching strategies, and what is the evidence that they will make a difference in your science teaching?<br>• Does the surface of Earth look the same everywhere? In what ways does the surface look different or the same in different places?<br>• Do you think the surface of Earth changes? Why do you think that?<br>• What happens to Earth's surface that causes mountains to form? |
| **Main Learning Goals** | Participants will understand the following:<br>• 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.<br>• 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.<br>• 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.<br>• 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.<br>• Earth's surface has a variety of landforms that are distributed in different patterns.<br>• Earth's thin outermost layer (crust) is made up of tectonic plates. Volcanic activity is one mechanism that builds up Earth's surface in some places over time. |

| **Preparation** | **Materials** | **Videos** |
|---|---|---|
| **Daily Setup Tasks**<br>• Check that video clips are correctly linked to PowerPoint (PPT) slides.<br>• Set up PowerPoint.<br>• Make sure video clips play correctly with good sound.<br>• Arrange furniture and food.<br>• Arrange participant materials.<br>• Put up posters and charts.<br><br>**Day-1 Setup Tasks** | **Posters and Charts**<br>• STeLLA Framework and Strategies poster<br>• Day-1 Agenda (chart)<br>• Norms for Working Together (chart)<br>• Day-1 Focus Questions (chart)<br>• Effective Science Teaching chart (blank except for title)<br>• Parking Lot poster<br><br>**Handouts in RESPeCT PD Binder Front Pocket**<br>• Half-page sheet of norms for participants to paste into their science notebooks | • Video Clip 1.1: TIMSS US Lesson 3; 1.1_TIMSS_US_lesson3_c1<br>• Video Clip 1.2: TIMSS Japan Lesson 1; 1.2_TIMSS_Japan_lesson1_c1_1<br>• *Minds of Our Own Lessons From Thin Air* video, segments 3:30–5:40; 7:50–16:45 |

- 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.
- For content deepening:
  - Prepare hard-boiled eggs (2 per pair of participants). Leave half of the eggs intact after boiling and carefully crack the shells of the other half to simulate the interlocking sections of Earth's tectonic plates.

- 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 "Synthesis of Research from *How Students Learn: Science in the Classroom*" (HSL)
- 1.6 Extended Homework: RESPeCT Lesson Plan Analysis
- 1.7 Daily Reflections—Day 1

**Supplies**

- Science notebooks
- Chart paper and markers
- Science-lesson materials kit (Earth's Changing Surface)
- For content deepening:
  - Plastic relief map of the United States (1 per pair) (from ECS lessons 1a/b)
  - Hard-boiled eggs (2 per pair—1 intact and 1 cracked) (from ECS lesson 2a)
  - Avocado and knife (1 per pair)

**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:*

- Earth's Changing Surface Content Background Document
- Common Student Ideas about Earth's Changing Surface

*Pretabs section:*

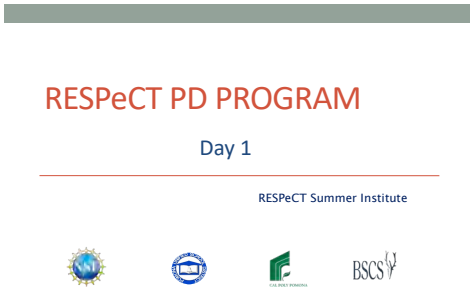
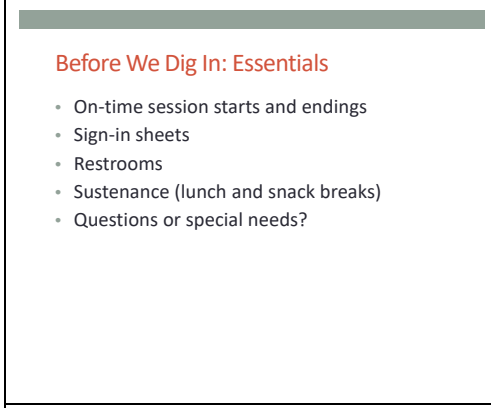
- Earth's Changing Surface: Learning Goals for Students and Teachers

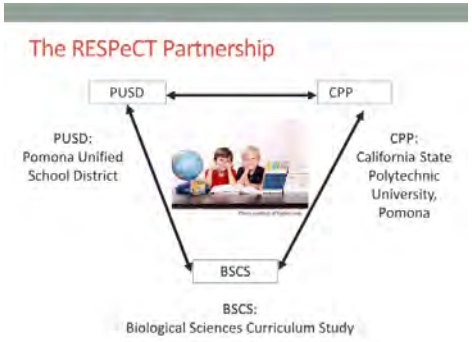
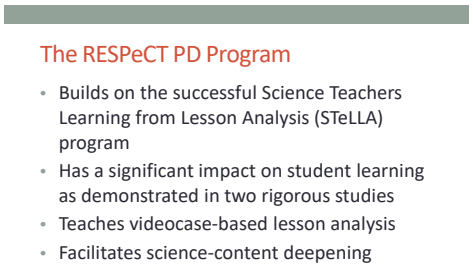
**DAY 1 SESSION OUTLINE**

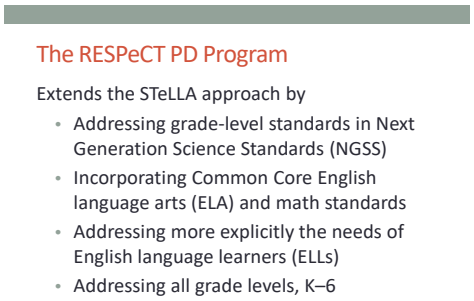
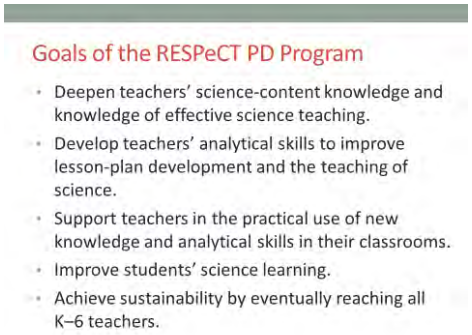
| Time | Activities | Purpose |
|---|---|---|
| 8:00–8:25<br>25 min | **Whole-Group Gathering: What Is RESPeCT?** | • Orient participants to the overall project.<br>• Introduce participants to the main goals of the project.<br>• Provide details about schedules and logistics that will address participants' immediate concerns. |
| 8:25–8:30<br>5 min | **Transition to Grade-Level Study-Group Settings** | |
| 8:30–9:20<br>50 min | **Getting Started: Introductions, Goals, Norms, Agenda, Focus Questions, Ideas about Effective Science Teaching** | • Build community within grade-level study groups.<br>• 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.<br>• 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<br>50 min<br>(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<br>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<br>80 min | **Content Deepening: Earth's Changing Surface** | • Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lessons 1a/b. |
| 12:00–12:45<br>45 min | **LUNCH** | |
| 12:45–2:10<br>85 min<br>(Includes 10-min break) | **Content Deepening (Continued)** | • Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lesson 2a. |
| 2:10–3:00<br>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). |

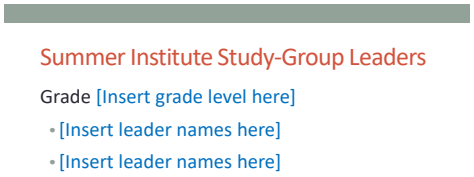
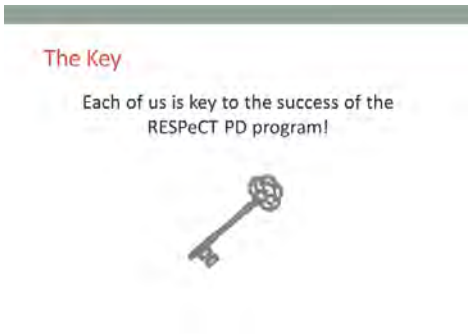
| Time | Activities | Purpose |
|---|---|---|
| 3:00–3:30<br>30 min | **Wrap-Up: Summary, Homework, and Reflections** | • Summarize and reflect on key ideas from today's learning and foreshadow what will be addressed tomorrow and later in the week. |

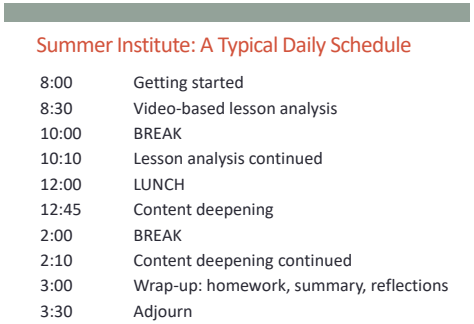
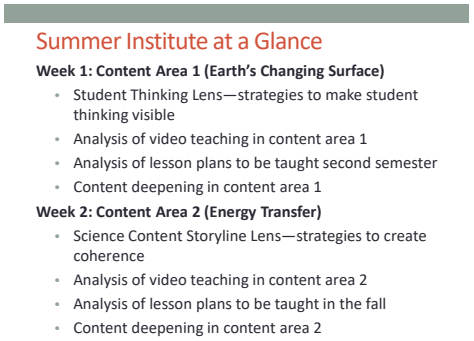
**DAY 1**

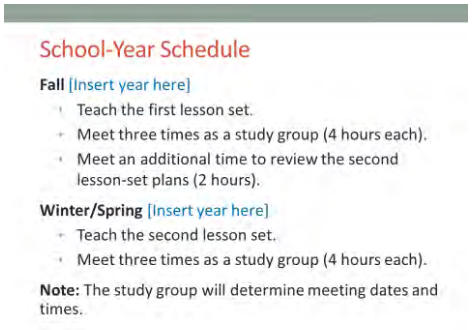
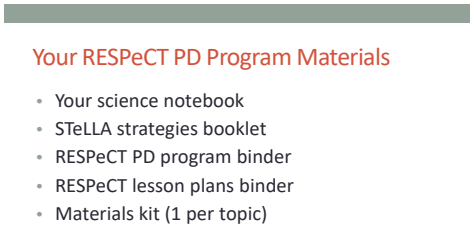
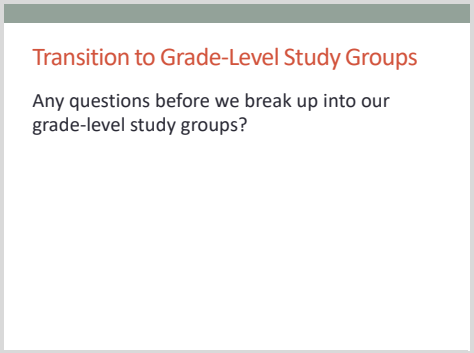
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| 8:00–8:25<br>25 min<br><br>**Whole-Group Gathering: What Is RESPeCT?**<br><br>Slides 1–14 | **Purpose**<br>• Orient participants to the overall project.<br>• Introduce participants to the main goals of the project.<br>• Provide details about schedules and logistics that will address participants' immediate concerns.<br><br>**Content**<br>• Discuss the following with participants:<br>  • Essential logistics<br>  • Components of the RESPeCT project<br>  • Members of the RESPeCT partnership<br>  • RESPeCT PD program and goals<br>  • Summer Institute schedule and overview<br>  • School-year schedule and overview<br><br>**What Participants Do**<br>• Listen to a brief introduction to the program and how it began. |  | **Display Slide 1.** RESPeCT PD Program (5 min)<br><br>a. Greet participants as they enter the room.<br>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)<br><br>a. Give everyone a big welcome to the RESPeCT PD program!<br>b. Fill participants in on the essential details listed on the slide. |
| | |  | **Display Slide 3.** What Is RESPeCT? (Approximately 1 min)<br><br>a. **Emphasize:** The RESPeCT project began with three main components:<br>  • A professional development program<br>  • A leadership development program<br>  • A research study<br>b. The district now sustains RESPeCT as a |

