RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	4	Day	2	STeLLA Strategy	STL Strategies 1, 2, and 3: Elicit, Probe, and Challenge Questions	Subject Matter Focus	Earth's Changing Surface

Focus Questions	• How can lesson analysis help us better understand how elicit, probe, and challenge questions can reveal and challenge student thinking? • What happens to Earth's surface that causes mountains to form? • Are the moving plates of Earth's crust involved in building up Earth's surface and forming mountains? If so, how? • What evidence can we find to support the idea that mountains form when Earth's crustal plates collide?
Main Learning Goals	Participants will understand the following: • Student thinking can be made more visible in science classrooms when the teacher asks questions that elicit and probe student ideas and predictions and challenge student thinking. • Lesson analysis allows us to slow down teaching so we can clarify our understandings of the distinct purposes of elicit, probe, and challenge questions and how they can be used effectively in science lessons. • Earth's outermost layer is made up of tectonic plates that float or ride on a hot, moving rock layer beneath them. Volcanic activity is one mechanism that builds up Earth's surface in some places. • Earth's tectonic plates move in different directions. They can collide (move toward each other), spread apart (move away from each other), or move side-to-side (slide past each other). Plate collision cause Earth's surface to build up, forming mountains and other surface features. • Mountains are formed when Earth's crustal plates move toward each other and collide.

Preparation	Materials	Videos
Daily Setup Tasks • Check that video clips are correctly linked to PowerPoint (PPT) slides. • Set up PowerPoint. • Make sure video clips play correctly with good sound. • Arrange furniture and food. • Arrange participant materials. • Put up posters and charts. **Planning and Preparation Tasks** • Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to the PPTs if needed. Modify text highlighted in light-blue font on slides and/or in PDLG to make it specific for your group.	**Posters and Charts** • STeLLA Framework and Strategies poster • Day-2 Agenda (chart) • Day-2 Focus Questions (chart) • Norms for Working Together (chart) • Effective Science Teaching chart (from day 1) • Strategy charts from day 1 (STL strategies 1–3) • Common Student Ideas chart • Parking Lot poster **Handouts in RESPeCT PD Binder Front Pocket** • Z-fold summary chart: Student Thinking Lens Strategies **Handouts in RESPeCT PD Binder, Day 2** • 2.1 Transcript for Video Clip 2.1 • 2.2 Transcript for Video Clip 2.2	• Video Clip 2.1: Nick interview, Torres classroom (elicit and probe questions); 2.1_stella2-04-torres4-SI_pre_nick_c1 • Video Clip 2.2: Torres classroom (probe and challenge questions); 2.2_stella2-04-torres4-L1_c1 • Video Clip 2.3: Torres classroom (probe and challenge questions); 2.3_stella2-04-torres4-L3_c1-c2 **Resources** • Stella2-04-torres4-SI_post_nick

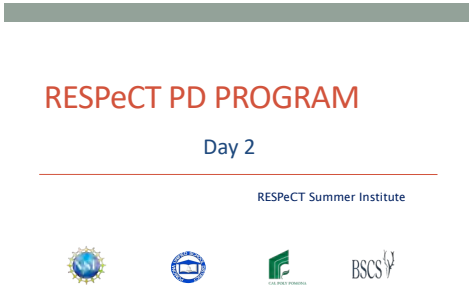
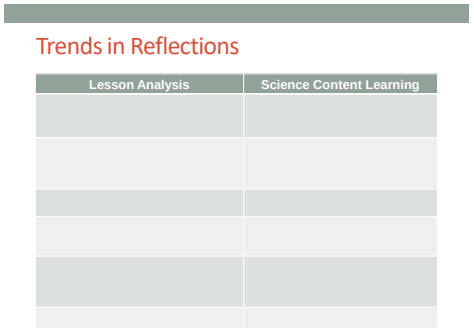
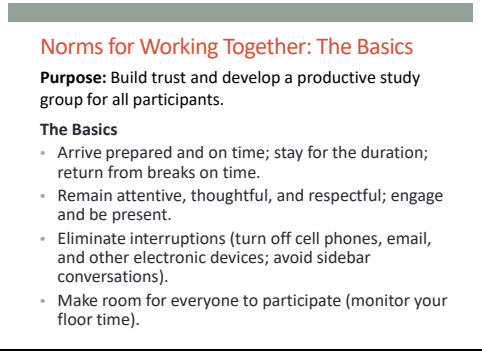
• Review the reflections from day 1 and create a summary slide.
• Cut apart the elicit-question cards from the PD leader master to pass out for practice interviews.
• Watch video clips and anticipate participant responses.
• Prepare charts for the day's agenda and focus questions.
• On chart paper, create a Common Student Ideas chart (see resources section in lesson plans binder) and post it at the front of the class. Make sure to leave space in the left-hand margin to apply sticker dots. This chart will be used during lesson analysis (slide 19).
• Review the activities for lessons 2b, 3a/b, and 4a/b in lesson plans binder.
• For content deepening:
  • Follow directions on ECS lesson handout 2.1 (Earth's Moving Mantle Demonstration) for setting up a thermal-convection apparatus. (**Note:** Start heating the vegetable oil at the beginning of the session to ensure that the liquid is already circulating by the time you begin the thermal-convection investigation.)
  • Photocopy the template (figure 4) on page 6 of handout 2.1 (1 copy per participant). Participants will use this template for sketching flow directions during the thermal-convection investigation.
  • Cut out enough construction-paper arrows (from handout 2.4) so that each pair of participants has 2 arrows.
	• 2.3 Transcript for Video Clip 2.3
	• 2.4 Arrows (2 per pair) (from ECS lesson 3a)
	• 2.5 Daily Reflections—Day 2
	
	Handouts in RESPeCT Lesson Plans Binder
	• 2.1 Earth's Moving Mantle Demonstration (from ECS lesson 2b)
	• 4.1 Map of Plate Boundaries around the World (from ECS lesson 4a)
	• 4.2 Physical Map of the World (from ECS lesson 4b)
	• 4.3 Volcanoes and Earthquakes around the World (from ECS lesson 4b)
	
	PD Leader Masters, Days 1–4
	• PD Leader Master: Elicit Question Cards—Earth's Changing Surface
	
	Supplies
	• Science notebooks
	• Chart paper and markers
	• Red and blue sticker dots (or pencils)
	• Science-lesson materials kit (Earth's changing surface)
	• For content deepening (thermal-convection apparatus from ECS lesson 2b):
	  • 1 glass bread loaf dish (1.5 liter)
	  • 2 ceramic coffee cups
	  • 1 small Sterno can or 2 small candles
	  • Vegetable oil (about 28-34 fl oz)
	  • Thyme (10 ml, or approx. 2 teaspoons)
	  • 1 metal spoon
	  • 1 box of matches
	  • 3 pieces of thin balsa wood (each 3 × 2 in and 1/16 in thick)
	• For content deepening (from ECS lessons 3a/b):
	  • Foam mats (2 per pair)
	  • Construction-paper arrows (2 per pair)
	
	PD Resources
	• STeLLA strategies booklet
	• RESPeCT PD program binder
	• RESPeCT lesson plans binder
	
	Resources in Lesson Plans Binder	

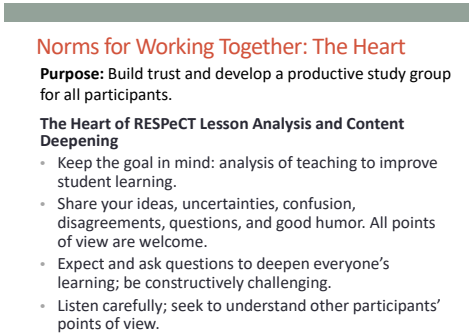
	Resources section: • Earth's Changing Surface Content Background Document • Common Student Ideas about Earth's Changing Surface	

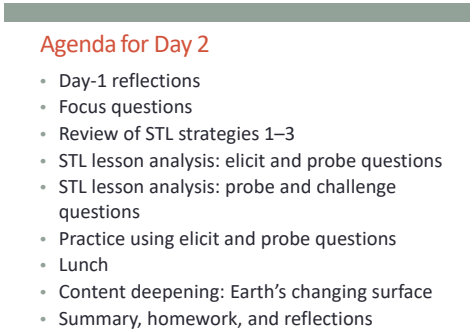
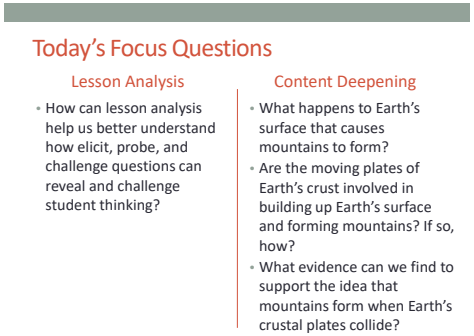
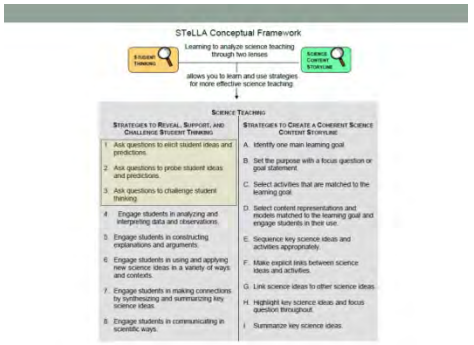
DAY 2 SESSION OUTLINE

Time	Activities	Purpose
8:00–8:35 35 min	**Getting Started: Housekeeping, Day-1 Reflections, Norms, Agenda, Focus Questions, Review STL Strategies**	• Build community by sharing participants' reflections from day 1 and reviewing/revising the norms. • Set the stage for a day of learning by introducing the focus questions for day 2 and reviewing the purposes and key features of elicit, probe, and challenge questions. (These strategies will be the focus of today's lesson analysis work.)
8:35–9:20 45 min	**STL Lesson Analysis: Elicit and Probe Questions**	• Begin to develop an understanding of the RESPeCT lesson analysis process. • Deepen understandings of elicit and probe questions (STL strategies 1 and 2) and how they reveal student thinking. • Deepen science-content knowledge of Earth's changing surface through lesson analysis.
9:20–11:20 120 min (Includes 10-min break)	**STL Lesson Analysis: Probe and Challenge Questions**	• Develop a deeper understanding of the RESPeCT lesson analysis process. • Deepen understandings of probe and challenge questions (STL strategies 2 and 3), how they reveal student thinking, and how they move student thinking forward. • Deepen science-content knowledge of Earth's changing surface through lesson analysis. • Understand that science-content knowledge is essential for using probe and challenge questions effectively in the classroom.
11:20–12:00 40 min	**Practice Using Elicit and Probe Questions: Interviews**	• Deepen understandings of elicit and probe questions. • Begin to develop the ability to ask elicit and probe questions effectively. • Appreciate that science-content knowledge is essential for using elicit and probe questions effectively in the classroom.
12:00–12:45 45 min	**LUNCH**	
12:45–3:15 150 min (Includes 10-min break)	**Content Deepening: Earth's Changing Surface**	• Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lessons 2b, 3a/b, and 4a/b.
3:15–3:30 15 min	**Wrap-Up: Summary, Homework, and Reflections**	• Summarize and reflect on the day's learning, including progress made in understanding Earth's changing surface, as well as the relationship between lesson analysis and asking effective elicit, probe, and challenge questions.

