**SSUP: Summer Institute PD Leader Guide Day 2 Sun’s Effect on Climate and Seasons**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Grade Level | 5 | Day | 2 | STeLLA Strategies Focus | STL 1, 2. 3 (& 4) | Subject Matter Focus | Sun’s effect on climate and seasons |
| Teacher Learning Goals | * Differential heating of Earth’s surface is directly related to the intensity of the sunlight striking the surface of Earth with the most intense/direct sunlight striking at or near the equator and less intense/direct sunlight striking near the poles. * Student thinking can be made more visible in science classrooms when the teacher asks questions that elicit student ideas and predictions, 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. | | | | | | |
| Focus Questions | * What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator? * Why is it summer in the United States (North America) when it is winter in Argentina (South America)? * How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal and challenge student thinking? * How can we develop a classroom culture focused on student thinking? | | | | | | |
| Ideal Teacher Response | What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator?  Differential heating of Earth’s surface is directly related to the intensity of the sunlight striking the surface of Earth with the most intense/direct sunlight striking at or near the equator and less intense/direct sunlight striking near the poles. The more intense the light, the higher the average temperatures at that location. Light is its most intense when it strikes the surface of Earth at a 90° angle/perpendicular to the surface. The angle at which the sunlight strikes the surface of Earth increases from perpendicular (the normal) with increasing latitudes from the equator.  Why is it summer in the United States (North America) when it is winter in Argentina (South America)?  As Earth orbits the Sun in a nearly circular orbit, its axis always tilts in the same direction. Earth’s consistent tilt causes the Northern Hemisphere to lean toward the Sun at certain times of year, specifically during June, July, and August, and away from the Sun at other times of the year—during the months of December, January, and February. Earth’s Northern Hemisphere experiences summer when it leans toward the Sun while the Southern Hemisphere experiences winter. Conversely, Earth’s Southern Hemisphere experiences summer in when it leans toward the Sun while the Northern Hemisphere experiences winter. (Note that the seasonal variations that we call summer and winter do not occur at latitudes close to the equator.) When Earth’s hemispheres lean neither toward nor away from the Sun along Earth’s orbit, we experience spring and fall.  How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal 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 in part to build toward more accurate understanding of the science and use of the practices and in part to develop a classroom culture of student thinking.  How can we develop a classroom culture focused on student thinking?  The intentional use of elicit, probe, and challenge questions in ways consistent with the STeLLA strategies make student thinking visible to both the teacher and students and provide opportunities for teachers to leverage students’ current understanding to figure out phenomena or solve problems and shift to more accurate understanding of the science and use of the practices. Teacher use of these questioning strategies provides a model for student interaction.  The intentional use of Student Thinking Lens Strategies 1, 2, 3, and 4 help to develop a classroom culture of student thinking in which student ideas—divergent and convergent; accurate and inaccurate—are valued by teachers and students as they figure out phenomena or solve problems and work together toward more accurate understanding of the science and use of the practices. | | | | | | |

| Preparation | Materials | Videos and Transcripts |
| --- | --- | --- |
| **Planning/Preparation Tasks:**   * Study PDLG, PPTs, video clips, and handouts. Make changes to PPTs, if needed. * Link clips * Prep materials for SEC Lesson 2: Energy Angles Investigation (adult learning experience)   **Daily Set Up Tasks:**   * Check that video clips are correctly linked to PPT * Set up PowerPoint and speakers * Check video & sound * Arrange furniture, food (include social distancing protocols in set up) * Arrange posters/charts   **Day 2 Set Up Task:**  Arrange teacher materials on tables:   * Tabletop name cards * Review reflection writing from Day 1 and create summary slide * Table boxes (small red, green, yellow dots)   **Daily Follow-up Tasks:**   * Archive final PPT * Collect and turn in daily feedback * Disinfect common materials, tables and common areas per protocol | **Posters/Charts:**   * STeLLA Conceptual Framework poster * Day 2 Agenda chart * Program Goals chart * Norms chart * Focus Questions chart * Parking Lot chart * Effective Science T&L chart * Purpose/Key Features (STL 1-2-3) chart   **Handouts in SSUP PD binder front pocket:**   * Z-fold chart: Student Thinking Lens Strategies * Z-fold chart: Science Content Storyline Strategies   **Handouts in SSUP PD binder, Tab 2**   * Deb Hannigan Pre-Interview S1 (elicit & probe) stella2-03-Hannigan6-SI pre-Lillian Transcript Clip 1 * Dara Wade Classroom Clip (E/P/C) SSUP\_Wade\_G5\_SEC\_L1\_C1 Transcript Clip 1 * Practice Probe/Challenge Protocol * Day 2 Daily Reflection * Cut Sheet: Science Content Handouts * Energy Angles Investigation * Analogy Map * Earth-Sunlight Representations   **Supplies:**   * Lesson 2: Energy Angles Investigation (adult version)   + 1 set/team: Tray, flashlight, grid paper, ruler   + Class set: prepared grid paper cut-outs with cell count for “direct and at an angle” tests posted on chart paper. * Lesson 3: Sun-Earth System   + 1 set/team: Globe, bulb/base/extension cord & powerstrip, Styrofoam ball, dowel, base, hula hoop, 2 push pins, rubber band   + 1 North star cut out   **Resources:**   * STeLLA Strategies booklet * BSCS Journal/Science Notebook * Elicit question cards | * **Deb Hannigan Pre-interview S1 (elicit & probe) stella2-03-Hannigan6-SI-pre-lillian:** Lillian believes that the Earth is tilted away from the Sun throughout its orbit. * **Grade 5 Classroom Clip L1: SSUP\_Wade\_G5\_SEC\_L1\_C1:** Teacher elicits student ideas about two focus questions: Why are some places hotter than others? What are some hotter at different times of the year?   **Note:** STL Strategies 1, 2, and 3 will be revisited on Days 4 and 5. |

**DAY 2 SESSION OUTLINE: 8:30 a.m. – 4:30 p.m.**

| **Time** | **Purpose** | **Content** | **Activities** |
| --- | --- | --- | --- |
| 8:30 – 9:00  30 min  Slides 1-7  **Study Group Teams** | **Purpose:** The purpose of the opening is to continue to build community and set the stage for today’s learning, in part by customizing the norms. | **Content:**Focus Questions:   * What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator? * Why is it summer in the United States (North America) when it is winter in Argentina (South America)? * How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal and challenge student thinking? * How can we develop a classroom culture focused on student thinking? | **Opening**   * Day 1 Reflections * Goals/Agenda * Focus Questions * Norms (revise) |
| 9:00 – 10:20  80 min  Slides 8-12  **Study Group Teams** | **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategies 1, 2, and 3: Elicit, Probe, and Challenge questions and how their use makes student thinking visible. | **Content:** The use of elicit, probe, and challenge questions helps teachers reveal student thinking and predictions and move student thinking forward. | **Lesson Analysis: STLSs 1, 2, 3**   * Set up: Charting * Video Analysis C1 (Hannigan/Lillian pre-interview) |
| 10:20 – 10:30 | **Break** | | |
| 10:30 – 12:15  105 min  Slides 13-22  **Study Group Teams** | **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategies 1, 2, and 3: Elicit, Probe, and Challenge questions and how their use makes student thinking visible. | **Content:** The use of elicit, probe, and challenge questions helps teachers reveal student thinking and predictions and move student thinking forward. | **Lesson Analysis: STLSs 1, 2, 3**   * Video Analysis C2 (Wade) * Follow-up |
| 12:15 – 12:45 | **Lunch** | | |
| 12:45 – 3:20  150 min plus 5 min break  Slides 23-38  **Study Group Teams** | **Purpose:** The purpose of this session is to model effective STeLLA-based science teaching and learning through a common experience that is grounded in a 3D, phenomena/program driven unit and designed for adult learners. | **Content:** STeLLA model lessons/units attend to the characteristics of effective science teaching and learning (e.g., 3D, phenomenon/problem-driven, student-centered, make student thinking visible and support sense-making, coherent, and access/engage PK and develop metacognitive abilities).  The content deepening experience will include explicit modeling and use of elicit, probe, and challenge questions.  Lesson 2: Differential heating of Earth’s surface is directly related to the intensity of the sunlight striking the surface of Earth with the most intense/direct sunlight striking at or near the equator and less intense/direct sunlight striking near the poles.  