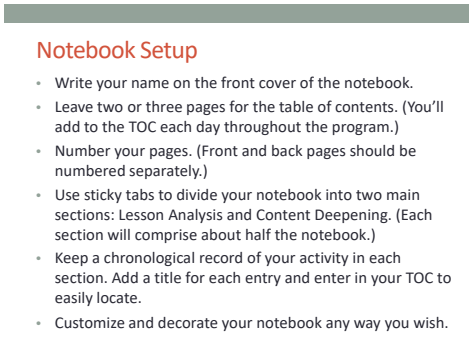
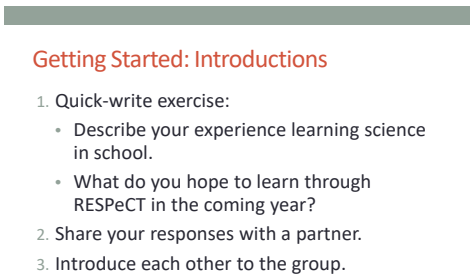
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | professional development program. |
| | |  | **Display Slide 4.** The RESPeCT Partnership (Approximately 1 min)<br><br>a. The original RESPeCT partners included the following:<br>• **Cal Poly:** science, science education, and mathematics faculty, as well as the Center for Excellence in Mathematics and Science Teaching (CEMaST)<br>• **PUSD:** district central administrators, principals, teacher specialists, and teachers<br>• **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.<br><br>**Note:** Established in 1958, BSCS stands for Biological Sciences Curriculum Study, but the organization now deals with all sciences, not just biology.<br><br>• **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)<br><br>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. |

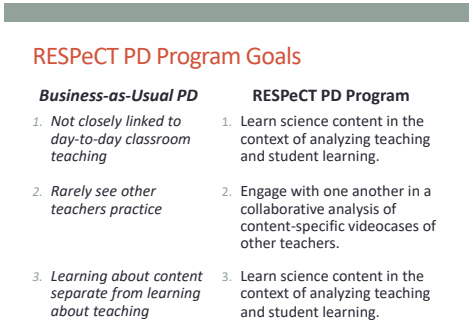
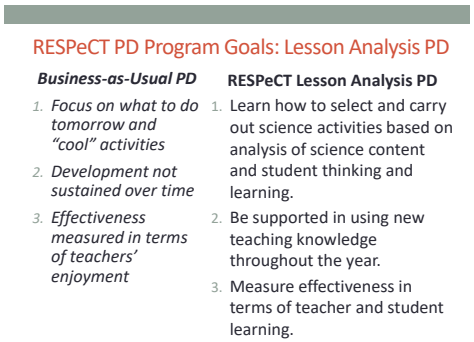
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | |
| | |  | **Display Slide 6.** The RESPeCT PD Program (Approximately 1 min)<br><br>a. Read the information on the slide.<br><br>b. Emphasize the importance of these additions to the STeLLA 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)<br><br>a. **The bottom line:** improving students' science learning—a goal that has been reached in two previous research studies of this approach. |

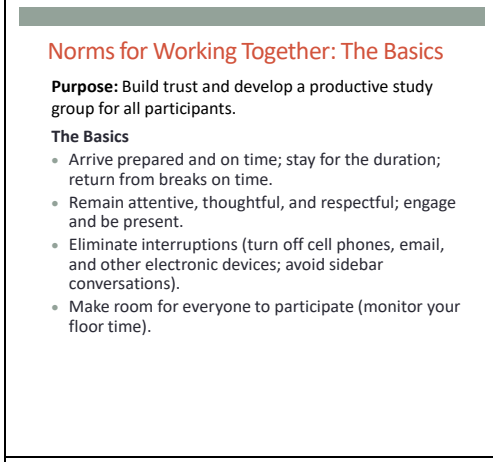
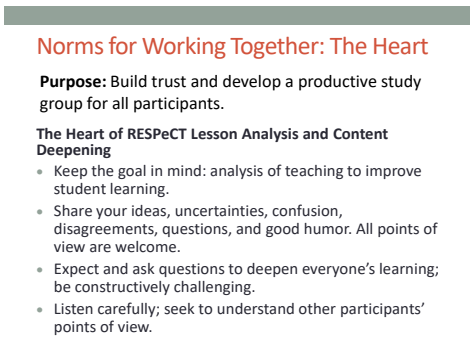
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 8.** Summer Institute Study-Group Leaders (Approximately 1 min)<br><br>a. Modify this slide to include the grade level of your study group and the names of the Teacher Leaders who will be facilitating the study-group sessions.<br><br>b. Formally introduce yourselves to the group. |
| | |  | **Display Slide 9.** The Key (Approximately 1 min)<br><br>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<br><br>**Note:** This is a transition slide. |

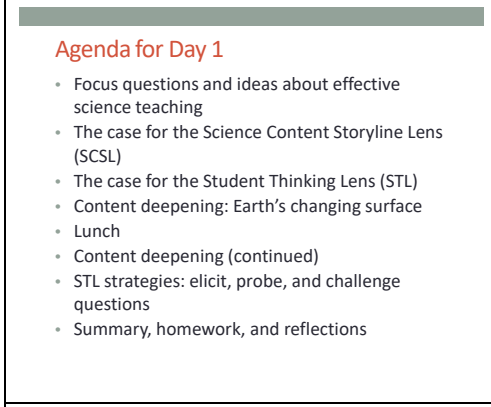
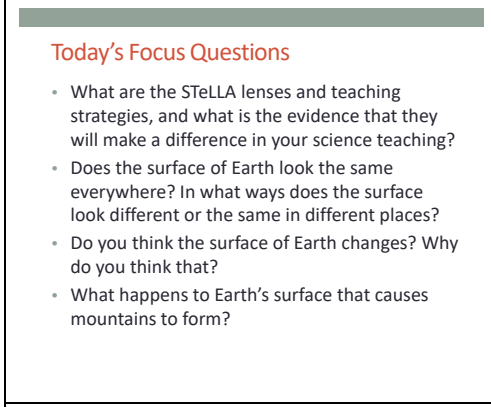
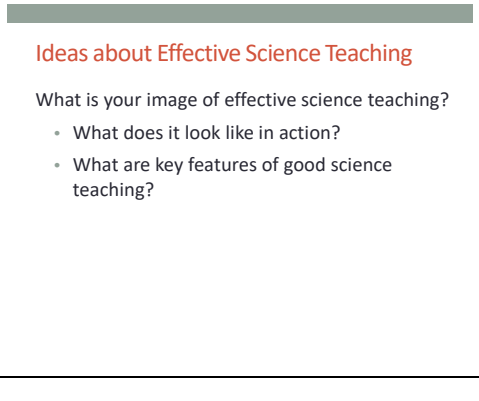
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | |
| | |  | **Display Slide 11.** Summer Institute: A Typical Daily Schedule (Approximately 1 min)<br><br>a. A typical daily schedule includes the following:<br>• Time spent on videocase lesson analysis<br>• Time focused on content deepening<br>• Short homework assignments<br>• A morning and an afternoon break, with a 45-minute lunch break |
| | |  | **Display Slide 12.** Summer Institute at a Glance (Approximately 1 min)<br><br>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. |

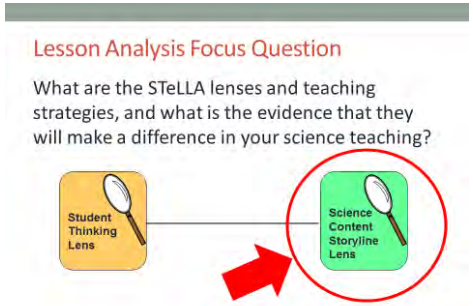
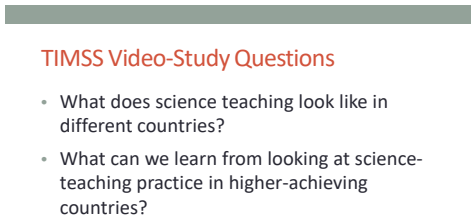
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 13.** School-Year Schedule (Approximately 1 min)<br><br>a. "The Summer Institute is just the beginning! During the school year, you'll continue meeting with your grade-level study group." |
| | |  | **Display Slide 14.** Your RESPeCT PD Program Materials (Approximately 1 min)<br><br>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." |
| 8:25–8:30<br>5 min<br><br>**Transition**<br><br>Slide 15 | **Transition to Grade-Level Study-Group Settings** |  | **Display Slide 15.** Transition to Grade-Level Study Groups (5 min)<br><br>a. "Any questions before we head to our grade-level study groups?"<br><br>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!" |

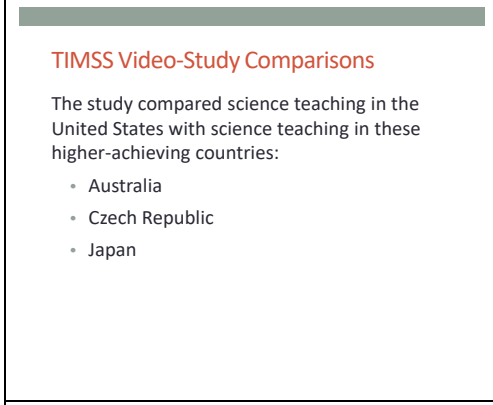
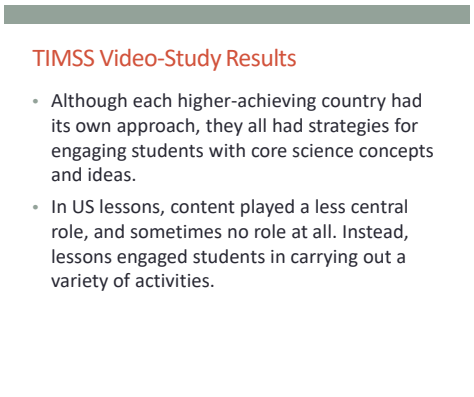
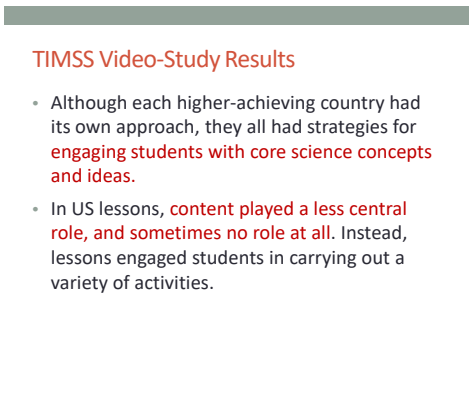
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| 8:30–9:20<br>50 min<br><br>**Getting Started**<br><br>Slides 16–24 | **Purpose**<br>• Build community within grade-level study groups.<br>• Set the stage for a day of learning about the RESPeCT PD program (formerly the STeLLA PD program), the STeLLA conceptual framework, and tools for lesson analysis.<br>• Access participants' prior knowledge/beliefs about science teaching and learning: What do participants include in their image of effective science teaching? What's missing?<br><br>**Content**<br>• RESPeCT PD is different from typical PD in a number of ways.<br>• Agreed-upon norms for working together will support our learning.<br>• Focus questions will guide our work in lesson analysis and content deepening activities.<br>• We bring to this work a variety of ideas about effective science teaching.<br><br>**What Participants Do**<br>• Set up their Summer Institute notebooks.<br>• Quick-write about their school experiences in science and their hopes for learning in this program.<br>• Share their writing with a partner.<br>• Introduce their partners to the group. |  <br>  | **Display Slide 16.** Notebook Setup (8 min)<br><br>a. Welcome participants to the study group and introduce yourself as they arrive.<br>b. Help participants find their table tents and materials so they can get settled.<br>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.<br><br>**Display Slide 17.** Getting Started: Introductions (15 min)<br><br>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.<br>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, favorite subjects to teach, hobbies).<br><br>**Note:** If the group has an odd number of participants, pair up with one of them.<br>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.<br><br>**Note:** If you weren't able to pair up with someone, |