DAY 2

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
8:00–8:35 35 min **Getting Started** Slides 1–8	**Purpose** • Build community by sharing participants' reflections from day 1 and reviewing/revising the norms. • Set the stage for a day of learning by introducing the focus questions for day 2 and reviewing the purposes and key features of elicit, probe, and challenge questions. (These strategies will be the focus of today's lesson analysis work.) **Content** • Norms enable the group to build trust and productivity. • Probe questions seek to understand what students are saying/writing and encourage them to explain their ideas more clearly or fully (**not** to change their thinking). • Challenge questions seek to engage students in ways that will challenge them to think, reconsider their ideas, change their initial ideas, and move toward more-scientific understandings. **What Participants Do** • Discuss the reflections from day 1 and how the group is doing with the norms. • Study a short transcript example from the STeLLA strategies booklet to identify probe and		**Display Slide 1.** RESPeCT PD Program (3 min) a. Take care of any housekeeping issues.
			**Display Slide 2.** Trends in Reflections (5 min) a. Give participants time to review your summary of their reflections from day 1 and offer reactions and comments or ask follow-up questions.
			**Display Slide 3.** Norms for Working Together: The Basics (5 min) a. **Provide context:** "Since we'll be working together throughout the Summer Institute and the academic year, we need norms that will enable us to build trust and productivity as a group. Today we'll start our analysis of other teachers' classroom videos. In the fall, we'll analyze videos from each other's classrooms. For this work to be

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	challenge questions. • Review and contrast the purposes and key features of probe and challenge questions. **Posters and Charts** • STeLLA Framework and Strategies poster • Norms for Working Together (chart) • Day-2 agenda (chart) • Day-2 focus questions (chart) **PD Resources** • STeLLA strategies booklet • Half-page sheet of norms (pasted into science notebooks)		meaningful, we'll need to push and challenge each other. This will require mutual respect and a common understanding of our goals." b. "Do you want to clarify or revise any of these norms?" **Note:** Have participants locate the half-page sheet of norms they pasted into their science notebooks on day 1. Remind them to leave space for revising the norms. c. Encourage participants to ask clarifying questions regarding the meaning of any of the norms and jot notes in their science notebooks. d. Ask participants if they're willing to live with these norms today, and let them know they'll have an opportunity to revise them tomorrow. Remind them of this at the end of the session.
			**Display Slide 4.** Norms for Working Together: The Heart (5 min) a. "Now let's review the norms at the heart of the RESPeCT PD program." b. "Do you want to clarify or revise any of these norms?" c. "Do you want to add any norms to this list?" d. Ask participants if they're willing to live with these norms today, and announce that they'll have an opportunity to revise them tomorrow.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 5.** Agenda for Day 2 (Less than 1 min) a. Talk through the agenda for the day.
			**Display Slide 6.** Today's Focus Questions (1 min) a. Introduce the focus questions that will guide today's session. b. "Each day we're going to have at least one lesson analysis focus question and one content deepening focus question." c. "Here are our focus questions for today's session."
			**Display Slide 7.** The STeLLA Conceptual Framework (Less than 1 min) a. Point out the strategies highlighted on the slide. b. "During today's session, we'll focus again on the first three Student Thinking Lens strategies: elicit, probe, and challenge questions."

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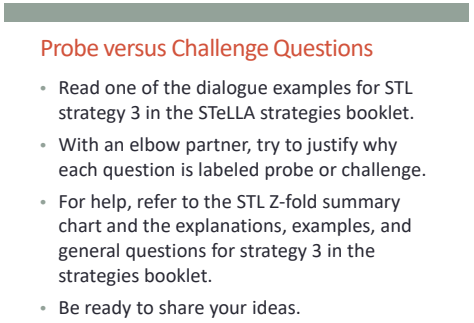
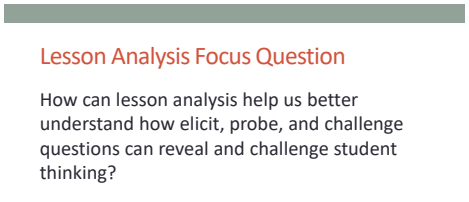
			**Display Slide 8.** Probe versus Challenge Questions (15 min) a. Have participants look in the STeLLA strategies booklet at a dialogue example for STL strategy 3 that highlights probe and challenge questions. b. The purposes of this activity are as follows: 1. To get participants' heads back into the questioning strategies discussed on day 1. 2. To make sure participants understand the distinct purposes of probe and challenge questions: • **Probe questions** seek to understand what students are saying/writing and encourage them to explain their ideas more clearly or fully (not to change their thinking). • **Challenge questions** seek to engage students in ways that will challenge them to think, reconsider their ideas, change their initial ideas, and move toward more-scientific understandings.
8:35–9:20 45 min **STL Lesson Analysis: Elicit and Probe Questions**	**Purpose** • Begin to develop an understanding of the RESPeCT lesson analysis process. • Deepen understandings of elicit and probe questions (STL strategies 1 and 2) and how they reveal student thinking. • Deepen science-content knowledge of Earth's changing surface through lesson analysis.		**Display Slide 9.** Lesson Analysis Focus Question (Less than 1 min) a. "Today we'll explore this focus question: How can lesson analysis help us better understand how elicit, probe, and challenge questions can reveal and challenge student thinking?" b. "But first let's discuss what lesson analysis involves."

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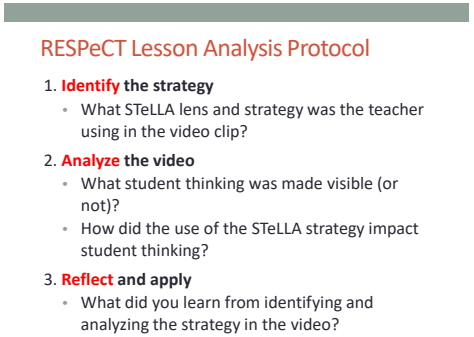
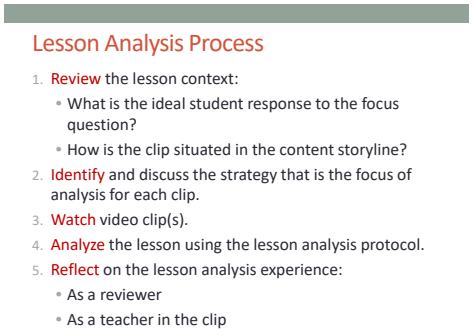
Slides 9–15	**Content** • Elicit questions are designed to reveal a variety of ideas, misconceptions, and experiences that students bring with them when learning new science content. • Probe questions follow up on student statements to find out more about what students are trying to say. • Lesson analysis involves a three-step protocol: (1) Identify the strategy, (2) analyze the use of the strategy in classroom videos, and (3) reflect on learning from the lesson analysis. • The lesson analysis protocol follows a five-step process: (1) Review the lesson content, (2) identify and discuss the STeLLA strategy in focus, (3) watch the video clip, (4) analyze the clip using the three-step protocol, and (5) reflect on the lesson analysis experience. • The analysis phase of lesson analysis involves making claims related to the STeLLA framework and providing evidence and reasoning to		**Display Slide 10.** RESPeCT Lesson Analysis Protocol (Less than 1 min) a. "This is the three-step protocol that will guide our video-based lesson analysis work. Although we'll follow the protocol a bit more loosely during the Summer Institute, we'll rely heavily on this explicit three-step format as we move into the fall study groups." b. Review the steps on the slide; then tell participants, "Framing our analysis in this way and following specific steps will help us focus more holistically on the teaching and the impact of the STeLLA strategies on student thinking and learning and the storyline students are constructing (i.e., the Student Thinking Lens and the Science Content Storyline Lens)."
			**Display Slide 11.** Lesson Analysis Process (Less than 1 min) a. "The lesson analysis protocol includes this five-step process." b. Review the steps on the slide and note that in the study groups, these steps will be followed more explicitly than they will be during the Summer Institute.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	support the claims. **What Participants Do** • Review the lesson analysis video viewing basics. • Use the five-step lesson analysis process to identify and analyze the use of elicit and probe questions in a student interview (video clip 1). **Videos** • Video Clip 2.1, Nick interview **Handouts in PD Binder** • 2.1 Transcript for Video Clip 2.1 **Supplies** • Science notebooks **PD Resources** • STeLLA strategies booklet • STL Z-fold summary chart	Lesson Analysis: Viewing Basics • **Viewing basic 1:** Look past the trivial, or little things, that bug you. • **Viewing basic 2:** Avoid the "This doesn't look like my classroom!" trap. • **Viewing basic 3:** Avoid making snap judgments about the teaching or learning in the classroom you're viewing. **Note:** Find out more about the viewing basics on page 1 of the STeLLA strategies booklet.	**Display Slide 12.** Lesson Analysis: Viewing Basics (2 min) a. **Ask:** "Why is each of these viewing basics important? Which will be hardest for you?" b. Tell participants they can find further details on the viewing basics in the STeLLA strategies booklet and refer to this information later. c. **Highlight:** "The videos we'll be viewing throughout the program aren't necessarily exemplary, but rather they provide real-world examples of teachers implementing the STeLLA strategies. Examples like these deepen our thinking because we can see the sometimes unintended results of teacher decisions and consider missed opportunities." d. **Honor the videocase teachers!** All of these courageous teachers are not only working hard to improve their own teaching practice but are also willing to make their practice public so that others can learn from it. None of them would claim to be exemplary science teachers.
		Our First Video Clip Video Clip 1 **Context:** • An interview with a student (Nick) before the teacher begins instruction on Earth's changing surface. • Read the context at the top of the video transcript (handout 2.1 in your PD program binder). • Nick and the interviewer refer to a relief map of the United States that shows various topographical features.	**Display Slide 13.** Our First Video Clip (2 min) a. Describe the context of the first video clip participants will watch. (See the top of the transcript—handout 2.1 in the PD program binder.) b. "This student interview showcases the use of elicit and probe questions. Even though this clip doesn't take place in the context of an actual classroom, the idea is to look at the quality and form of the questions. Our second video clip will feature probe and challenge questions in a