Lesson 3 (4): As Earth orbits the Sun in a nearly circular orbit, its axis always tilts in the same direction. Earth’s consistent tilt causes the Northern Hemisphere to lean toward the Sun at certain times of year, specifically during June, July, and August, and away from the Sun at other times of the year—during the months of December, January, and February. Earth’s Northern Hemisphere experiences summer when it leans toward the Sun while the Southern Hemisphere experiences winter. Conversely, Earth’s Southern Hemisphere experiences summer in when it leans toward the Sun while the Northern Hemisphere experiences winter. (Note that the seasonal variations that we call summer and winter do not occur at latitudes close to the equator.) When Earth’s hemispheres lean neither toward nor away from the Sun along Earth’s orbit, we experience spring and fall. (Note: This content will be continued in Day 3.) | **Content Deepening: Lessons 2 and 3**   * Teacher Set-up * Common Experience * Teacher Follow-up |
| 3:20 – 4:10  50 min  Slides 39-43  **Study Group Teams** | **Purpose:** The purpose of this session is to continue to develop a common understanding of probe and challenge questions, to support teachers as they develop the ability to effectively ask probe and challenge questions, and to emphasize the importance of planning. | **Content:** Probe questions are used to gain additional information about a student’s current thinking and build on the ideas they have made visible. They help guide a teacher’s instruction and are a powerful resource for student learning. Challenge questions help students think more deeply about science ideas and prompt students to link ideas and/or reconsider their ideas. Challenge questions (and probe questions for that matter) avoid leading students to the right answer. Teachers need deep content knowledge to ask productive elicit, probe, and challenge questions. | **Practice Probe & Challenge**   * Set-up * Probe X 2 Rounds * Challenge X 2 Rounds * Follow-up |
| 4:10 – 4:30  20 min  Slides 44-49  **Study Group Teams** | **Purpose:** The purpose of the closing is to continue to build community, reflect on the day, and set the stage for tomorrow’s learning. | **Content:**Focus Questions   * What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator? * Why is it summer in the United States (North America) when it is winter in Argentina (South America)? * How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal and challenge student thinking? * How can students be empowered to reveal their thinking and to listen, probe, and challenge each other during classroom conversations? | **Closing**   * Revisit FQs * Day 2 Reflection * Homework: Read and Z-fold SCSL A, B, I/9 |

**DAY 2 Session Detail**

| **Time** | **Purpose and Content &**  **What Participants Do** | **Slides** | **Process** |
| --- | --- | --- | --- |
| 8:00 – 8:30 | **Coffee & Conversation** |  | Need several hands-on deck to help with logistics. |
| 8:30 – 9:00  30 min  Slides 1-7  **Study Group Teams** | **Opening**  **Purpose:** The purpose of the opening is to continue to build community and set the stage for today’s learning, in part by customizing the norms.  **Content:**  Focus Questions:   * What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator? * Why is it summer in the United States (North America) when it is winter in Argentina (South America)? * How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal and challenge student thinking? * How can we develop a classroom culture focused on student thinking?   **What Participants Do:** Participants make connections among the day 1 reflections, program goals, and agenda. The team revises the norms to strengthen the community.  **Resources**   * Journals * CSW poster * PD Binder * STeLLA Conceptual Framework poster * Charts   + Program Goals   + Day 2 Agenda   + Day 2 Focus Questions   + Parking Lot   + Effective Science T&L   + STL 1-2-3 Purpose/Key Features |  | 1. **SSUP Program Day 1 (0 min)** 2. Greet participants as they enter the room. |
|  | 1. **Day 1 Reflections (5 min)** 2. Share patterns in the Day 1 reflections. Link to goals and agenda for today as possible. 3. Check parking lot and respond as appropriate. 4. Direct participants to the daily reflections sheet (PD Binder p.\_\_\_). Explain that we will be collecting these reflections at the end of the day. Invite participants to add thoughts and ideas to their reflection sheet throughout the day. |
|  | 1. **STeLLA Goals (5 min)** 2. Briefly highlight the program goals |
|  | 1. **Week-at-a-Glance (0 min)** 2. Point to the Day 2 agenda chart and link the agenda to the program goals. |
|  | 1. **Reconnections (5 min)** 2. Set up the opening by reminding team members of the importance of norms to support collaborative learning. 3. Invite team members to reflect on their attendance to the norms as an individual and as a team. 4. Note that we will be working together throughout the summer institute and academic year. This work will include analysis of other teachers’ classroom videos. In the fall, we will analyze classroom video from each other’s classrooms. For this work to be meaningful, we need to push and challenge each other, but we need to do this with a common understanding of our goals and purposes, so we’ll customize these norms for our work together. 5. Provide a few moments for individual think time. |