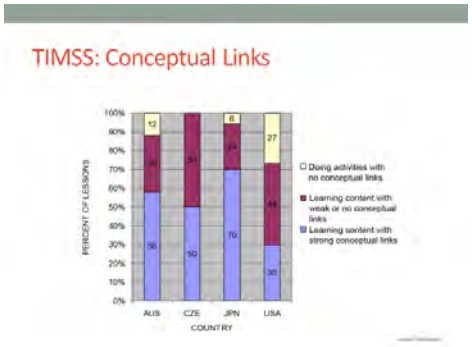
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | • Discuss suggested norms for working together.<br>• Brainstorm and discuss ideas about effective science teaching.<br><br>**Posters and Charts**<br>• STeLLA Framework and Strategies poster<br>• Norms for Working Together (chart)<br>• Day-1 Agenda (chart)<br>• Day-1 Focus Questions (chart)<br>• Effective Science Teaching chart (blank except for title)<br>• Parking Lot poster<br><br>**Handouts in PD Binder**<br>• 1.1 Norms for Working Together<br><br>**Supplies**<br>• Table tents with names<br>• Science notebooks<br>• Chart paper and markers<br><br>**PD Resources**<br>• RESPeCT PD program binder<br>• RESPeCT lesson plans binder<br>• STeLLA strategies booklet<br>• Setting Up Your Summer Institute Notebook (pretabs section in PD | | simply introduce yourself.<br><br>**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)<br><br>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)<br><br>a. Highlight the goals of RESPeCT lesson analysis PD and how it differs from other professional development opportunities. |

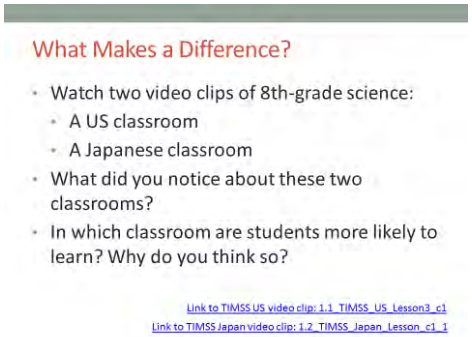
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | binder)<br>• Half-page copy of the norms (front pocket of PD binder) |  | **Display Slide 20.** Norms for Working Together: The Basics (3 min)<br>a. "To do this kind of work together, we need 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."<br>b. Read over these basic norms.<br>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)<br>a. "This set of norms moves beyond the basics and targets the heart of RESPeCT PD program goals."<br>b. Read the list.<br>c. "Is anything unclear? Do you have any changes or additions you'd like to suggest? Do you have any concerns about these norms?"<br>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.<br>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)<br><br>a. Talk through the agenda for the day. |
| | |  | **Display Slide 23.** Today's Focus Questions (1 min)<br><br>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."<br>b. Read the focus questions on the slide. |
| | |  | **Display Slide 24.** Ideas about Effective Science Teaching (15 min)<br><br>a. "Before we explore these questions, let's create a list of ideas about effective science teaching."<br>b. **Individuals (3 min):** "Take a few minutes to think and write about the questions on the slide."<br>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 |

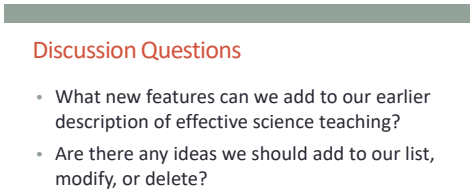
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | chart "Effective Science Teaching."<br>d. "Throughout the sessions, we'll revisit this list to add new ideas, clarify our thinking, and make other modifications." |
| 9:20–10:10<br>50 min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

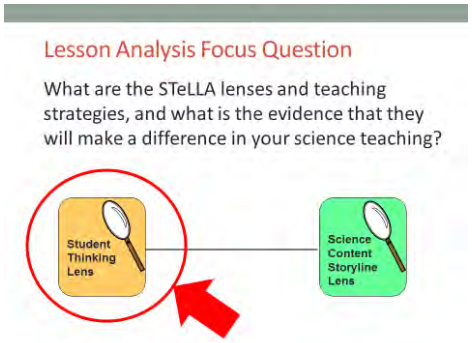
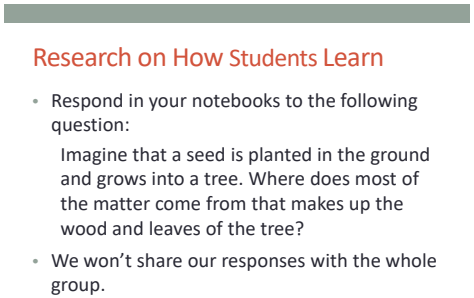
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | **Posters and Charts**<br>• Effective Science Teaching chart<br>**Videos**<br>• Video Clip 1.1, TIMSS US Lesson 3<br>• Video Clip 1.2, TIMSS Japan Lesson 1<br>**Handouts in PD Binder**<br>•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

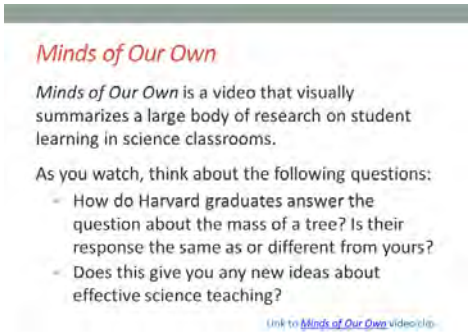
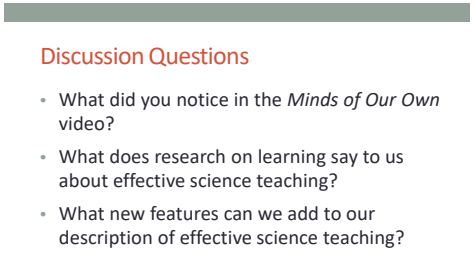
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 30.** TIMSS: Conceptual Links (3 min)<br><br>a. **Ask:** "What do you notice from this graph? What do you make of this data?"<br><br>b. **Emphasize:** "In the US, more than 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."<br><br>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!"<br><br>**Other key ideas to highlight:**<br>• Each higher-achieving country engaged students with core science concepts and ideas (more consistently than the US).<br>• All the higher-achieving countries linked ideas and activities (more consistently than the US).<br>• In US lessons, the focus was on performing activities with less attention to content and even less attention to linking activities and science ideas. |

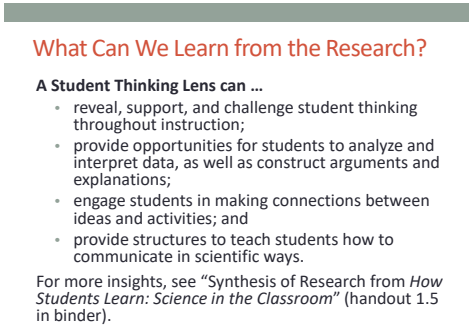
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 31.** What Makes a Difference? (20 min)<br><br>a. Direct participants to the transcripts for Video Clips 1.1 and 1.2 (handouts 1.2 and 1.3) before showing each clip.<br>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

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | Why?"<br><br>**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)<br><br>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)<br><br>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.<br><br>b. Encourage participants to read handout 1.4 (TIMSS *Educational Leadership* article) for further insight. |

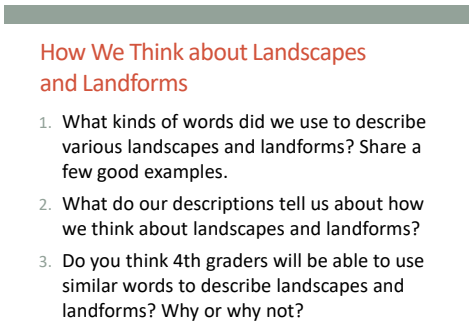
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 34.** Discussion Questions (5 min)<br><br>a. "What features on our list of ideas about effective science teaching are consistent with the TIMSS video-study findings?"<br>b. "Are there any ideas you'd like to add to our list, delete, or modify?"<br><br>**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.<br><br>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<br>10 min | **BREAK** | | |

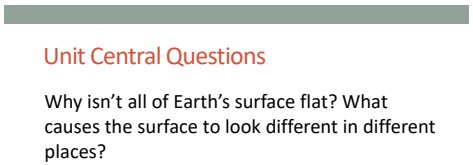
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| 10:10–10:40<br>30 min<br><br>**The Case for the Student Thinking Lens (STL)**<br><br>Slides 35–39 | **Purpose**<br>• Draw from research on science learning to build the case for the Student Thinking Lens as a core analytical tool in the STeLLA conceptual framework.<br><br>**Content**<br>• Research on science teaching and learning shows that learners cling to important misconceptions even after what we usually consider to be good hands-on science instruction.<br>• To help students change their ideas and truly understand science concepts, we need to engage them in more thinking and sensemaking.<br>• Making students' ideas and misconceptions visible is essential to effective science teaching.<br>• For teachers, knowledge of students' ideas can guide them in designing instruction to provide evidence and support that will help students change their ideas |  | **Display Slide 35.** Lesson Analysis Focus Question (Less than 1 min)<br><br>a. "At this point, we'll transition from a focus on the Science Content Storyline Lens (SCSL) to the Student Thinking Lens (STL)."<br>b. "We'll be focusing on the Student Thinking Lens the rest of the day and throughout this week." |
| | |  | **Display Slide 36.** Research on How Students Learn (3 min)<br><br>a. **Individuals:** Have participants answer the question on the slide in their science notebooks.<br><br>**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. |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | and find science ideas meaningful.<br>• For students, making their thinking visible engages them actively in the learning process.<br><br>**What Participants Do**<br>• Write about where the added mass comes from when a tiny seed becomes a full-grown tree.<br>• Watch *Minds of Our Own Lessons From Thin Air* video clips in which Harvard graduates and an 8th-grade student answer the same question.<br>• Discuss ideas about research on student thinking addressed in the video.<br>• Review the chart of participant ideas about effective science teaching in light of this research.<br><br>**Posters and Charts**<br>• Effective Science Teaching chart<br><br>**Videos**<br>• *Minds of Our Own*<br><br>**Handouts in PD Binder**<br>• 1.5 "Synthesis of Research from *How Students Learn: Science in the Classroom*"<br><br>**Supplies**<br>• Science notebooks |  <br>  | **Display Slide 37.** *Minds of Our Own* (10 min)<br><br>a. Read the information and instructions on the slide.<br><br>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)<br>• MIT/Harvard interview—start at segment 3:30 and end at 5:40.<br>• John preinterview, class, and postinterview—start at segment 7:50 and end at 16:45.<br><br>**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.<br><br>**Display Slide 38.** Discussion Questions (15 min)<br><br>a. There's a lot to talk about in this video! Here are some additional questions you might pose:<br>• Did John's ideas about photosynthesis change through instruction?<br>• What did the teacher say about his instruction?<br>• What did the experts say?<br>• How do the Harvard students' responses compare with your own? What ideas does this give you about your own science learning experiences?<br><br>**Key idea 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. |