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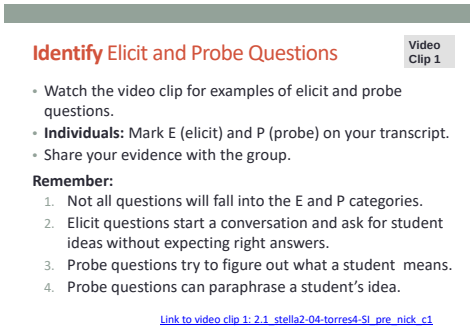
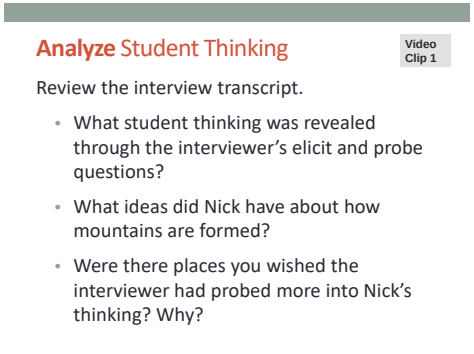
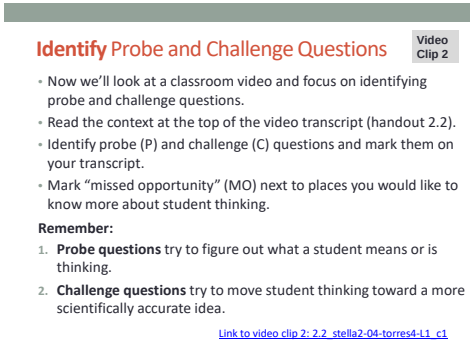
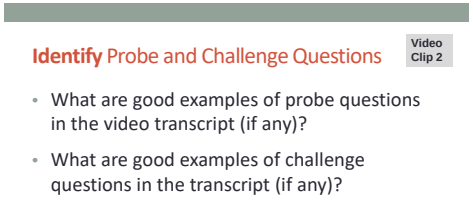
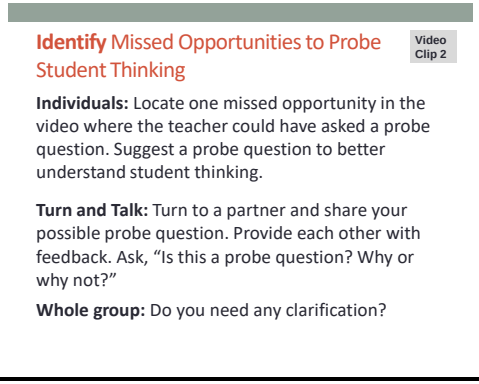
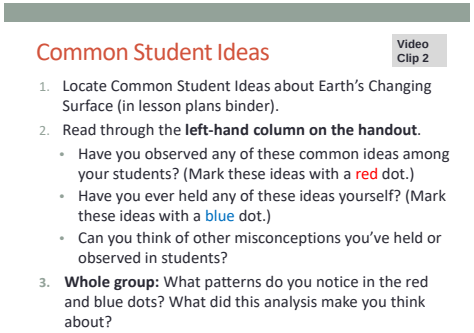
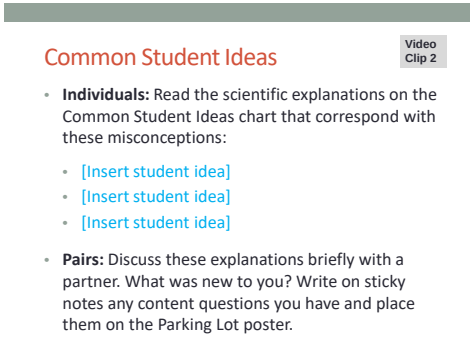
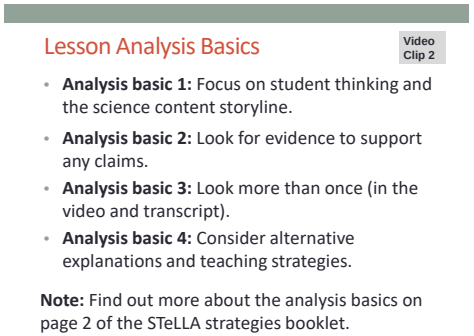
			classroom context."
			**Display Slide 14.** Identify Elicit and Probe Questions, Video Clip 1 (20 min) a. Provide instructions for watching video clip 1 and using the transcript (handout 2.1) to identify questions that elicit (E) and probe (P) student ideas and predictions. b. Remind participants that the purpose of watching the video clip is to deepen their shared understandings of these strategies and to build their individual and collective lesson analysis skills. c. **Individuals:** Allow time for participants to review the video transcript and mark E and P questions. d. **Whole group:** Discuss what participants found in the transcript. Encourage them to use evidence from the transcript and reasons from their Z-fold summary charts or the STeLLA strategies booklet to support their ideas. Participants should work to differentiate elicit and probe questions and distinguish them from other types of teacher questions or statements.
			**Display Slide 15.** Analyze Student Thinking, Video Clip 1 (20 min) a. Give participants time to review the video transcript and develop an answer to one of the analysis questions on this slide. Encourage them to write down their answers in their science notebooks. b. For this first video analysis, do a round-robin and have each participant share. Ask probe and

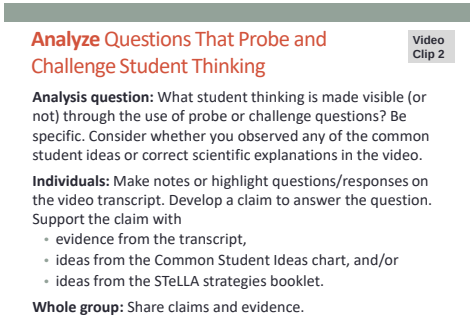
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			challenge questions to support participants in communicating their ideas clearly and completely: • **Probe question:** "Can you say more about what you mean by …?" • **Challenge question:** "Can you point to a specific place in the transcript that supports your idea?" c. As participants share, encourage others to respond by asking questions like these: • Do others have additional evidence to support (or challenge) this idea? • Do others have a different interpretation?
9:20–11:20 120 min (Includes 10-min break) **STL Lesson Analysis: Probe and Challenge Questions** Slides 16–26	**Purpose** • Develop a deeper understanding of the RESPeCT lesson analysis process. • Deepen understandings of probe and challenge questions (STL strategies 2 and 3), how they reveal student thinking, and how they move student thinking forward. • Deepen science-content knowledge of Earth's changing surface through lesson analysis. • Understand that science-content knowledge in essential for using probe and challenge questions effectively in the classroom. **Content** • Probe questions follow up on student statements to find out		**Display Slide 16.** Identify Probe and Challenge Questions, Video Clip 2 (15 min) a. Provide instructions for watching video clip 2 and using the transcript (handout 2.2) to identify questions that probe student ideas and predictions and challenge student thinking. b. Encourage participants to refer to the strategy charts from day 1 (STL strategies 1–3), their Z-fold summary charts, and the STeLLA strategies booklet for help differentiating probe and challenge questions. Remind them that other types of questions (such as elicit questions) may appear in this video clip. c. **Set the context:** Read the context for video clip 2 (at the top of the transcript). d. Show the video clip and allow time for participants to study the transcript before advancing to the next slide.

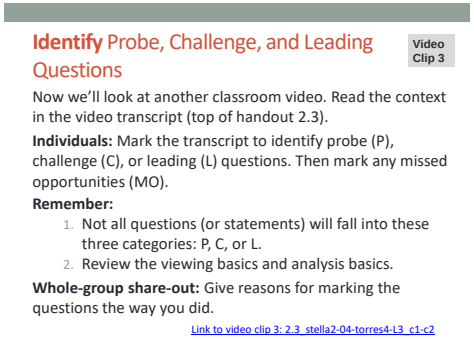
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	more about what they're trying to say. • Challenge questions are designed to push students to think hard, make new connections, change their ideas, and move toward more-scientific understandings. • The lesson analysis process involves making claims related to the STeLLA framework and providing evidence and reasoning to support those claims. • Viewing basics and analysis basics guide the lesson analysis process. **What Participants Do** • Identify probe and challenge questions in a classroom video (video clip 2). • Review common student ideas about the water cycle. • Analyze the use of probe and challenge questions in a classroom video (video clip 2). • Identify and analyze the use of probe and challenge questions in another classroom video (video clip 3). • Discuss the importance of science-content knowledge in using probe and challenge questions effectively in the classroom. **Posters and Charts** • Strategy charts from day 1 (STL strategies 1–3)		**Display Slide 17.** Identify Probe and Challenge Questions, Video Clip 2 (5 min) a. After each suggested probe or challenge question, ask participants the following: • "What makes this a probe/challenge question?" • "Did others mark this as a probe/challenge question?" • "Can you point to any of our resources (the Z-fold summary chart, our strategy charts from day 1, or the STeLLA strategies booklet) to support your answer?" b. Don't worry about debate and lack of agreement on some questions. **The important thing** is that participants clearly understand the difference between the purposes of probe and challenge questions. Sometimes it's hard to tell whether the teacher in the video intended to find out what a student meant (probe) or move student thinking toward more-scientific understandings (challenge). The teacher may also be asking elicit questions to reveal student ideas and misconceptions.
			**Display Slide 18.** Identify Missed Opportunities to Probe Student Thinking, Video Clip 2 (10 min) a. **Individuals:** "Identify a missed opportunity for a probe question in the video transcript." b. **Turn and Talk:** Have participants pair up and discuss their suggested probe questions. Listen to their conversations to assess whether they truly comprehend that a probe question is designed to help them understand what students