|  | 1. **STeLLA Norms (15 min)**   **PDL Note:** The revision of norms may take longer than 15 min.   1. Ask study group members if there are there any of these norms that they would want to clarify or revise. 2. Invite participants to suggest modifications to norms. Change the slide as needed.   **PDL Note:** Copy and paste a revised slide into the SSUP PPT decks for summer institute days 3-5 and use during academic year study group sessions.  Example of how one study group customized their norms.  **The Basics**   1. Arrive prepared and on time; stay for the duration. 2. Remain attentive, thoughtful, and mindful of our community; eliminate interruptions. 3. Make room for participation from all and monitor your talk time.   **The Heart**   1. Keep the goal in mind: We are analyzing teaching to improve student learning. 2. Share your ideas, uncertainties, disagreements, and questions. 3. Expect and ask questions to deepen everyone’s learning! |
|  | 1. **Focus Questions (0 min)** 2. Share the focus questions for Day 2. Link back to the program goals and the agenda for today.   **Transition:** *We’ll dig in to our homework as we think about the use of EPC.* |
| 9:00 – 10:20  80 min  Slides 8-12  **Study Group Teams** | **Lesson Analysis: STL Strategies 1, 2, 3**  **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategies 1, 2, and 3: Elicit, Probe, and Challenge questions and how their use makes student thinking visible.  **Content:** The use of elicit, probe, and challenge questions helps teachers reveal student thinking and predictions and move student thinking forward. Along with CSW, the use of EPC also supports developing a classroom culture of student thinking.  Key ideas for each strategy are listed below.  **What participants do:** Participants begin to negotiate a shared understanding of elicit, probe, and challenge questions by sharing and charting their ideas based on a study of the STeLLA Strategies Booklet.  **Resources:**   * STeLLA Strategies Booklet & Z-fold * STeLLA Conceptual Framework poster * CSW poster * Charts   + Norms   + STL 1-2-3 purpose/key feature charts   Key Ideas  Elicit questions are used to uncover students’ prior knowledge and experiences related to the content of the upcoming unit, lesson, or activity. Student responses help guide a teacher’s instruction. Student ideas and predictions are made visible to the individual student, other students, and the teacher.   * Purpose:   + Make student thinking visible   + Focus on some aspect of the main learning goal * Key Features   + Asked of a group of students with responses from multiple students.   + Uses everyday language OR language within students’ experiences.   + Asked early in a unit, lesson, and activity, but can be asked at any time in a lesson or unit to uncover the thinking of multiple students.   Probe questions are used to gain additional information about a student’s current thinking and build on the ideas they have made visible. Student responses help guide a teacher’s instruction. Student ideas and predictions are made visible to the individual student, other students, and the teacher.   * Purpose   + Clarify a student’s CURRENT thinking. * Key Features:   + Focuses on the thinking of one student but can be turned to others.   + Can be a paraphrase (ala Norms of Collaboration) (revoicing could be considered in this category)   + Does NOT introduce new language or ideas.   + PRODUCTIVE probe questions have some connection to the MLG; however, there are times when students (particularly those with different ways of knowing) put ideas on the table that seem unrelated but are not. See Ch. 3 in *Helping Students Make Sense of the World* (Schwarz).   Challenge questions help students think more deeply about science ideas and prompt students to link ideas and/or reconsider their ideas. Challenge questions (and probe Qs for that matter) avoid leading students to the right answer. Student thinking made visible to the individual student, other students, and the teacher.   * Purpose   + Help students reconsider their ideas; make connections, and develop more scientifically accurate ideas or explanations   + Deepen their understanding   + Prompt students to use academic language * Key Features   + Open-ended; no one right answer   + NOT leading questions: questions seeking one right answer (i.e., guess what’s in my head)   Other ideas to emphasize when appropriate   * IRE pattern (Initiate-Response-Evaluate) * Leading questions can be used to highlight reasoning (e.g., a series of if, then statements) if/when followed by the student’s summary and/or what made sense/what didn’t and a meta moment about what the process did for their thinking. |  | 1. **Conceptual Framework (10 min)**  Point to the strategies highlighted on the slide to focus on the Student Thinking Lens questioning strategies, elicit, probe, and challenge questions. Note that one goal for today is to develop a more shared understanding of each of these strategies, in part because we’ll use them to analyze video much as we did for CSW yesterday and in part because using them makes a difference in student learning.Invite participants to pull out their completed Z-fold and their STeLLA Strategies Booklet. Provide instructions for participants to share their ideas with a partner.Remind participants to clarify one another’s’ thinking and to ask where they found that idea in the strategy booklet.Transition: *To help us refine our understanding of each of these important strategies, we’ll make more of our thinking public.* |
|  | 1. **STL Strategies 1, 2, & 3 (30 min)**  PDL Note: The slide provides an example of the charts that study group members will create.Divide study group members into 3 groups and assign one strategy to each group. Remind participants:Purpose: why the strategy is importantKey features: characteristics that distinguish the strategy from othersFocus on the text; if the idea is not in the strategy document, it doesn’t go on the chart.  * 1. Remind participants that our goal is shared understanding, so…if it is not in the strategy summary document, it doesn’t go on the chart.   2. After charts are completed, invite participants to review other charts. They should plan to ask clarifying questions and pose wonderings about ideas that might be missing or where ideas came from in the strategy doc.   3. Use the clarifications and wonderings to revise charts as needed.   **PDL Note:** As teams are working, move around to each group and ask questions such as:   * (probe) *What do you mean by…?* * (challenge) *Where did you see that in the text?* (**NOTE:** Make sure to ask this of ideas consistent and inconsistent with the text.)   Pay attention to ideas on the charts that need to be probed and challenged during the whole group conversation. Some of these ideas will be made visible to everyone by the prompts on the next two slides. |
|  | 1. **Elicit vs Probe Questions (20 min)**    1. Turn and talk to elbow partner about this question, share out.    2. Revise the elicit and probe charts during the debrief.   Key Ideas   * Elicit questions are addressed to whole class, probe questions are addressed to individual students. * Elicit questions are used before students have studied a concept or as an intro into new ideas; probe questions can be asked at any time. * Elicit questions start a discussion; probe questions follow up on something a student has already said. |
|  | 1. **Probe vs. Challenge Questions (15 min)** 2. Turn and talk to an elbow partner about this question, share out. 3. Revise charts during the debrief.   Key Ideas   * Probe questions build on CURRENT thinking. Challenge questions deepen understanding. * Probe questions often precede challenge questions. |
|  | 1. **Meta Moment (5 min)**   **PDL Note:** This slide is animated   1. Provide a few moments for individual reflection. 2. Whip around and gather thoughts from a few teachers to share ideas that have been clarified or changed through the process. 3. Advance slide and invite teachers to return to their Z-fold charts and update information based on the public charts and debrief of the strategies. This will serve as the Meta Moment.   **Transition:** Synthesize and summarize a few key ideas.  *When we come back from break, we’ll apply what we learned about EPC questions in video analysis of classroom practice.* |
| 10:20 – 10:30 | **Break** | | |
| 10:30 – 12:15  105 min  Slides 13-22  **Study Group Teams** | **Lesson Analysis: STL Strategies 1, 2, 3**  **Purpose:** The purpose of this session is to continue to develop a shared understanding of STeLLA Strategies 1, 2, and 3: Elicit, Probe, and Challenge questions.  **Content:** The use of elicit, probe, and challenge questions helps teachers reveal student thinking and predictions and move student thinking forward. Their use makes student thinking visible and contributes to the development of a classroom culture of student thinking.  Key ideas for each video are listed below.  **What Participants Do:** Participants analyze two videoclips (student interview and classroom) related to the content in lesson 1 of the Sun’s Effect on Climate and Seasons unit.  **Resources**   * PD Binder   + Viewing/Analysis Basics p. \_\_   + Hannigan/Lillian Interview Transcript p. \_\_   + Wade L1 Transcript p. \_\_ * Video Clips   + **Deb Hannigan Pre-interview S1(elicit & probe) stella2-03-Hannigan6-SI-pre-lillian:** Lillian believes that the Earth is tilted away from the Sun throughout its orbit.   + **Grade 5 Classroom Clip L1: SSUP\_Wade\_G5\_SEC\_L1\_C1:** Teacher elicits student ideas about two focus questions: Why are some places hotter than others? What are some hotter at different times of the year? * STeLLA Strategies Booklet * STL Z-fold * STeLLA Conceptual Framework poster * Charts   + Norms   + STL 1-2-3 purpose/key feature charts |  | 1. **Prep for Video Analysis (5 min)**    1. Share that, again, we’ll be explicit about our video analysis structure. Framing our analysis in this way (i.e., identify, analyze, reflect and apply) will help us to focus more holistically on BOTH the teaching and the impact of particular STeLLA strategies on student thinking and learning, and the storyline the students are constructing (i.e., the two lenses).    2. Note that over the next couple of hours, we’ll analyze two video clips. The first will be of a student interview and the second of a classroom. Revisit other key ideas about video analysis as needed (refer to Day 1 PDLG).   **PDL Note:** Remind participants of the viewing and analysis basics introduced on Day 1. |
|  | 1. **Prep for Video Analysis: Context (5 min)** 2. Direct participants to the transcript in binder p.\_\_\_. 3. Share the context of the video. |
|  | 1. **Video Analysis (20 min)** 2. Provide an overview of the sequence of events    * 1. Watch the video      2. Time to study and mark up the transcript      3. Whole group discussion focused initially on clear examples. 3. Individually: Give time for individual team members to review the transcript and mark questions using E, P, C, LQ (leading question) notations. Remind participants that not everything a teacher says is an EPC question.   **PDL Note:** Technically, there are no elicit questions because the interviewer is only talking with one student. Try and pay attention to questions asked to elicit Lillan’s ideas and questions to probe or challenge ideas that Lillian has already shared.   1. Whole group: Discuss what they found. Encourage teachers to use point to the timestamp from the transcript and justify their identification using the large charts, Z-Fold Chart, or the STeLLA strategy booklet. Teachers should work to differentiate elicit and probe questions from each other and from other types of teacher questions or statements. BEGIN BY asking for a CLEAR example of each type of question so you can make progress. After discussing clear examples, take some time to work through a more challenging example or two. Make sure to keep in mind that it’s about the justification…not the “right” answer. 2. Examples 3. 07:03 (elicit) So what about in July? What do you think the temperatures would be like in those three places? 4. 07:32 (probe) Uh-huh. Why did you say that? 5. 07:50 (elicit) Okay. Okay. So, um, I’m gonna turn the sun back on. And I’d like you to explain to me, or show me with the, the sun and the globe. 6. 08:17 (probe) So can you show me with, with the sun and the globe why that is? 7. 09:08 (classic probe) Uh-huh. And when you say it’s tilting the same way, what do you mean? 8. 09:46 (challenge) And I want you to go around again. And I want you to, to show me when it’s winter in Colorado Springs. If you can. 9. Provide a few minutes for teachers to discuss any interesting student thinking they noticed and to reflect on the process. [**PDL Note:** Cut this if time is short, especially if the clip doesn’t include particularly compelling student thinking.] |
|  | 1. **Video Analysis (15 min)** 2. Provide instructions for the Analyze phase of video analysis. 3. Note that they may want to focus on interesting student thinking identified in the previous phase. 4. Key Ideas to Highlight: 5. Lillian thinks the Earth always tilts backwards. 6. The interviewer probes with questions and challenges Lillian to use the model to explain summer and winter. 7. Lillian seems to know that the Earth spins (in some timeframe) and goes around the Sun each year. She also seems to think that the Earth is always tilted back at the same angle. She can’t use the model to explain seasons or average temperatures in Colorado Springs. 8. Lillian has difficulty explaining why it is winter in the northern hemisphere. Lillian seems to know that summer occurs six months after the new year but cannot make sense of why it is warmer or colder.   **PDL Note:** Cut this piece if you are short on time and especially if the video clip doesn’t include particularly compelling student thinking. |