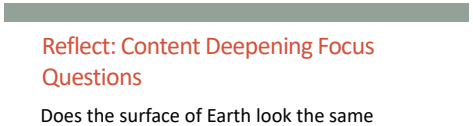
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | b. Modify the chart of ideas about effective science teaching as participants share features from the research. |
| | |  | **Display Slide 39.** What Can We Learn from the Research? (2 min)<br><br>a. "This slide nicely summarizes some of the ways we get students thinking and make their thinking visible."<br><br>**Note:** Encourage participants to read handout 1.5 ("Synthesis of Research from *How Students Learn: Science in the Classroom*") for further insight.<br><br>b. **Transition:** "Today we'll start learning some particular strategies for making student thinking more prominent in science lessons."<br><br>**Background for PD leaders:** The STeLLA conceptual framework addresses the need uncovered in this and other studies on how people learn and, more specifically, how students learn science.<br><br>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.<br>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 |

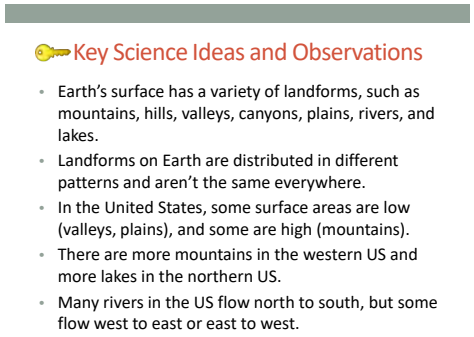
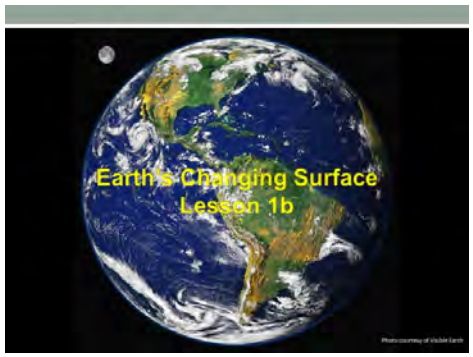
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | concepts meaning.<br>3. This idea helps students monitor their developing understandings, engaging them in reflecting on their learning experiences, their changing ideas, and their remaining questions and musings. |
| 10:40–12:00<br>80 min<br><br>**Content Deepening: Earth's Changing Surface**<br><br>Slides 40–73 | **Purpose**<br>• Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lessons 1a/b.<br><br>**Content**<br>• Earth has a variety of landforms, such as mountains, hills, valleys, canyons, plains, rivers, and lakes.<br>• The landforms aren't the same everywhere.<br>• *Geomorphology* is the geologic study of Earth's surface and the natural processes that shape and change its form.<br>• A *landform* is a local feature of Earth's surface formed by a characteristic natural process or set of processes.<br>• *Landscape* is the regional assemblage of landforms that are typical of a particular tectonic |  | **Display Slide 40.** Content Deepening: Earth's Changing Surface (Less than 1 min)<br><br>a. "Now let's begin our investigation of Earth's changing surface."<br><br>**Note:** Throughout this content deepening phase, refer as needed to Earth's Changing Surface: Learning Goals for Students and Teachers, the content background document, and Common Student Ideas about Earth's Changing Surface. |
| | |  | **Display Slide 41.** Today's Content Deepening (Less than 1 min)<br><br>a. "Today's content deepening work will focus on science ideas about Earth's changing surface from ECS lessons 1 and 2." |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | and/or climatic setting.<br>• A *geomorphic province* is a broad sector of a continent that has a common geologic history and tectonic origin.<br><br>**What Participants Do**<br>• Use a relief map to investigate landforms in the United States to determine whether Earth's surface looks the same everywhere.<br>• Investigate landforms in various locations to determine whether Earth's surface changes over time.<br>• Identify landform and landscape patterns across various geomorphic provinces on Earth's surface.<br>• Explore and discuss key science ideas behind ECS lessons.<br>• Apply content learning to answer the focus questions for lessons 1a and 1b.<br><br>**Supplies**<br>• Science notebooks<br>• Chart paper and markers<br>• Science-lesson materials kit (Earth's Changing Surface)<br>• Plastic relief map of the United States (1 per pair) (from ECS lessons 1a/b)<br><br>**PD Resources**<br>• RESPeCT lesson plans binder<br><br>**Resources in Lesson Plans Binder** |  | **Display Slide 42.** How We Think about Landscapes and Landforms (20 min)<br><br>a. Read the three questions on the slide.<br>b. **Individuals (5 min):** "Briefly answer these questions in your science notebooks."<br>c. **Whole-group share-out (12 min):** In a round-robin, ask participants to state their names, school affiliations, where they were born, and where they live now. Then invite them to share their answers to the questions.<br>d. As participants share their answers, record their descriptions on chart paper.<br>e. Following the share-out, briefly summarize some key descriptions, focusing on the diversity of landscapes (e.g., flat urban landscape; rural farm; high, snowy mountains; tropical beach at sunset). |
| | |  | **Display Slide 43.** How We Think about Landscapes and Landforms (10 min)<br><br>a. **Whole-group discussion (10 min):** Discuss the questions on the slide.<br>b. Highlight some of the descriptive terminology on the chart that participants used for landscapes, landforms, and shapes. Examples may include the following:<br>• **Landscapes:** mountains, deserts, coastlines, cities<br>• **Landforms:** peaks, ridges, hills, valleys, canyons, gullies, plains, prairies, plateaus, coastlines, shores, cliffs, beaches, headlands, deltas, islands, lakes, ponds, rivers, streams<br>• **Topographic shapes:** steep, sloping, gentle, |

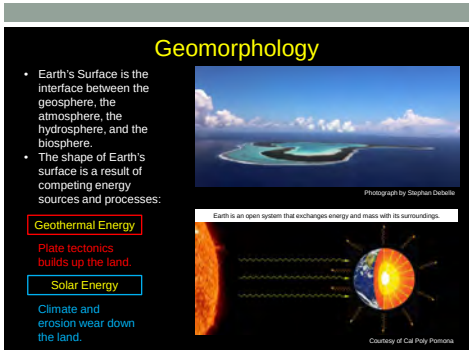
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | *Resources section:*<br>• Content background document<br>• Common Student Ideas<br>*Pretabs section:*<br>• Earth's Changing Surface: Learning Goals for Students and Teachers | | flat, rough, rugged, jagged, abrupt, smooth, low, high |
| | |  | **Display Slide 44.** Unit Central Questions (1 min)<br>a. Read the unit central questions on the slide.<br>b. Emphasize that these questions will guide student learning throughout the entire ECS unit.<br>c. Tell participants that the information they gather during the content deepening investigations this week will help them answer these questions.<br>d. Have participants write these questions in their science notebooks and draw a double-lined box around them. This practice reinforces the process they'll follow with students in the lessons. |
| | |  | **Display Slide 45.** Earth's Changing Surface: Lesson 1a (Less than 1 min)<br>a. "Next, we'll explore science ideas about Earth's changing surface from ECS lesson 1a." |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | Content Deepening Focus Questions<br>Does the surface of Earth look the same everywhere? In what ways does the surface look different or the same in different places? | **Display Slide 46.** Content Deepening Focus Questions (1 min)<br>a. Read the focus questions on the slide.<br>b. Emphasize that these questions will guide student learning throughout ECS lesson 1a.<br>c. Have participants write these questions in their science notebooks and draw a box around them. |
| | |  | **Display Slide 47.** Investigation 1: Identifying Landforms (2 min)<br>a. "For this investigation, you'll work with a partner to identify landforms on this relief map of the United States."<br>b. Have participants pair up; then give each pair a relief map. |
| | | Investigation 1: Identifying Landforms<br>• How many *different landforms* can you find on the map? (You'll need to LOOK AT and TOUCH the map to find the landforms.)<br>  • Record the landforms in your science notebooks using the descriptive words we used earlier.<br>• What *landform patterns* can you identify on the map?<br>  • Where do you find mountains, rivers, and lakes?<br>  • Record at least 3 different patterns in your notebook using descriptive words.<br>  • Use directions (north, south, east, west) to indicate where the landforms are located. | **Display Slide 48.** Investigation 1: Identifying Landforms (10 min)<br>a. **Pairs:** "First, work with your partner to identify as many different landforms on the map as you can. You'll need to look at and touch the map to find the landforms. When you identify a landform, record it in your science notebooks using descriptive words like the ones we discussed earlier."<br>b. "Next, search for landform *patterns* on the map. Notice where certain types of landforms appear |

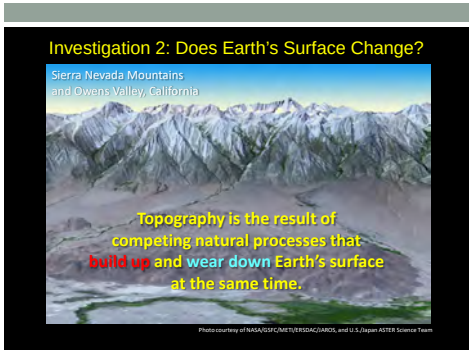
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | and don't appear. Where are mountains located? What about rivers and lakes? Record at least three different landform patterns in your notebooks using descriptive words, and use directions like *north*, *south*, *east*, or *west* to indicate where the landforms are located."<br>c. **Whole-group share-out**: Invite pairs to describe the landforms and landform patterns they identified on the relief map. Probe their responses (e.g., "What do you mean by 'more mountains in the west'?" "What do you mean by 'flat in the middle'?") and elicit differing points of view (e.g., "Does everyone agree with that observation?"). |
| | |  | **Display Slide 49.** Reflect: Content Deepening Focus Questions (5 min)<br>a. "Reflect on the focus questions for a moment and then share your answers in concise statements. Make sure to use evidence from the relief map to support your ideas."<br>b. "As others share their ideas and evidence, listen carefully and be prepared to agree, disagree, ask questions, or add new ideas using evidence from the map."<br>c. During this discussion, record key ideas on chart paper. |

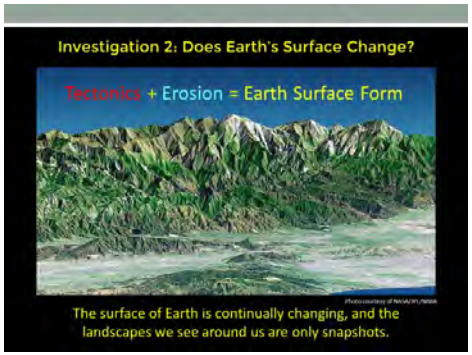
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 50.** Key Science Ideas and Observations (5 min)<br><br>a. Review the key science ideas and observations on the slide that answer the focus questions. Emphasize that participants' observations and the map evidence they gathered helped shape these responses.<br>b. **Whole-group discussion:** "Does everyone agree with these ideas and observations? Would you like to add or revise anything?"<br>c. Ask participants to copy these ideas and observations into their science notebooks under the focus questions. |
| | |  | **Display Slide 51.** Earth's Changing Surface: Lesson 1b (Less than 1 min)<br><br>a. "Now let's explore ideas about Earth's changing surface from lesson 1b." |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | Content Deepening Focus Questions<br><br>Do you think the surface of Earth changes? Why do you think that? | **Display Slide 52.** Content Deepening Focus Questions (Less than 1 min)<br><br>a. Read the focus questions on the slide.<br>b. Emphasize that these questions will guide student learning throughout ECS lesson 1b.<br>c. Have participants write the focus questions in their science notebooks and draw a box around them. |
| | |  | **Display Slide 53.** Review: Identifying Landforms on Earth's Surface (Less than 1 min)<br><br>a. "In our first investigation, we used a relief map of the United States to explore landforms and landform patterns on Earth's surface. From the evidence we gathered, we concluded that Earth's surface doesn't look the same everywhere. There are a variety of landforms distributed in different patterns." |
| | | Investigation 2: Does Earth's Surface Change?<br><br>Look at the relief map of the United States from our first investigation.<br>• Do you think landforms in the United States have always looked the way they do today?<br>• Do you think landforms in the United States will change in the future? | **Display Slide 54.** Investigation 2: Does Earth's Surface Change? (6 min)<br><br>a. Read the questions on the slide and ask participants to share their ideas and reasoning. Encourage them to look at the relief map of the United States as needed throughout this discussion.<br>b. "Listen carefully to the ideas and reasoning others share and be prepared to agree, disagree, ask |