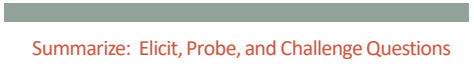
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	• Common Student Ideas chart • Parking Lot poster **Videos** • Video Clip 2.2, Torres classroom • Video Clip 2.3, Torres classroom **Handouts in PD Binder** • 2.2 Transcript for Video Clip 2.2 • 2.3 Transcript for Video Clip 2.3 **Supplies** • Red and blue sticker dots (or pencils) • Sticky notes **PD Resources** • STeLLA strategies booklet • STL Z-fold summary chart **Resources in Lesson Plans Binder** *Resources section:* • Common Student Ideas		are thinking. c. **Whole-group share-out:** Participants may need guidance about when to ask probe questions. Remind them that probe questions are appropriate when students make vague or abbreviated statements, or when they simply use a vocabulary term without saying what it means. Do they really understand the term or concept, or do they have misconceptions? Ask a probe question to find out! d. **Remind participants:** "Don't probe everything a student says. Just probe responses that seem relevant to the lesson's main learning goal and might reveal interesting student thinking."
	10-MINUTE BREAK		

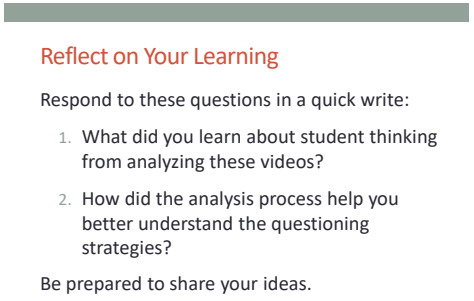
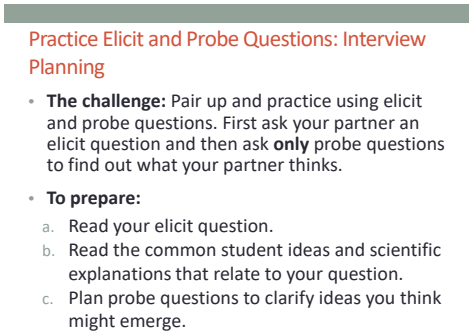
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 19.** Common Student Ideas, Video Clip 2 (12 min) a. "Now let's consider some commonly held student ideas (misconceptions). Then we can analyze whether any of these ideas appear in our video clips." b. Have participants locate the Common Student Ideas chart in the resources section of their lesson plans binders. c. "This Common Student Ideas chart shows some commonly held student ideas that are interesting but aren't scientifically accurate." d. **Individuals:** Have participants mark with a red sticker dot any ideas they've observed among their students, and mark with a blue sticker dot any ideas they've had themselves. e. **Pairs:** Have participants discuss their observations with a partner. f. **Whole group:** Ask participants to share which ideas they've observed in their students and themselves. During this share-out, apply sticker dots to the Common Student Ideas chart at the front of the room as participants to highlight patterns in the results. Then discuss the following questions: • "What conceptual patterns do you notice in the red and blue dots?" • "What reactions do you have to this analysis? What did it make you think about?" **Note:** If time is short, skip this pattern analysis and discussion. g. "We've recognized these common ideas in students or held them ourselves. It's important to

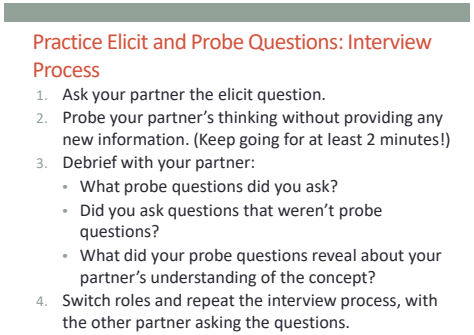
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			be aware of them when we're analyzing student thinking in the video clips or planning and teaching lessons in the future." h. "Now let's look for evidence of these common student ideas in a video clip."
			**Display Slide 20.** Common Student Ideas, Video Clip 2 (10 min) a. Select three or four student misconceptions from Common Student Ideas chart and insert them on the PPT. At least one of the misconceptions should be clearly visible in the video clip. b. **Individuals:** "Read the scientific explanations on the Common Student Ideas chart that correspond with the student misconceptions on the slide." c. **Pairs:** "Discuss these explanations briefly with a partner. What was new to you? Write on sticky notes any content questions you have and place the notes on the Parking Lot poster."
			**Display Slide 21.** Lesson Analysis Basics (5 min) a. "Before we analyze the video clip, let's think about our lesson analysis process." b. Review the analysis basics on the slide. **Note:** Direct participants to page 2 in the strategies booklet if they have specific questions that require more information. c. **Why the analysis basics are important:** "The analysis basics will help us dig deeper and learn more from our videocase analyses while keeping us focused on the ultimate goal of improved student learning."

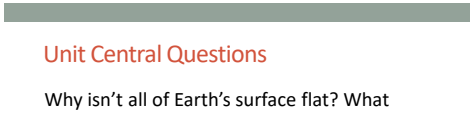
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			Note: This lesson analysis process is **not** about critiquing teachers but about improving student learning. d. "We'll use a more structured lesson analysis protocol when we begin reviewing each other's videos in the fall study-group sessions."
			**Display Slide 22.** Analyze Questions That Probe and Challenge Student Thinking, Video Clip 2 (15 min) a. Remind participants of the purposes of video analysis: to deepen understandings of STeLLA strategies; to develop their ability to analyze student thinking; and, ultimately, to improve student learning. b. **Tell participants:** "Remember to refer to your Common Student Ideas chart as you analyze the video clip." c. **Individuals:** Review the slide instructions before participants begin working independently on the tasks. d. **Whole group:** • Have several participants share their claims and evidence. • **Ask:** "Did you recognize any of the common student ideas in the students' responses?" • **Ask:** "What probe or challenge questions might you ask to better understand student thinking?" **Note:** Remember to use probe and challenge questions as you interact with participants.

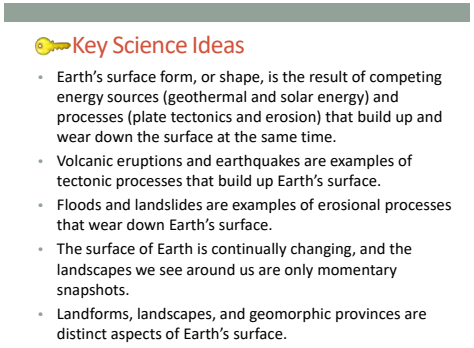
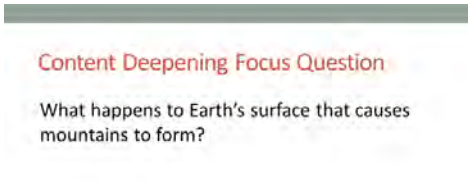
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 23.** Identify Probe, Challenge, and Leading Questions, Video Clip 3 (15 min) a. Read the context for this video clip (at the top of the transcript). b. Provide instructions for watching video clip 3 and using the transcript (handout 2.3) to identify questions that probe student ideas and predictions and challenge student thinking. **Participants should also be on the lookout for leading questions and missed opportunities.** (**Note:** Leading questions provide hints or make it easy for students to give the "right" answer.) Remind participants that other types of questions (such as elicit questions) may appear in this video clip. c. **Individuals:** Review the slide instructions before participants begin working independently on the tasks. d. **Whole group:** • Challenge participants to clearly state their reasons for identifying a question as probe, challenge, or leading. • Encourage participants to provide evidence from the STeLLA strategies booklet to support their claims.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 24.** Analyze Student Thinking, Video Clip 3 (15 min) a. **Emphasize:** "Remember to refer to your Common Student Ideas chart as you analyze the video." b. **Individuals:** Review the slide instructions before participants begin working independently on developing a claim to answer the analysis question. c. **Whole group:** • Have several participants share their claims and evidence. • **Ask:** "Did you recognize any of the common student ideas in the students' responses?" • **Ask:** "What probe or challenge questions might you ask to better understand student thinking?" **Note:** Remember to use probe and challenge questions as you interact with participants.
			**Display Slide 25.** Summarize: Elicit, Probe, and Challenge Questions (3 min) a. Pose the first question on the slide. If participants need support, point them to the descriptions of strategies 1, 2, and 3 in the STeLLA strategies booklet (especially the Summary of STeLLA Student Thinking Lens Strategies). b. Pose the second question. Do participants come up with the idea that science-content knowledge is essential for asking good elicit, probe, and challenge questions?

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			c. Use the rest of the time to highlight the importance of knowing science content and being aware of common student ideas.
			**Display Slide 26.** Reflect on Your Learning (5 min) a. Ideally, participants will first respond to the questions in a quick write and then share their ideas with the group. But if time is running short, you can have them simply think for a minute and then share their ideas. But be sure to give them time to think before opening up the discussion.
11:20–12:00 40 min **Practice Using Elicit and Probe Questions: Interviews** Slides 27–29	**Purpose** • Deepen understandings of elicit and probe questions. • Begin to develop the ability to ask elicit and probe questions effectively. • Appreciate that science-content knowledge is essential for using elicit and probe questions effectively in the classroom. **Content** • Understanding the purposes and key features of elicit and probe questions is essential for implementing the STeLLA questioning strategies effectively		**Display Slide 27.** Practice Elicit and Probe Questions: Interview Planning (10 min) a. **Describe the challenge:** "Next, you and a partner will practice using elicit and probe questions by interviewing each other. The challenge is to ask your partner an elicit question and then follow up by asking **only** probe questions." b. Give each participant a different elicit question (from the PD leader master cards). c. Direct participants to prepare for the interviews by following the slide instructions. **Note:** Participants may refer to the Common Student Ideas chart as a resource for this activity.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	in the classroom. **What Participants Do** • Consider possible responses an elicit question (related to the water cycle) might produce, and plan probe questions to follow up on these responses. • Work in pairs, taking turns being the interviewer and asking each other an elicit question and then following up with only probe questions. • Participate in a group discussion afterward that focuses on the difficult aspects of the pairs work and the interesting thinking it revealed. **Posters and Charts** • Common Student Ideas chart **PD Leader Masters** • PD Leader Master: Elicit Question Cards (cut apart) **Resources in Lesson Plans Binder** *Resources section:* • Common Student Ideas	 	**Display Slide 28.** Practice Elicit and Probe Questions: Interview Process (15 min) a. Review the instructions on the slide. b. "Each interviewer will have 5 minutes to ask questions. Try to keep going with your probe questions for at least 2 minutes." c. **Interviewees:** "Don't pretend to be an elementary student; be yourself. Help your partner by pushing yourself to explain things in more depth than you actually understand. Try to come up with possible explanations that go beyond the surface vocabulary. Don't worry about being wrong; this will actually make the task more like what you might encounter in the classroom." **Display Slide 29.** Group Discussion (15 min) a. **Whole group:** Discuss the questions on the slide. b. If there's time, ask participants, "How might it help your teaching to do more of this type of practice (with a partner or small group)?"
12:00–12:45 45 min	**LUNCH**		

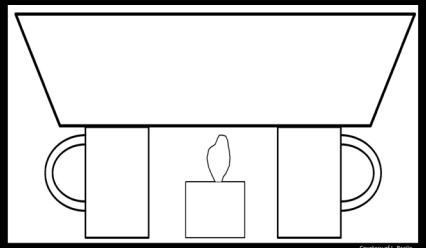
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
12:45–3:15 150 min (Includes 10-min break) **Content Deepening: Earth's Changing Surface** Slides 30–78	**Purpose** • Deepen participants' science-content knowledge of Earth's changing surface by conducting investigations from ECS lessons 2b, 3a/b, and 4a/b. **Content** • Earth's surface form is the result of competing geothermal and solar energy sources, as well as tectonic and erosional processes that build up and wear down the surface at the same time. • Earth's surface is continually changing, and the landscapes we see around us are only momentary snapshots. • Landforms, landscapes, and geomorphic provinces are distinct aspects of Earth's surface. **What Participants Do** • Explore and discuss key science ideas behind ECS lessons. • Apply content learning to answer the focus questions for lessons 2a, 3a/b, and 4a/b. **Handouts in Lesson Plans Binder** • 2.1 Earth's Moving Mantle Demonstration (from ECS lesson 2b) • 4.1 Map of Plate Boundaries around the World (from lesson	  	**Display Slide 30.** Content Deepening: Earth's Changing Surface (Less than 1 min) a. **Transition:** This slide marks the transition to the content deepening work. **Note:** Throughout this content deepening phase, refer as needed to 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 31.** Today's Content Deepening: (Less than 1 min) a. "Today's content deepening will focus on science ideas about Earth's changing surface from ECS lessons 2a, 3a/b, and 4a/b." **Display Slide 32.** Unit Central Questions (Less than 1 min) a. Review the unit central questions on the slide. b. Remind participants that these questions will guide student learning throughout the entire series of ECS lessons. c. "Keep in mind that our content deepening investigations this week will help us answer these questions."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	4a) • 4.2 Physical Map of the World (from lesson 4b) • 4.3 Volcanoes and Earthquakes around the World (from lesson 4b) **Supplies** • Science notebooks • Chart paper, markers • Science-lesson materials kit (Earth's changing surface) • Thermal-convection apparatus (from ECS lesson 2b) (see Supplies section on overview page) • Foam mats (2 per pair) (from lessons 3a/b) • Construction-paper arrows (2 per pair) (from lessons 3a/b) **PD Resources** • RESPeCT lesson plans binder **Resources in Lesson Plans Binder** *Resources section:* • Content background document • Common Student Ideas *Pretabs section:* • Earth's Changing Surface: Learning Goals for Students and Teachers		**Display Slide 33.** Key Science Ideas (1 min) a. Review the key science ideas on the slide that were developed during the previous content deepening session. b. "The fundamental theme behind the ECS unit is that Earth's surface form is the result of competing energy sources and processes that build up and wear down the surface at the same time."
			**Display Slide 34.** Earth's Changing Surface: Lesson 2b (Less than 1 min) a. "First, we'll explore ideas about Earth's changing surface from lesson 2b, focusing on an investigation of thermal convection."
			**Display Slide 35.** Content Deepening: Focus Question 1 (1 min) a. Review the focus question on the slide from the previous session. b. "This focus question from ECS lesson 2a will guide student learning throughout lesson 2b as well." c. "What initial ideas did we come up with in our previous content deepening session for

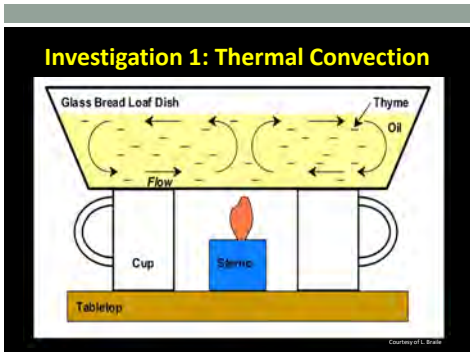
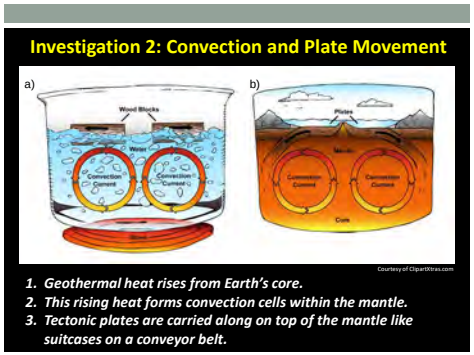
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			answering this question?" d. Highlight the key idea that volcanic eruptions are involved in forming mountains as layers of lava, ash, and other materials build up Earth's surface over time. e. "In our previous session, we also learned about tectonic plates. These crustal plates are broken into interlocking sections that fit together like puzzle pieces. In today's investigation, we'll explore the movement of these plates and consider how they might be involved in mountain formation."
			**Display Slide 36.** Investigation 1: Thermal Convection (4 min) a. Ask participants to bring their notebooks and pencils to the front of the room and gather around the thermal-convection apparatus. **Note:** You should already have set up the apparatus in advance and started heating the vegetable oil at the beginning of the session to ensure that it's properly heated and circulating when the investigation begins. b. Divide the group into pairs. Direct participants to examine the apparatus and discuss their observations with their partners.

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

		Investigation 1: Thermal Convection
		• What does each of these items represent in relation to Earth?
		  • Pieces of wood
		  • Vegetable oil
		  • Heat source
		• Do you think the heat will cause any changes to occur in the system? If so, what do you think will change?
			Display Slide 37. Investigation 1: Thermal Convection (5 min)
			a. Read through the questions on the slide.
			b. **Pairs:** "Discuss these questions with your partners and then write down your answers in your science notebooks."

		Investigation 1: Thermal Convection 	**Display Slide 38.** Investigation 1: Thermal Convection (1 min) a. Distribute copies of the convection template (figure 4) from ECS lesson handout 2.1 (Earth's Moving Mantle Demonstration). b. Inform participants that they'll use this template to make a sketch of the oil-flow directions in the baking dish.

		Investigation 1: Thermal Convection
		1. Using the convection template, draw a picture of what's happening in the baking dish as the oil is heated from below.
		2. Look at the dish from the top and the sides. Describe the patterns of movement you observe.
		  • Where do you observe upward flow in the oil? What about sideways flow? Downward flow?
		  • What's happening to the wood pieces and the thyme?
		  • How might these patterns of movement relate to tectonic plates on Earth?
			Display Slide 39. Investigation 1: Thermal Convection (8 min)
			a. Read through the instructions on the slide.
			b. "Work with your partner to draw a sketch of what's happening in the baking dish. Then discuss the questions on the slide and record your answers in your notebooks."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 40.** Investigation 1: Thermal Convection (5 min) a. Have participants to return to their seats. Then draw their attention to the diagram on the slide. b. **Ask:** "Do your sketches of the oil-flow directions in the baking dish look something like this illustration?" c. **Whole-group discussion:** Call on pairs to share some of their observations of the oil flow in the baking dish and the patterns of movement they recorded in their science notebooks. d. "So how do you think the patterns of movement in this experiment might relate to tectonic plates on Earth?"
			**Display Slide 41.** Investigation 2: Convection and Plate Movement (8 min) a. "The diagrams on this slide illustrate thermal convection in a pot of boiling water and within Earth's mantle." b. Read the key science ideas at the bottom of the slide and explain that this is the most widely accepted theory of how tectonic plates move around Earth's surface. c. "How do you think this theory relates to the thermal-convection investigation we just completed? Let's hear a few of your ideas." d. Explain that density plays a very important role in thermal convection. Like oil in a baking dish or water in a pot being heated from below, as the

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			bottom layer of rock in the mantle absorbs heat from Earth's core, it expands and becomes less dense. This causes the rock to rise toward the surface, or away from the center of Earth. When it reaches the surface, heat is released, and the rock begins to cool. As it cools and contracts, the density increases, and the rock sinks back toward the center of Earth, pushing the newly heated, less dense rock out of the way. The newly heated rock continues rising toward the surface, while the cooler rocker begins to heat again. This is the basic process involved in a convection cell. e. "The rotating convection cell in the mantle (or asthenosphere) exerts a drag force on the overlying crust (or lithosphere). This drag force pulls the overlying tectonic plates along like suitcases on an airport conveyer belt, or pieces of wood floating on vegetable oil in our thermal-convection model." f. Emphasize that the thermal-convection model can promote a significant misconception that Earth's mantle is composed of liquid like vegetable oil in a baking dish or water in a pot. But the mantle is **NOT** liquid. It consists of solid, dense, heated rock that can deform or flow very slowly, much like playdough or warm wax. Many people think that the mantle is a pool of liquid lava, but this is also a misconception. The mantle is composed of solid, hot, gooey rock that is capable of flowing very slowly, like the growth rate of a fingernail.