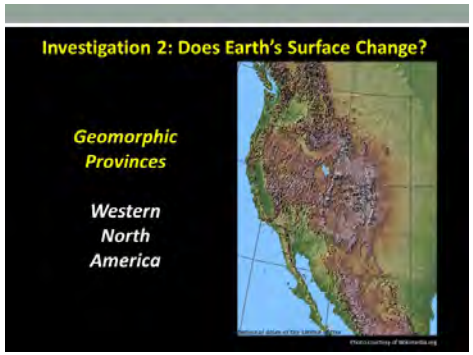
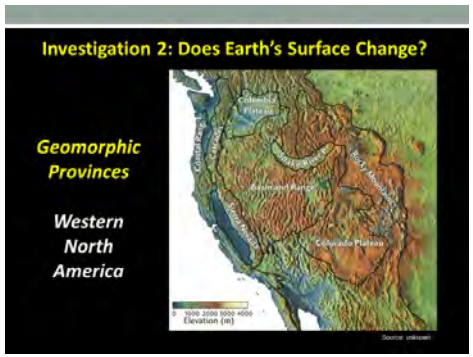
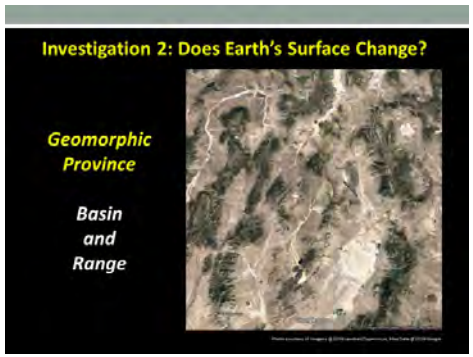
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | questions, or add ideas."<br>c. During this discussion, record participants' ideas and reasoning on chart paper. |
| | |  | **Display Slide 55.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br>a. "Next, we'll explore geomorphology, or the science of Earth's surface."<br>b. Read the definition at the bottom of the slide. |
| | |  | **Display Slide 56.** Investigation 2: Does Earth's Surface Change? (2 min)<br>a. Read the information on the slide describing the relationship between Earth's surface and the two main energy sources in Earth's system: geothermal energy and solar energy.<br>b. Highlight these key science ideas:<br>1. Geothermal energy (heat) from Earth's core powers plate tectonics, which builds up the land.<br>2. Solar energy (heat) powers climate and erosion, which wear down the land.<br>c. Emphasize that gravity plays an important role in geothermal energy powering plate tectonics and solar energy powering climate and erosion, both of which change the surface of Earth.<br>d. "We'll talk more about plate tectonics in |

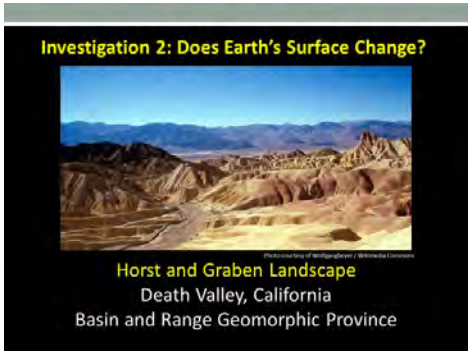
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | subsequent investigations." |
| | |  | **Display Slide 57.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "Volcanic eruptions and earthquakes are two examples of tectonic processes that build up Earth's surface."<br>b. "The photo on the left shows a blocky andesite lava flow from Volcán Arenal in Costa Rica that plowed its way through the rain forest in 1992, creating a brand-new built-up area of land."<br>c. "The photo on the right shows an area of coseismic uplift along Costa Rica's Caribbean coast that occurred in 1991 during a magnitude 7.7 earthquake. The coastal uplift of the coral reef was 1.5 meters. Older uplifts of coral deposits from previous earthquakes are found inland in the jungle." |
| | |  | **Display Slide 58.** Investigation 2: Does Earth's Surface Change? (1 min)<br><br>a. "Floods and landslides are two examples of erosional processes that wear down Earth's surface."<br>b. "The photo on the left shows a major flood of the Río Choluteca in Honduras during Hurricane Mitch in 1998. The deep-brown color of the water indicates that it's carrying large amounts of eroded sediment from the landscape. Hurricane Mitch was a major disaster for much of Central America, causing widespread flooding and landslides that killed thousands of people and displaced billions of tons of sediment." |

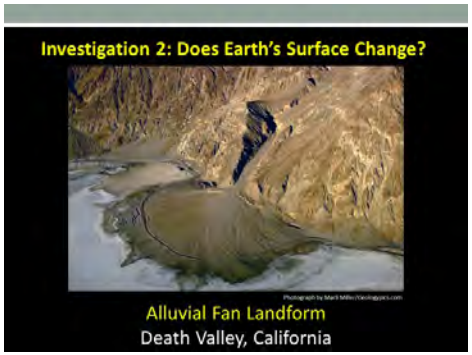
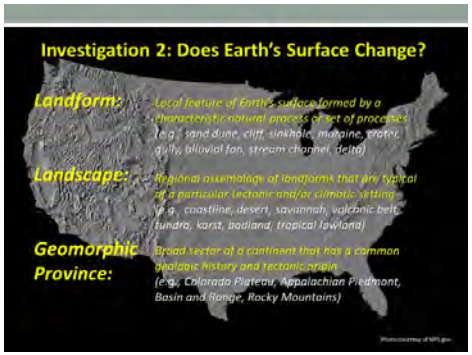
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | c. "The photo on the right shows the Las Colinas landslide and debris flow that plowed through Santa Tecla, El Salvador, in 2001, killing more than 580 people. This 'flowslide' was triggered by a magnitude 7.6 earthquake that loosened rain-saturated volcanic soils above the town and sent 170,000 cubic yards of rock and soil (plus water) plunging down the mountain in a matter of seconds." |
| | |  | **Display Slide 59.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. Explain to participants that the term *topography* refers to the shape of Earth's surface.<br><br>b. "This image shows the dramatic topographic relief of the Sierra Nevada Mountains, with Mount Whitney towering more than 14,000 feet above sea level, and the adjacent Owens Valley reaching only 4,000 feet in elevation." |
| | |  | **Display Slide 60.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. Emphasize that topography is the result of competing natural processes that build up and wear down Earth's surface at the same time. |

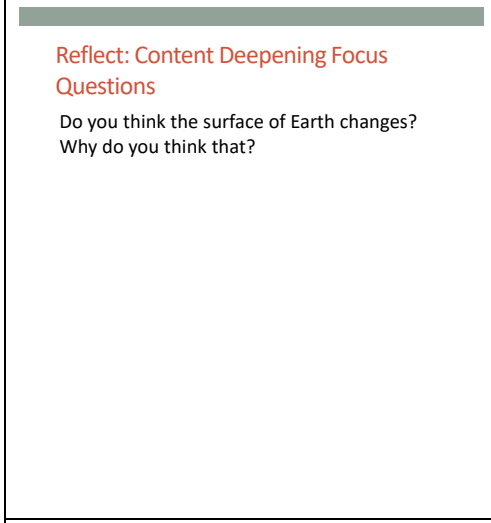
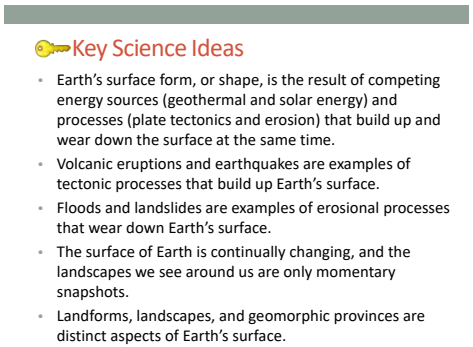
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 61.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "The topography of Earth changes in response to the relative impacts, or rates, of tectonic and climatic processes that either build up or wear down Earth's surface." |
| | |  | **Display Slide 62.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "This slide shows a digital elevation model of the San Gabriel Mountains rising above the Pomona Valley. Mount Baldy (also known as Mount San Antonio) towers more than 10,000 feet above sea level."<br><br>b. "The surface of Earth is continually changing, or evolving, and the landscapes we see around us are only momentary snapshots or freeze-frames in a full-length movie." |
| | |  | **Display Slide 63.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "Earth's surface form is the result of tectonic processes that build up the land and erosional processes that wear down the land at the same time." |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 64.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "Geomorphologists use the terms *landform*, *landscape*, and *geomorphic province* to describe features of Earth's surface." |
| | |  | **Display Slide 65.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "Earlier, we searched for distinctive landform patterns on a relief map of the United States. Based on these patterns, we can divide the North American continent into regional sectors called *geomorphic provinces* or *physiographic provinces*."<br>b. "*Geomorphic provinces* are broad sectors of a continent that share a common geologic history and tectonic origin."<br>c. "The geomorphic provinces represented on this slide are quite generalized, but next, we'll examine a more detailed model of geomorphic provinces in the western United States." |

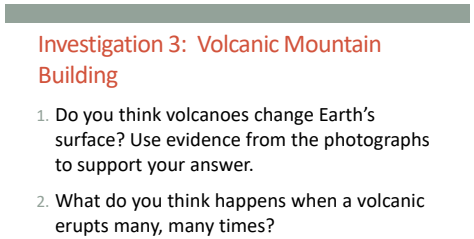
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 66.** Investigation 2: Does Earth's Surface Change? (3 min)<br><br>a. "This slide shows a digital elevation model of western North America."<br>b. "What distinct surface patterns do you observe on this map?"<br>c. Ask participants to think about how they might divide this area into geomorphic provinces. |
| | |  | **Display Slide 67.** Investigation 2: Does Earth's Surface Change? (3 min)<br><br>a. "This slide shows the standard geomorphic provinces that geomorphologists have identified for western North America."<br>b. "How does this model compare with the geomorphic divisions you came up with?"<br>c. "Next, we'll zoom in on one province that stretches from eastern California across Nevada to central Utah." |
| | |  | **Display Slide 68.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "This image in this slide is a close-up view of a portion of the Basin and Range geomorphic province. This region is known for its parallel rows of rugged, snowy (Nevada) mountain ranges and deep desert valleys. The ranges and valleys are separated by extensional normal faults that accommodate tectonic stretching from west to east." |