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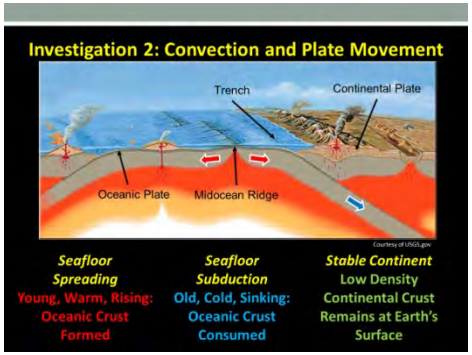
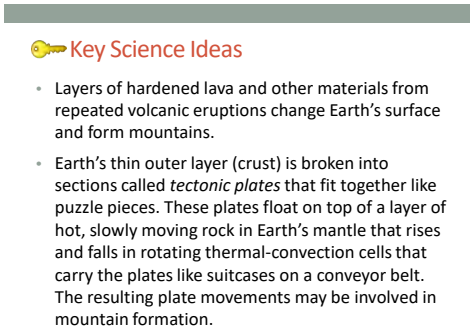
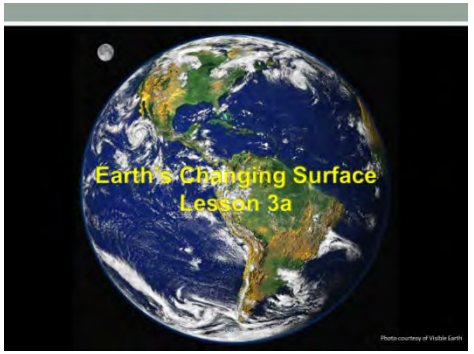
			**Display Slide 42.** Investigation 2: Convection and Plate Movement (1 min) a. "The illustration on this slide shows how mantle convection leads to plate tectonics." b. "Above the rising layer of mantle rock in a convection cell, tectonic plates are pulled apart, and new, warm crust is formed in the gap. This process is called *seafloor spreading*." c. "Above the falling layer of mantle rock in a convection cell, tectonic plates are pushed together, and old, cold crust is pulled back into the mantle. This process is called *seafloor subduction*." d. "While old, cold oceanic crust can sink back into the mantle, thicker continental crust is too low in density to sink. Oceanic crust is recycled over time, but continental crust stays afloat, riding on the mantle like pieces of balsa wood floating on vegetable oil, or whipped cream sitting on top of a latte."
			**Display Slide 43.** Reflect: Content Deepening Focus Question 1 (5 min) a. Review the focus question on the slide. b. "What ideas did our thermal-convection investigations give you for answering this question? Do you think thermal convection and the movement of tectonic plates might be involved in mountain building?" c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share. d. During this discussion, record key ideas on chart

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			paper.
			**Display Slide 44.** Key Science Ideas (2 min) a. Review the key science ideas on the slide that provide an initial answer to the focus question. Emphasize that participants' observations and evidence from volcano and tectonic-plate investigations helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Ask participants to copy these ideas into their science notebooks under the focus question. d. Note that more information is needed to determine exactly how volcanoes and tectonic plates cause mountains to form.
	10-MINUTE BREAK		
			**Display Slide 45.** Earth's Changing Surface: Lesson 3a (Less than 1 min) a. "Next, we'll explore ideas about Earth's changing surface from lesson 3a."

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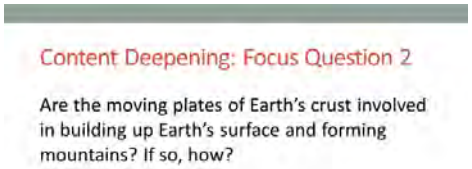
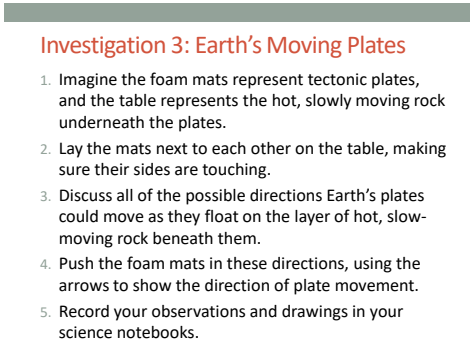
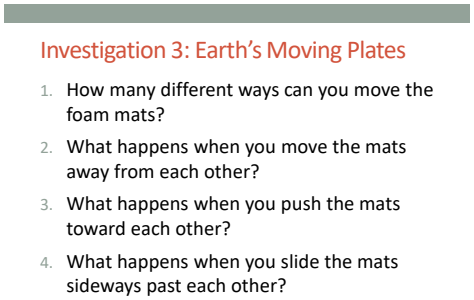
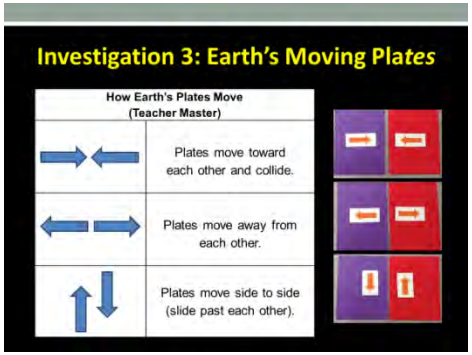
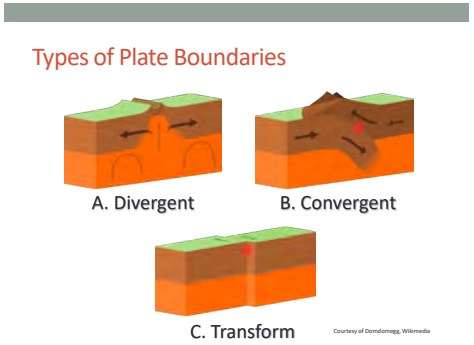
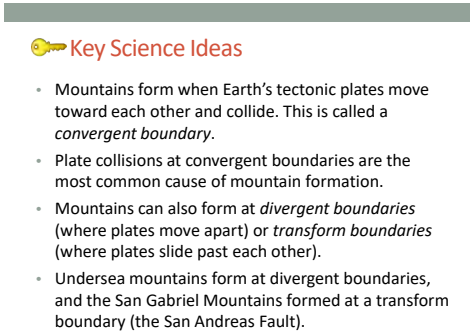
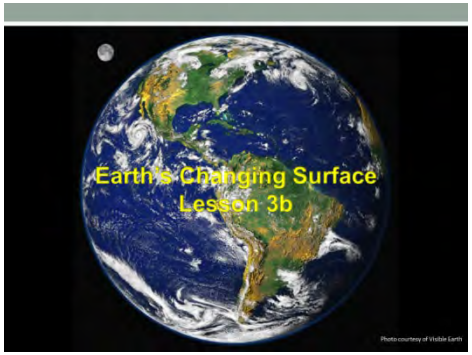
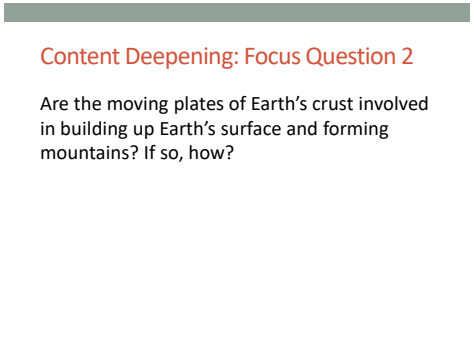
			**Display Slide 46.** Content Deepening: Focus Question 2 (Less than 1 min) a. Read the focus questions on the slide. b. Emphasize that these questions will guide student learning throughout ECS lesson 3a. c. Have participants write the questions in their science notebooks and draw a box around them.
			**Display Slide 47.** Investigation 3: Earth's Moving Plates (1 min) a. Have participants pair up again; then distribute two foam mats and two construction-paper arrows to each pair. b. "In this investigation, you and your partner will use the foam mats and arrows to explore the possible movements and interactions of tectonic plates."
			**Display Slide 48.** Investigation 3: Earth's Moving Plates (8 min) a. Read the directions on the slide. b. "As you and your partner discuss the directions Earth's plates could move, keep in mind that they could move in a number of different ways." c. "Use the foam mats to model how the plates might move, and use the arrows to show the direction of plate movement. Then write and draw your observations in your science notebooks."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			d. While pairs are working with their models, walk around the room and observe what they're doing. If you see participants moving the mats in unusual ways, ask probe questions to guide their thinking.
			**Display Slide 49.** Investigation 3: Earth's Moving Plates (8 min) a. **Whole-group discussion:** Call on pairs to answer the first question on the slide and share their observations from the investigation. Probe participants' responses (e.g., "What do you mean by 'away from each other'?"; "What do you mean by 'crashing together'?") and elicit differing points of view (e.g., "Does everyone agree with these observations?"). b. Following this discussion, read the other three questions on the slide one at a time and call on one or two participants to share their observations. Keep participants focused on what happens to the mats with each movement (e.g., When the mats are pushed toward each other, they get crumpled up). Remind participants that the mats represent Earth's tectonic plates and therefore may not move or interact in some of the ways their models are capable of moving and interacting.