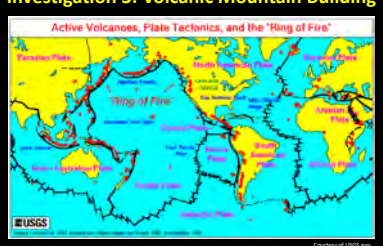
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | b. "In this region, the North American continent is actually being pulled apart from both sides. This movement has resulted in a distinctive pattern of north-south-trending mountain ranges and intervening basins or valleys." |
| | |  | **Display Slide 69.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "This is an example of a typical Basin and Range landscape within the western geomorphic province. The photo was taken from Zabriskie Point in Death Valley National Park, looking east across the desert basin toward the mountain range on the far side."<br><br>b. "At the bottom of the valley is a desert playa lake, which is a depression in the ground filled with water at certain times of the year. Alluvial fans, or accumulations of sediment, appear along the edges of the mountain range, and a fault runs along the foot of the mountains."<br><br>c. Point out that in geomorphology, the term *landscape* refers to a regional assemblage of landforms that characterize a certain tectonic or climatic environment. Death Valley can be described as a *horst and graben landscape*. In German, *horst and graben* are geologic terms that describe extensional mountain ranges, or *horst*, and intervening basins, or *graben*. |

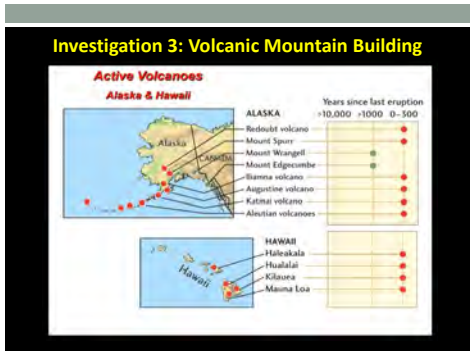
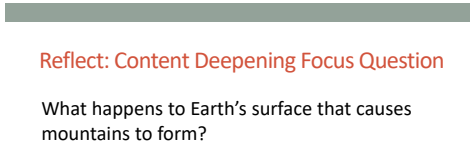
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 70.** Investigation 2: Does Earth's Surface Change? (Less than 1 min)<br><br>a. "This photo of an alluvial fan is an example of a characteristic landform in a horst and graben landscape."<br>b. "Alluvial fans are piles of sediment that accumulate at the mouth of a mountain stream where it empties into an adjacent valley or basin. This landform results from a sudden change in stream gradient crossing a mountain front. As the streambed builds up, it maintains a continuous longitudinal profile."<br>c. Explain that landforms are local surface features that result from a specific natural process or set of processes. Many types of landforms exist around the world. |
| | |  | **Display Slide 71.** Investigation 2: Does Earth's Surface Change? (2 min)<br><br>a. Read the definitions on the slide to summarize this investigation of Earth's changing surface. |

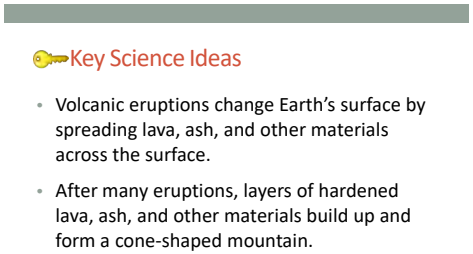
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 72.** Reflect: Content Deepening Focus Questions (5 min)<br><br>a. "Reflect on these focus questions for a moment and then share your answers in a concise statement. Make sure to include evidence from our investigation of landforms, landscapes, and geomorphic provinces to support your ideas."<br>b. "As others share their ideas and evidence, listen carefully and be prepared to agree, disagree, ask questions, or add new ideas using evidence from the map."<br>c. During this discussion, record key ideas on chart paper. |
| | |  | **Display Slide 73.** Key Science Ideas (5 min)<br><br>a. Review the key science ideas on the slide that answer the focus questions. Emphasize that the information they gathered during this investigation helped shape these responses.<br>b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?"<br>c. Ask participants to copy these ideas into their science notebooks under the focus questions. |
| 12:00–12:45<br>45 min | **LUNCH** | | |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| 12:45–2:10<br>85 min<br><br>**Content Deepening (Continued)**<br>(Includes 10-min break)<br><br>Slides 74–98<br>1 | **Purpose**<br>• Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lesson 2a.<br><br>**Content**<br>• Volcanic eruptions build up Earth's surface over time as lava, ash, and other materials spread out, harden into layers of rock, and eventually form a cone-shaped mountain.<br>• Earth's thin outer layer (crust) is made up of interlocking sections called *tectonic plates* that fit together like puzzle pieces.<br>• Tectonic plates are part of Earth's lithosphere, which includes the oceanic and continental crust and the uppermost mantle.<br><br>**What Participants Do**<br>• Investigate how volcanic eruptions are involved in building up Earth's surface.<br>• Compare the locations of major volcanoes and mountain ranges around the world and discuss the possible connection between |  | **Display Slide 74.** Earth's Changing Surface: Lesson 2a (Less than 1 min)<br><br>a. "Next, we'll explore ideas about Earth's changing surface from lesson 2a." |
| | | Content Deepening Focus Question<br><br>What happens to Earth's surface that causes mountains to form? | **Display Slide 75.** Content Deepening Focus Question (Less than 1 min)<br><br>a. Read the focus question on the slide.<br>b. Emphasize that this question will guide student learning throughout ECS lesson 2a.<br>c. Have participants write the focus question in their science notebooks and draw a box around it. |

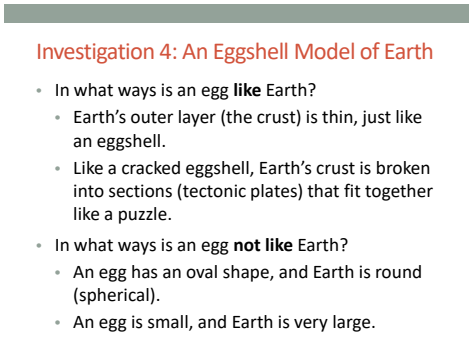
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | volcanic eruptions and mountain formation.<br>• Use hard-boiled eggs and cracked eggshells as representations of Earth's crust and tectonic plates.<br>• Explore Earth's composition using an avocado as a model.<br>• Explore and discuss key science ideas behind ECS lessons.<br>• Apply content learning to answer the unit central questions and the focus question for lesson 2a.<br><br>**Supplies**<br>• Science notebooks<br>• Chart paper and markers<br>• Hard-boiled eggs (2 per pair—1 intact and 1 cracked) (from lesson 2a)<br>• Avocado and knife (1 per pair)<br><br>**PD Resources**<br>• RESPeCT lesson plans binder<br><br>**Resources in Lesson Plans Binder**<br>*Resources section:*<br>• Content background document |  | **Display Slide 76.** Investigation 3: Volcanic Mountain Building (5 min)<br><br>a. Have participants pair up with their partners from the previous investigation.<br>b. "Examine the photographs on this slide. What kinds of landforms do you observe? What's happening in each photo? What changes are taking place on Earth's surface?"<br>c. "Share your observations with your partner; then record them in your science notebooks." |
| | |  | **Display Slide 77.** Investigation 3: Volcanic Mountain Building (5 min)<br><br>a. Read the questions on the slide.<br>b. Ask participants to answer these questions using evidence from the volcano photographs to support their ideas. Probe participants' responses and elicit differing points of view.<br>c. During this discussion, record key ideas and evidence on chart paper. |

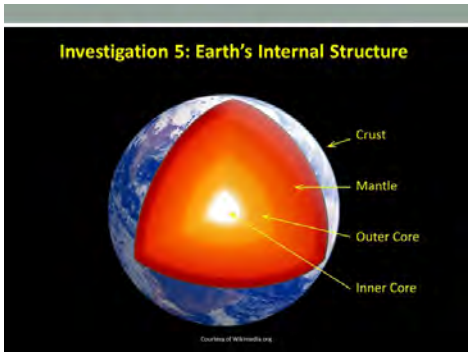
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | • Common Student Ideas<br>*Pretabs section:*<br>• Earth's Changing Surface: Learning Goals for Students and Teachers | Investigation 3: Volcanic Mountain Building<br>1. Do you think volcanoes change Earth's surface? Use evidence from the photographs to support your answer.<br>• Yes. The photographs of volcanic eruptions show lava and an ash cloud spreading out on Earth's surface and changing how the surface looks.<br>2. What do you think happens when a volcanic erupts many, many times?<br>• I think that after many eruptions, layers of hardened lava, ash, and other materials will build up and form a cone-shaped mountain. | **Display Slide 78.** Investigation 3: Volcanic Mountain Building (5 min)<br>a. Read through the answers on the slide.<br>b. Ask participants, "Does everyone agree with these observations and ideas? Would you like to add or revise anything?" |
| | | Investigation 3: Volcanic Mountain Building<br>  <br><br>Map of Earth's Major Volcanoes | **Display Slide 79.** Investigation 3: Volcanic Mountain Building (2 min)<br>a. "This map shows the locations of major volcanoes around the world."<br>b. Point out some of the volcanoes on the map and ask, "Do you think the volcanoes on this map correspond with major mountain ranges? Why or why not?"<br>c. Note that many volcanoes form under the ocean and correspond with undersea mountain ranges. |
| | | Investigation 3: Volcanic Mountain Building<br>  <br> | **Display Slide 80.** Investigation 3: Volcanic Mountain Building (2 min)<br>a. "This map shows major active volcanoes on the US mainland. The United States ranks third after Indonesia and Japan in the total number of active volcanoes on record."<br>b. "Do you think the volcanoes on this map correspond with major mountain ranges in the |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | western United States? Why or why not?"<br>c. Highlight some examples on the map. |
| | |  | **Display Slide 81.** Investigation 3: Volcanic Mountain Building (2 min)<br>a. "These maps show major active volcanoes in Alaska and Hawaii. Notice how many of these volcanoes have erupted within the last 300 years."<br>b. Again, ask participants whether they think the volcanoes on these maps correspond with mountains in these regions. Then highlight some examples. |
| | |  | **Display Slide 82.** Reflect: Content Deepening Focus Question (5 min)<br>a. Review the focus question on the slide.<br>b. Ask participants to share their ideas for answering this question using evidence from the volcano investigation to support their answers.<br>c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share.<br>d. During this discussion, record key ideas on chart paper. |

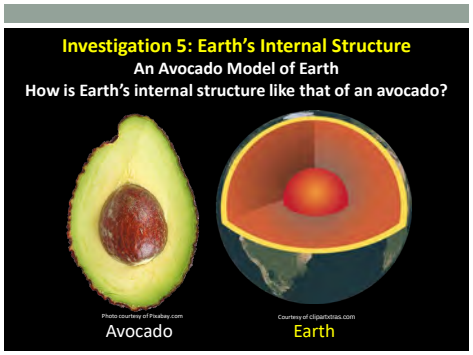
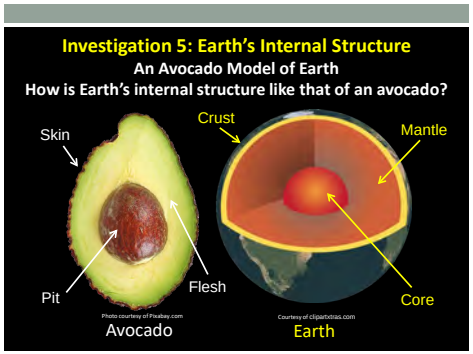
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 83.** Key Science Ideas (Less than 1 min)<br><br>a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations helped shape these responses.<br>b. Ask participants to copy these ideas into their science notebooks under the focus questions.<br>c. "So far we've determined that volcanic eruptions are involved in causing mountains to form."<br>d. "Next, we'll investigate other aspects of Earth's surface and consider whether they might be involved in mountain building." |
| | |  | **Display Slide 84.** Investigation 4: Eggshell Model of Earth (5 min)<br><br>a. Have participants pair up with their partners from the previous investigation. Give each pair two hard-boiled eggs, one intact and one with a cracked shell.<br>b. "Examine these eggs and share your observations with your partner. How would you describe the shape of your eggs? How would you describe the surface of the intact egg? How would you describe the surface of the cracked egg?"<br>c. "Record your observations in your science notebooks and include drawings." |

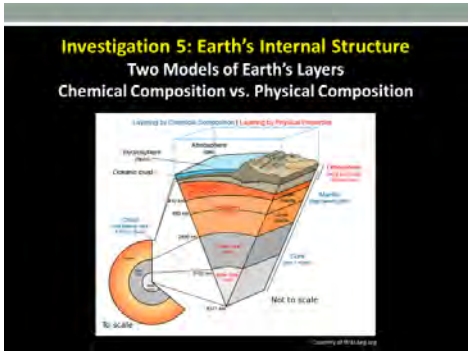
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 85.** Investigation 4: An Eggshell Model of Earth (3 min)<br><br>a. "Does this map of Earth remind you of anything?"<br>b. If participants don't immediately observe that the map looks like a cracked eggshell, ask whether the lines and sections on the map remind them of anything. In addition to a cracked eggshell, participants may note that the map looks like a puzzle with interlocking pieces.<br>c. "The outer layer of Earth's surface is called the *crust*. Like a cracked eggshell, this layer is very thin and is broken into sections called *tectonic plates* that fit together like a puzzle. This map shows Earth's major tectonic plates and the boundaries where various plates meet."<br>d. "*Plate tectonics* is a fundamental scientific theory, or paradigm, that explains all of the major geologic characteristics of Earth's surface."<br>e. "We'll explore Earth's crustal layer in a bit more detail later on, but right now, we'll focus on investigating similarities and differences between our hard-boiled eggs and Earth's surface." |
| | | Investigation 4: An Eggshell Model of Earth<br>• In what ways is an egg **like** Earth?<br>• In what ways is an egg **not like** Earth? | **Display Slide 86.** Investigation 4: An Eggshell Model of Earth (6 min)<br><br>a. Read the questions on the slide.<br>b. **Pairs (2 min):** Have pairs briefly discuss similarities and differences between an egg and Earth. Remind them to think about the plate-tectonics map from the previous slide as well as the general features of Earth.<br>c. **Whole-group discussion (3 min):** Call on pairs |

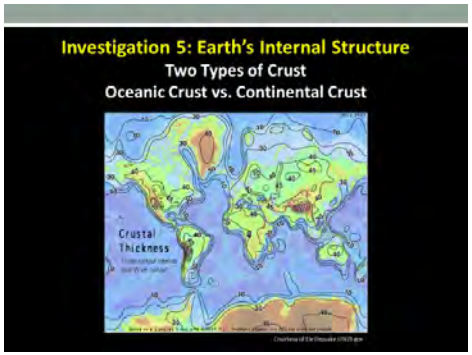
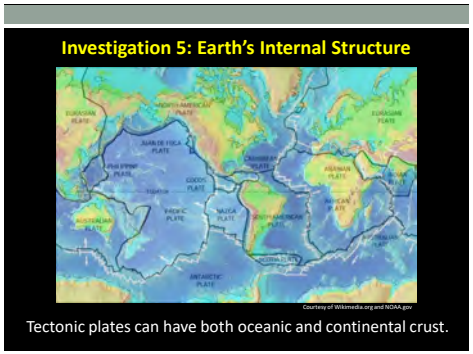
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | to share their observations and ideas for answering these questions using evidence from the egg investigation and the map of Earth to support their answers. Probe participants' responses and elicit differing points of view.<br>d. During this discussion, record key ideas on chart paper. |
| | |  | **Display Slide 87.** Investigation 4: An Eggshell Model of Earth (5 min)<br>a. Read through the answers on the slide.<br>b. Ask participants, "Does everyone agree with these answers? Would you like to add or revise anything?"<br>c. Have participants copy these ideas and observations into their science notebooks. |

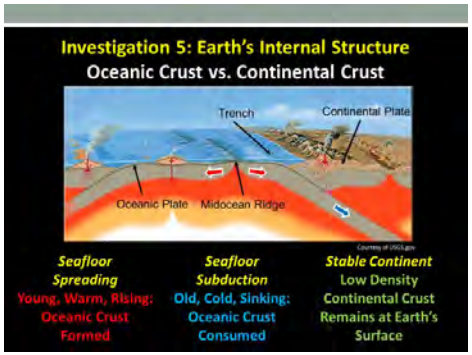
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 88.** Investigation 5: Earth's Internal Structure (1 min)<br><br>a. "To better understand plate tectonics, we need to understand some key ideas about Earth's internal structure."<br><br>b. "This diagram shows Earth's internal layers based on chemical composition. The three main layers are the core, the mantle, and the crust. Scientists believe that the core, which has a solid inner portion and a liquid outer portion, is composed primarily of iron and nickel. This metallic core, which is extremely hot and under very high pressure, is the main source of Earth's geothermal heat."<br><br>c. "Earth's mantle is made up of hot, solid rock that flows slowly beneath Earth's surface by heat convection. This layer is composed of iron, magnesium, silicon, aluminum, oxygen, and other minerals."<br><br>d. "Earth's crust is made up of cold, solid rock composed of a wide variety of silicate minerals. This layer of rock is very thin and rigid. As we learned earlier, Earth's crust is broken into interlocking pieces called *tectonic plates*." |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 89.** Investigation 5: Earth's Internal Structure (5 min)<br><br>a. "In this investigation, you'll pair up again and explore Earth's internal structure using an avocado as a model of Earth."<br>b. Give each pair an avocado and a knife and instruct participants to carefully slice the avocado in half lengthwise as shown on the slide.<br>c. "Examine the avocado and discuss your observations with your partner. What does the outer surface of the skin look like? How would you describe the different internal layers? What do they look like? How thick are they? Are the layers hard or soft? What color are they?"<br>d. "Record your observations in your science notebooks and include a drawing. Make sure to label the different layers of the avocado in your drawings." |
| | |  | **Display Slide 90.** Investigation 5: Earth's Internal Structure (2 min)<br><br>a. "This photo of an avocado shows three different layers: the pit or core, the flesh and the skin. Did you and your partner come up with the same results? Do you have any other observations to add?"<br><br>**Note:** Some pairs may have identified two layers of flesh: the yellow inner layer and the green outer layer. This is also correct. |

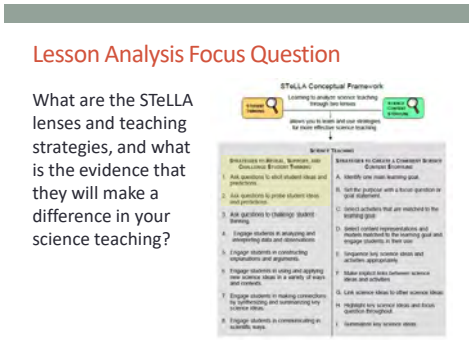
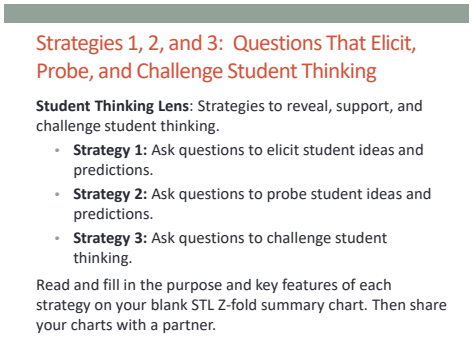
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 91.** Investigation 5: Earth's Internal Structure (5 min)<br><br>a. Read the question on the slide.<br><br>b. Call on pairs to share their ideas for answering this question. Remind them to use evidence from the diagram of Earth's layers and the avocado-Earth model to support their answers. Probe participants' responses and elicit differing points of view. |
| | |  | **Display Slide 92.** Investigation 5: Earth's Internal Structure (5 min)<br><br>a. "The diagrams on this slide compare the layers of Earth with the layers of an avocado. Did you and your partner come up with similar results? Do you have any other observations or ideas to add?"<br><br>b. Summarize key similarities and differences between and avocado and Earth. Point out that the relative sizes or thicknesses of an avocado's pit, flesh, and skin are similar to Earth's core, mantle, and crust. An avocado's flesh is solid but soft and deformable like Earth's mantle, and the skin is solid, rigid, and bumpy like Earth's crust. However, there are also some key differences. For example, an avocado pit is hard and solid, whereas Earth's core consists of both a solid inner core and a liquid outer core. And even though an avocado's skin is thin, Earth's crust is proportionally much thinner.<br><br>c. "Overall, an avocado is a pretty good model of Earth, with a few exceptions. What makes it not such a good model?" |

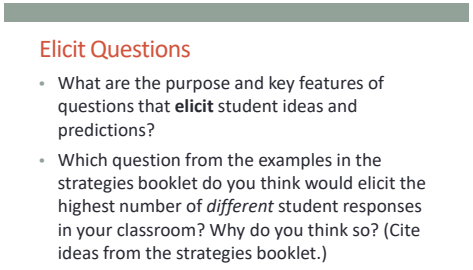
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | d. Participants may note that an avocado is not such a good model for the following reasons:<br>• An avocado has an oval shape, and Earth is round (spherical).<br>• An avocado pit is hard, whereas Earth's outer core is liquid.<br>• The chemical composition of an avocado isn't metallic like Earth.<br>• The flesh of an avocado is soft, but Earth's mantle is composed of solid rock. |
| | |  | **Display Slide 93.** Investigation 5: Earth's Internal Structure (1 min)<br><br>a. "Geologists use two different models to describe Earth's internal layers. One model, similar to our avocado Earth model has four layers: an inner core and an outer core, the mantle, and the crust. These layers are defined by their *chemical composition*."<br>b. "But when they're talking about plate tectonics, geologists use another model with five layers: an inner core, an outer core, the mesosphere, the asthenosphere, and the lithosphere. These layers are defined by their *physical properties*."<br>c. "Tectonic plates are actually part of the lithosphere, which is thicker than the crust and comprises all of the crust as well as the uppermost mantle that's stuck to it." |

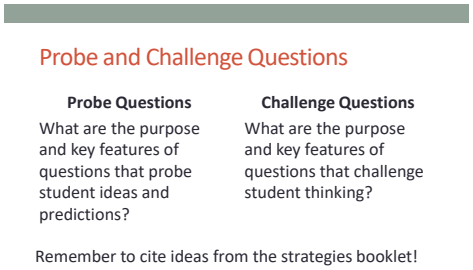
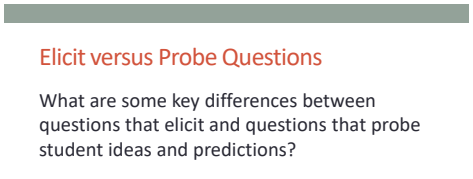
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 94.** Investigation 5: Earth's Internal Structure (Less than 1 min)<br><br>a. "To understand plate tectonics, it's also important to understand the different types of crust on Earth's surface that are part of the lithosphere. This map contrasts the thickness of oceanic crust and continental crust."<br>b. "*Oceanic crust* is composed of dense, heavy rock called *basalt* that is primarily volcanic rock. *Continental crust*, on the other hand, is composed of rock that is similar to granite but is lighter and less dense. Because of these differences in crustal composition, ocean basins are low places on Earth's surface that are filled with water, and continents are high places that rise above the oceans." |
| | |  | **Display Slide 95.** Investigation 5: Earth's Internal Structure (2 min)<br><br>a. "Most of Earth's tectonic plates are composed of both oceanic and continental crust."<br>b. "For example, the North American Plate on this map is made of continental crust in the west (under the United States) and the oceanic crust in the east (under the Atlantic Ocean). In contrast, the Pacific Plate is made up almost entirely of oceanic crust."<br>c. Point to the North American Plate and the Pacific Plate on the map and outline the crustal boundaries. |