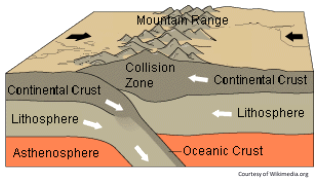
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 50.** Investigation 3: Earth's Moving Plates (2 min) a. Review the summary slide and emphasize the three different directions the arrows are pointing. b. "Does everyone agree that these are the three basic directions the foam mats (representing Earth's tectonic plates) could move?" c. "Do you want to add or revise anything?"
		Reflect: Content Deepening Focus Question 2 Are the moving plates of Earth's crust involved in building up Earth's surface and forming mountains? If so, how?	**Display Slide 51.** Reflect: Content Deepening Focus Question 2 (8 min) a. Review the focus question on the slide. b. "So based on our mat investigation, how would you answer this question? Share your ideas with your partner and make sure to include evidence from our mat investigation to support your answers." c. **Whole-group share-out:** Call on pairs to share their ideas and reasoning. Probe participants' responses and elicit differing points of view. d. "Does anyone agree or disagree, have a question to ask, or want to add on?" e. During this discussion, record key ideas on chart paper. f. "So can we all agree that mountains are most likely to form when tectonic plates collide? Do you have any other observations or ideas to add?" **Note:** Some participants may also suggest that mountains can form where plates move apart, and/or slide side to side or past each other. This

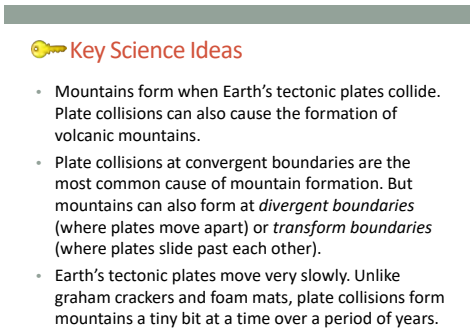
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			is actually correct, as the following slide will demonstrate. g. "We'll continue thinking about this focus question during our next investigation and see if we gather more information to add to our answer."
			**Display Slide 52.** Types of Plate Boundaries (3 min) a. "This slide shows three main types of plate boundaries: divergent, convergent, and transform. The arrows indicate the direction of plate movement in each diagram." b. "At a *divergent boundary*, tectonic plates move away from each other, which is called *extension*. at a *convergent boundary*, plates move toward each other, and at a *transform boundary*, plates slide past each other, which is called *shear*. This reflects the conclusions we reached about plate movements in our foam-mat investigation, doesn't it?" c. "Plate collisions at convergent boundaries are the most common cause of mountain formation. Remember what happened to the foam mats when you pushed them together?" d. "Most convergent boundaries are also *subduction zones*, where one oceanic plate sinks back into the mantle under another plate. This process causes mantle melting and the formation of volcanic mountains. So mountains form not only when plates collide and crumple upward but when one plate sinks under another and melts." e. "Mountains can also form at divergent and transform boundaries, though this isn't as common. As we talked about earlier, tectonic plates can pull apart above the rising layer of

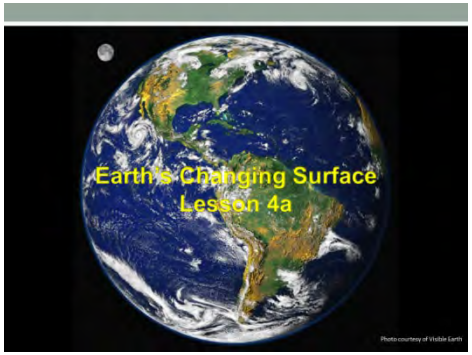
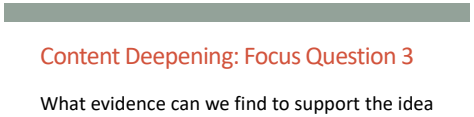
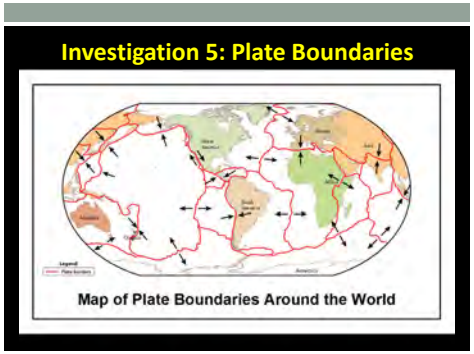
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			mantle in a convection cell. This process is called *seafloor spreading*. Heat from the rising mantle causes the crust to expand at this divergent boundary and grow into a midocean ridge or giant undersea mountain range." f. "At a transform boundary, mountains can form where a kink or bend in the fault line makes it difficult for two plates to slide past each other. As the plates crumple up against each other, mountains can form. Examples include the San Gabriel Mountains and the San Bernardino Mountains along the San Andreas Fault in Southern California."
			**Display Slide 53.** Key Science Ideas (2 min) a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations and evidence from the foam-mat investigation helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Ask participants to copy these ideas into their science notebooks under the focus question.

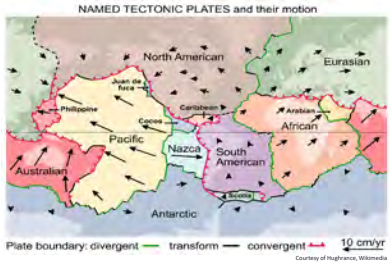
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 54.** Earth's Changing Surface: Lesson 3b (Less than 1 min) a. "Next, we'll explore ideas about Earth's changing surface from lesson 3b."
			**Display Slide 55.** Content Deepening: Focus Question 2 (Less than 1 min) a. Review the focus question on the slide. b. "This focus question from ECS lesson 3a will guide student learning throughout lesson 3b as well."
			**Display Slide 56.** Investigation 4: Mountain Building (Less than 1 min) a. "The graham crackers on this slide have been dipped in water and are a little soggy." b. "Imagine that these soggy graham crackers are two tectonic plates that are moving toward each other at a convergent boundary."

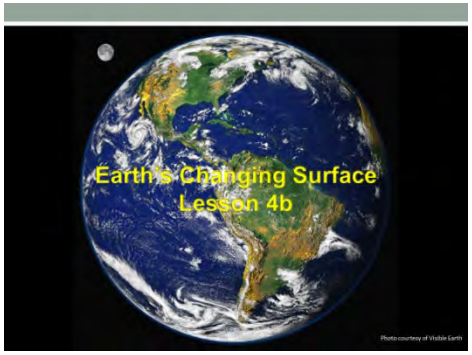
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Investigation 4: Mountain Building What do you think the two graham-cracker "plates" will look like if they collide? • Write your prediction in your science notebook and include a drawing of the graham crackers.	**Display Slide 57.** Investigation 4: Mountain Building (5 min) a. Read the directions on the slide and ask participants to write the question in their science notebooks. **Note:** As participants work on their predictions, toggle back to the previous slide so they can make a sketch of the graham crackers. b. Make sure everyone has finished writing their predictions and drawing their sketches before advancing to the next slide.
			**Display Slide 58.** Investigation 4: Mountain Building (3 min) a. "The slide shows what happened to the graham crackers when they collided. Is this what you predicted?" b. **Whole-group discussion:** Invite participants to share their predictions and observations.

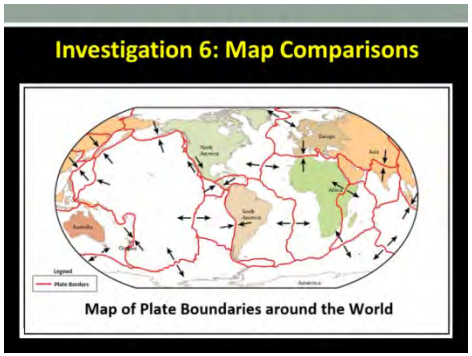
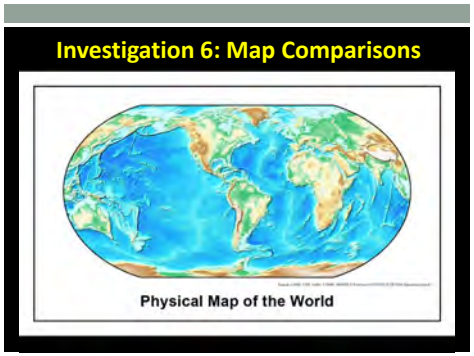
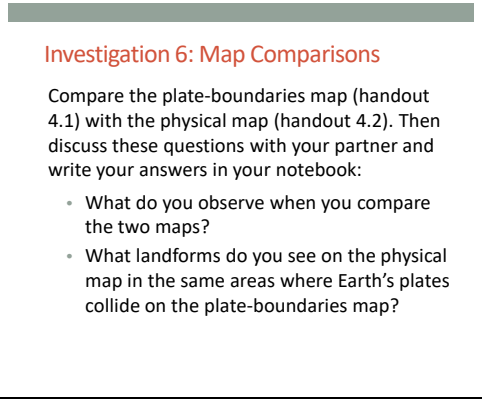
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Investigation 4: Mountain Building Is the result of the graham-cracker collision similar to what happened with the foam mats when they collided? How so?	**Display Slide 59.** Investigation 4: Mountain Building (4 min) a. Read the questions on the slide. b. Invite several participants to share their ideas and observations. Remind them to use evidence from the investigations to support their answers. c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share.
		Investigation 4: Mountain Building  **Himalayan Mountain Belt: Continent-versus-Continent Collision**	**Display Slide 60.** Investigation 4: Mountain Building (2 min) a. "This diagram is an example of a continent-versus-continent collision in which the sides of two tectonic plates crumple up and form a mountain range. A collision of this type between the Indian and Eurasian Plates formed the Himalayan Mountains." b. Compare this illustration with the photo of the crumpled-up graham crackers. Note that the two images are very similar in illustrating how plate collisions form mountains. c. Emphasize that Earth's tectonic plates move very slowly, and unlike the graham-cracker and foam-mat models, plate collisions form mountains and mountain ranges a tiny bit at a time over many, many years. This is why we can't see mountains being built.

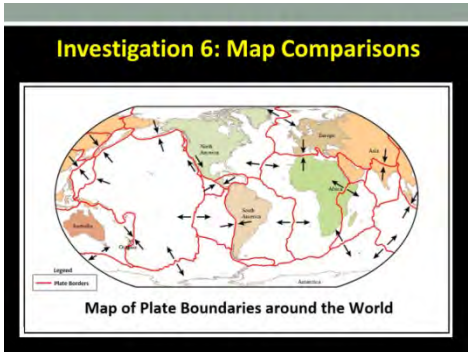
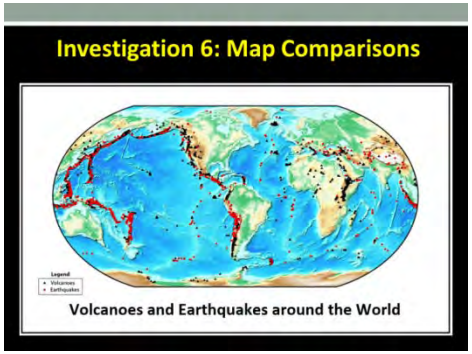
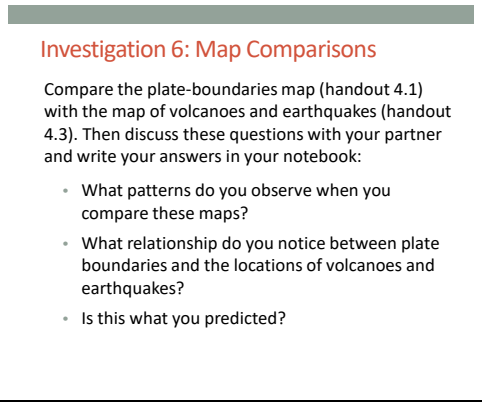
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 61.** Reflect: Content Deepening Focus Question 2 (5 min) a. Review the focus question on the slide. b. Ask: "How would you answer this question now?" c. Invite participants to share their ideas for answering the question, using evidence from the mat and graham-cracker investigations to support their ideas. d. "As others share their ideas and evidence, listen carefully and be prepared to agree, disagree, ask questions, or add new ideas and evidence." e. During this discussion, record key ideas on chart paper.
			**Display Slide 62.** Key Science Ideas (3 min) a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations and evidence from the mat and graham-cracker investigations helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Ask participants to copy these ideas into their science notebooks under the focus question.

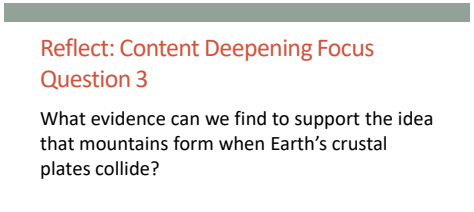
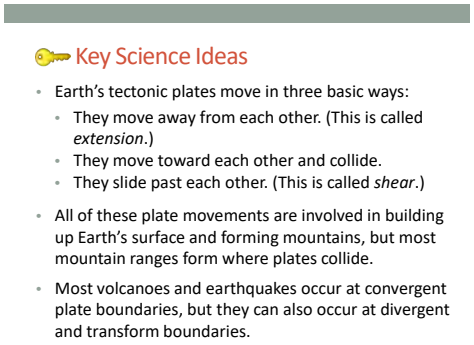
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 63.** Earth's Changing Surface: Lesson 4a (Less than 1 min) a. "Our next investigation is from ECS lesson 4a."
			**Display Slide 64.** Content Deepening: Focus Question 3 (Less than 1 min) a. Read the focus question on the slide. b. "This question will guide student learning throughout ECS lesson 4a." c. Ask participants to write this question in their science notebooks and draw a box around it.
			**Display Slide 65.** Investigation 5: Plate Boundaries (Less than 1 min) a. Have participants pair up with the same partners from previous investigations. b. Direct participants to locate handout 4.1 (Map of Plate Boundaries around the World) in their lesson plans binders. c. "This map shows the boundaries of Earth's major tectonic plates."

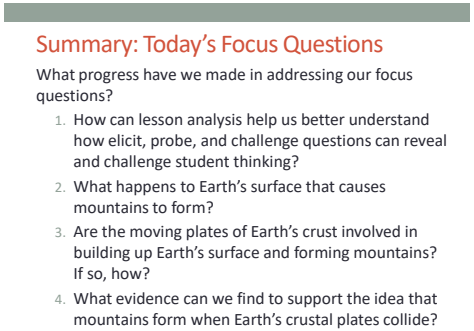
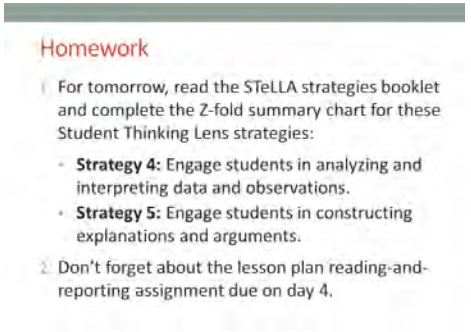
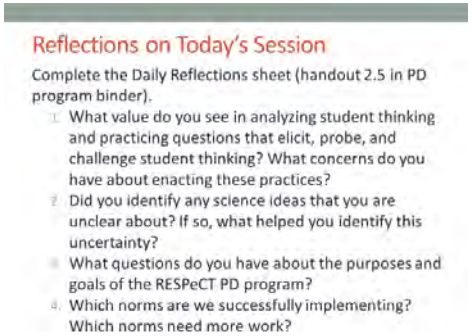
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		Investigation 5: Plate Boundaries Examine the map on handout 4.1 (Map of Plate Boundaries around the World). 1. What do you notice about this map? How would you describe it? 2. In what ways does this map remind you of the cracked eggshell from our earlier investigation? 3. What do the red lines represent? 4. What do the arrows represent?	**Display Slide 66.** Investigation 5: Plate Boundaries (7 min) a. Read the questions on slide. b. **Pairs:** "Examine the map on your handouts and discuss these questions with your partners. Then write your answers in your science notebooks." c. **Whole group:** Invite a few participants to share their answers with the group.
		Investigation 5: Plate Boundaries How would you describe the tectonic plates on the map? 1. Are the plates large or small? 2. Do they touch one another? 3. Are the borders even or uneven? 4. What else do you notice?	**Display Slide 67.** Investigation 5: Plate Boundaries (6 min) a. Read the questions on the slide b. **Pairs:** "Discuss these questions with your partners and write your answers in your notebooks." c. **Whole group:** Invite a few participants to share their answers and observations with the group.
		Investigation 5: Plate Boundaries 	**Display Slide 68.** Investigation 5: Plate Boundaries (3 min) a. "This map shows Earth's tectonic plates and their motion. Three types of plate boundaries are shown at the bottom of the slide. The green lines on the map represent divergent motion, the black lines represent transform motion, and the pink lines represent convergent motion." b. **Pairs:** Have participants pair up with an elbow partner, compare this map with the map they just

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			examined, and share their observations. c. **Whole group:** Invite a few participants to share their observations with the group.
			**Display Slide 69.** Earth's Changing Surface: Lesson 4b (Less than 1 min) a. "Next, we'll explore ideas about Earth's changing surface from lesson 4b."
		Content Deepening: Focus Question 3 What evidence can we find to support the idea that mountains form when Earth's crustal plates collide?	**Display Slide 70.** Content Deepening: Focus Question 3 (Less than 1 min) a. Review the focus question on the slide. b. "In our final content deepening investigation, we'll gather more information about plate boundaries to help us answer this question." c. "This focus question from lesson 4a will guide student learning throughout lesson 4b as well."

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 71.** Investigation 6: Map Comparisons (Less than 1 min) a. "For this investigation, you'll work in pairs again. You'll also need your plate-boundaries map from the previous investigation."
			**Display Slide 72.** Investigation 6: Map Comparisons (Less than 1 min) a. Direct participants to locate handout 4.2 (Physical Map of the World) in their lesson plans binders. b. "This map shows the topographic features of Earth's surface, such as ocean basins, continents, and mountains."
			**Display Slide 73.** Investigation 6: Map Comparisons (7 min) a. Read the directions and questions on the slide. b. **Pairs:** "Compare the two maps on your handouts and discuss the questions on the slide. Then write your answers in your notebooks." c. **Whole group:** Invite a few participants to share their answers and observations with the group.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 74.** Investigation 6: Map Comparisons (2 min) a. "Next, we'll compare this plate-boundaries map with another showing where volcanoes and earthquakes are located on Earth's surface." b. "What do you predict you'll see when you compare these maps?"
			**Display Slide 75.** Investigation 6: Map Comparisons (Less than 1 min) a. Direct participants to locate handout 4.3 (Volcanoes and Earthquakes around the World) in their lesson plans binders. b. "This map shows the distribution of volcanoes and earthquakes across Earth's surface. The black dots represent volcanoes, and the red dots represent earthquakes."
			**Display Slide 76.** Investigation 6: Map Comparisons (7 min) a. Read the directions and questions on the slide. b. **Pairs:** "Compare the two maps on your handouts and discuss the questions on the slide. Then write your answers in your notebooks." c. **Whole group:** Invite a few participants to share their answers and observations with the group.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			**Display Slide 77.** Reflect: Content Deepening Focus Question 3 (5 min) a. Review the focus question on the slide. b. Invite participants to share their ideas for answering the question, using observations and evidence from the map investigations. c. Encourage participants to agree, disagree, ask questions, or add to the ideas others share. d. During this discussion, record key ideas on chart paper.
			**Display Slide 78.** Key Science Ideas (3 min) a. Review the key science ideas on the slide that answer the focus question. Emphasize that participants' observations and evidence from the map investigations helped shape these responses. b. **Whole-group discussion:** "Does everyone agree with these ideas? Would you like to add or revise anything?" c. Ask participants to copy these ideas into their science notebooks under the focus question.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
3:15–3:30 15 min **Wrap-Up: Summary, Homework, and Reflections** Slides 79–81	**Purpose** • Summarize and reflect on the day's learning, including progress made in understanding Earth's changing surface, as well as the relationship between lesson analysis and asking effective elicit, probe, and challenge questions. **What Participants Do** • Synthesize key ideas about the science content, questioning strategies, and lesson analysis. • Copy down the homework assignment for day 3. • Write reflections on STeLLA strategies 1, 2, and 3 and the science content. **Handouts in PD Binder** • 2.5 Daily Reflections—Day 2 **Supplies** Science notebooks		**Display Slide 79.** Summary: Today's Focus Questions (8 min) a. Divide participants into two groups. Have Group 1 come up with some conclusions/key ideas related to focus questions 1 and 2. Have Group 2 do the same thing for focus questions 3 and 4. b. Give each group 3 minutes to come up with ideas and conclusions. c. Allow a 2-minute share-out for each group.
			**Display Slide 80.** Homework (1 min) a. Forecast that tomorrow you'll tackle two new, closely interconnected Student Thinking Lens strategies. b. Have participants copy the homework assignment into their science notebooks. c. Remind participants about their homework for Friday (becoming experts on the lesson plans assigned to them).
			**Display Slide 81.** Reflections on Today's Session (6 min) a. Make sure participants have **at least 5 minutes** to think about the questions on the reflections sheet (handout 2.5 in the PD program binder) and write down their reflections.