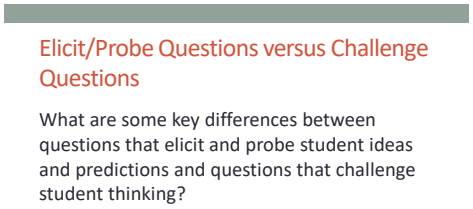
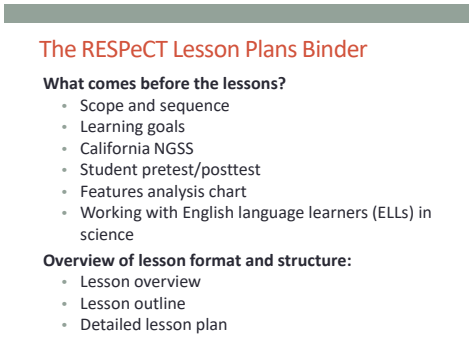
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 96.** Investigation 5: Earth's Internal Structure (1 min)<br><br>a. "The difference in density between oceanic crust and continental crust is very important in plate tectonics."<br><br>b. "New oceanic crust is formed where plates move away from each other. This process is called *seafloor spreading*. Where Earth's plates move toward each other, old oceanic crust returns to the mantle in a process called *seafloor subduction.* Old oceanic crust can sink back into the mantle because it's cold, heavy, and dense. But continental crust is less dense and too thick to sink into the mantle. This is why continents are relatively stable and don't sink below Earth's surface." |
| | | Reflect: Content Deepening Focus Question<br><br>What happens to Earth's surface that causes mountains to form? | **Display Slide 97.** Review: Content Deepening Focus Question (Less than 1 min)<br><br>a. Review the focus question on the slide.<br><br>b. "In our next content deepening session, we'll investigate how tectonic plates move and change Earth's surface. The information we gather will help us answer this question."<br><br>c. "Based on what we've learned so far, what initial ideas do you have for answering this question?" |

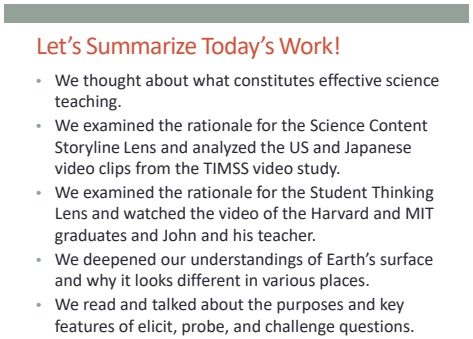
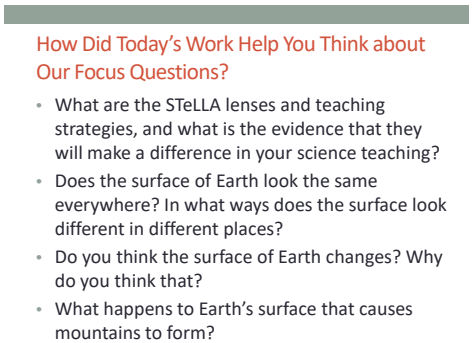
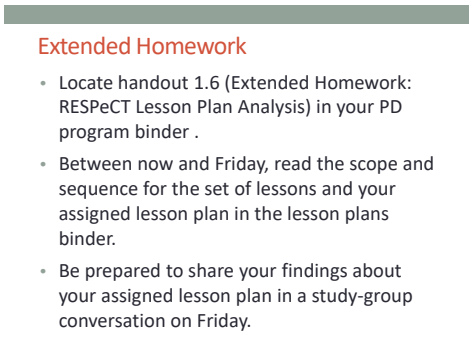
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | Unit Central Questions<br>Why isn't all of Earth's surface flat? What causes the surface to look different in different places? | **Display Slide 98.** Unit Central Questions (5 min)<br>a. "Based on today's investigations, what initial ideas do you have that might help us answer these questions?"<br>b. "We'll add to these ideas in our next content deepening session." |
| 2:00–2:10<br>10 min | **BREAK** | | |
| 2:10–3:00<br>50 min<br><br>**STL Strategies: Elicit, Probe, and Challenge Questions**<br><br>Slides 99–105 | **Purpose**<br>• Begin to develop shared understandings of the Student Thinking Lens (STL) and STeLLA strategies 1, 2, and 3 (elicit, probe, and challenge questions).<br>**Content**<br>• 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 | Lesson Analysis Focus Question<br>What are the STeLLA lenses and teaching strategies, and what is the evidence that they will make a difference in your science teaching?<br>  | **Display Slide 99.** Lesson Analysis Focus Question (1 min)<br>a. Read the focus question on the slide.<br>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."<br>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." |

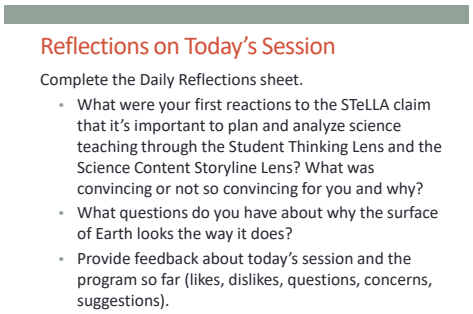
| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | video footage of these strategies in action.<br>• Elicit questions are designed to reveal a variety of student ideas, misconceptions, and experiences before they learn new content.<br>• Probe questions follow up on something a student has already said to find out more.<br>• Challenge questions are designed to push students toward more-scientific understandings by making new connections and changing their thinking.<br><br>**What Participants Do**<br>• Read about STeLLA strategies 1, 2, and 3 and write summaries on their blank STL Z-fold summary charts.<br>• Chart and discuss the purposes and key features of strategies 1, 2, and 3.<br>• Discuss key similarities and differences among the three strategies.<br><br>**Supplies**<br>• Chart paper and markers<br><br>**PD Resources**<br>• STeLLA strategies booklet<br>• STL Z-fold summary chart (blank copy in front pocket of PD binder) |  | **Display Slide 100.** Lesson Analysis Focus Question (1 min)<br><br>a. "Today we'll begin learning about three of the Student Thinking Lens teaching strategies.<br>b. Read the strategies highlighted on the slide.<br>c. "These three types of questions will help reveal, support, and challenge student thinking."<br>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." |
| | |  | **Display Slide 101.** Strategies 1, 2, and 3: Questions That Elicit, Probe, and Challenge Student Thinking (20 min)<br><br>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.<br>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.<br>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 |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | interpreted that differently."<br><br>**Display Slide 102.** Elicit Questions (5 min)<br><br>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.<br><br>b. Sample chart:<br><br>**Key Ideas about Elicit Questions**<br><br>**Purpose:** To reveal student ideas, predictions, misconceptions, and experiences *before* they learn about the content.<br><br>**Key features:**<br>• Asked anytime, but often at the beginning of a lesson<br>• Phrased in everyday language that students can understand even before studying the related content<br>• Addressed to multiple students (usually the whole class)<br>• Reveals a variety of student ideas<br>• Useful to teachers in adapting instruction<br>• Useful to students so they see that others have different ideas<br>• Can be a prediction<br>• Can set up a discrepant event |
| | |  | |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 103.** Probe and Challenge Questions (13 min)<br><br>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).<br><br>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 104.** Elicit versus Probe Questions (5 min)<br><br>a. **Turn and Talk:** "Discuss this question with an elbow partner."<br><br>b. **Whole-group share-out:** Invite participants to share their ideas with the group.<br><br>**Key ideas about elicit questions versus probe questions:**<br>• Elicit questions are addressed to the whole class; probe questions are addressed to individual students.<br>• Elicit questions are used before students have studied a concept; probe questions can be asked at any time.<br>• Elicit questions start a discussion; probe questions follow up on something a student has already said. |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | |  | **Display Slide 105.** Elicit/Probe Questions versus Challenge Questions (5 min)<br><br>a. **Turn and Talk:** "Discuss this question with your elbow partner."<br>b. **Whole-group share out:** Invite participants to share their ideas with the group.<br><br>**Key ideas about elicit/probe questions versus challenge questions:**<br>• Elicit and probe questions focus on understanding students' existing ideas rather than trying to change students' thinking.<br>• In contrast, challenge questions are designed to push students' thinking toward more-scientific understandings and support them in changing their thinking. |
| 3:00–3:30<br>30 min<br><br>**Wrap-Up: Summary, Homework, and Reflections**<br><br>Slides 106–110 | **Purpose**<br>• Summarize and reflect on key ideas from today's learning and foreshadow what will be addressed tomorrow and later in the week.<br><br>**What Participants Do**<br>• Review the lesson plans binder.<br>• Summarize today's learning and discuss the focus questions.<br>• Go over directions for an extended homework assignment |  | **Display Slide 106.** The RESPeCT Lesson Plans Binder (5 min)<br><br>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."<br>b. "But before we look at the assignment, let's review the organization and contents of the lesson plans binder."<br>c. Use the slide to guide participants through the binder contents. |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | related to the ECS lesson plans (content area 1).<br>• Write reflections on today's session.<br><br>**Handouts in PD Binder**<br>• 1.6 Extended Homework: RESPeCT Lesson Plan Analysis<br>• 1.7 Daily Reflections—Day 1<br><br>**PD Resources**<br>• RESPeCT lesson plans binder |  | **Display Slide 107.** Let's Summarize Today's Work! (5 min)<br><br>a. Remind participants of the various activities they've been involved in today.<br><br>b. **Foreshadow:** Let participants know that you're going to ask them to reflect on what they've learned from these activities. |
| | |  | **Display Slide 108.** How Did Today's Work Help You Think about Our Focus Questions? (10 min)<br><br>**Note:** If time is running short, you may want to skip the Turn and Talk or the entire slide.<br><br>a. **Turn and Talk:** "Discuss these questions with an elbow partner."<br><br>b. **Whole-group share-out:** Invite participants to share their ideas with the group. |
| | |  | **Display Slide 109.** Extended Homework (5 min)<br><br>a. Assign each participant one of the lessons in the Earth's Changing Surface 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.<br><br>b. If the study group is small, figure out who will be assigned an extra lesson (or when you, as the PD |

| PD Model: Time/Phase | Purpose, Content, and What Participants Do | Slides | Process |
|---|---|---|---|
| | | | leader, will cover any extra lessons).<br>c. If the study group is large, assign lessons to more than one teacher later in the sequence.<br>d. Go over the homework sheet (handout 1.6) with participants. If time allows, have them read the assignment sheet before discussing. |
| | |  | **Display Slide 110.** Reflections on Today's Session (5 min)<br>a. Review the questions on the Daily Reflections sheet (handout 1.7).<br>b. Ask participants to think about these questions and write down their reflections. |