|  | 1. **Video Analysis (5 min)** 2. Provide instructions for the Reflect and Apply phase of video analysis. 3. Key Ideas to highlight: Elicit, probe and challenge questions can help reveal student ideas, whether accurate or inaccurate, and develop a classroom where all ideas are valued as students figure out/explain given phenomena.   **Transition:** *Now that we’ve had a chance to consider interview video, let’s take a look at the use of these strategies in the classroom setting.* |
|  | 1. **Prep for Video analysis: Context (5 min)** 2. Direct participants to the transcript in binder p.\_\_. 3. Share the context of the video. |
|  | 1. **Video analysis: (15 min)** 2. Provide an overview of the sequence of events 3. Watch the video 4. Time to study and mark up the transcript 5. Whole group discussion focused initially on clear examples 6. Show the video. 7. Individually: Give time for individual team members to review the transcript and mark questions using E, P, C, LQ notations. Remind participants that not everything a teacher says is an EPC question. 8. Whole group: Discuss what they found. Encourage teachers to use point to the timestamp from the transcript and justify their identification using the large charts, Z-Fold Chart, or the STeLLA strategy booklet. Teachers should work to differentiate elicit and probe questions from each other and from other types of teacher questions or statements. BEGIN BY asking for a CLEAR example of each type of question so you can make progress. After discussing clear examples, take some time to work through a more challenging example or two. Make sure to keep in mind that it’s about the justification…not the “right” answer.   **PDL Note:** Clear examples of elicit/probe/challenge questions   * What patterns in temperature can we find on Earth at different times of the year? (elicit) * So what’s your pattern...? (probe) * In January? Or July (probe) * Teacher introduces the idea of the equator. Then asks Cloe: you said its hotter in the north than the south. Can you talk a little bit more about that? (probe/challenge) * So when you say down south... (leading) * Does anybody disagree with Cloe’s statement? (elicit) * So when you say they are experiencing different seasons... (probe) * In January? (probe)  1. Provide a few minutes for teachers to discuss any interesting student thinking they noticed and to reflect on the process. [**PDL Note:** Cut this if time is short, especially if the clip doesn’t include particularly compelling student thinking.] |
|  | 1. **Video analysis: (15 min)** 2. Provide instructions for the Analyze phase. 3. Note that participants may want to focus on interesting student thinking identified in the previous phase. 4. Key Ideas to Highlight: 5. The teacher introduces the focus question and through whole class discussion elicit student ideas the focus question. 6. Through some probing and some leading questions, students show knowledge about Earth’s tilt and Earth spins on an axis. 7. It is also revealed that students think water cycle causes some places to be hotter than other places. The teacher asks probing questions to make student thinking visible. |
|  | 1. **Video Analysis (15 min)** 2. Provide instructions for the Reflect and Apply phase of video analysis. 3. Key Ideas to Highlight: When used effectively, we can use elicit, probe and challenge questions to build toward more accurate understanding of the science. |
|  | 1. **Meta Moment (5 min)** 2. Provide a few moments for participants to respond to the question in their journal.   **Transition:** *We’ve had an opportunity to think about the STeLLA questioning strategies and how they develop a classroom culture focused on student thinking. We’ll continue our common lesson experience with the next lesson(s) in the STeLLA lessons you will teach this fall.* |
| 12:15 – 12:45 | **Lunch** | | |
| 12:45 – 3:20  150 min plus 5 min break  Slides 23-38  **Study Group Teams** | **Content Deepening**  **Purpose:** The purpose of this session is to model effective STeLLA-based science teaching and learning through a common experience that is grounded in a 3D, phenomena/program driven unit and designed for adult learners.  **Content:** STeLLA model lessons/units attend to the characteristics of effective science teaching and learning (e.g., 3D, phen/prob-driven, student-centered, make student thinking visible and support sense-making, coherent, and access/engage PK and develop metacognitive abilities).  The content deepening experience will include explicit modeling and use of elicit, probe, and challenge questions.  Earth’s surface heats unevenly because the Sun’s light (solar radiation/energy) strikes sunlight strikes some areas more directly and other areas less directly due to the Earth’s spherical shape. Areas where the sunlight strikes the surface more directly (perpendicular to it), the sunlight is more intense (concentrated) over a small area. and have higher average temperature.  Areas where the sunlight strikes the surface less directly (at an angle to the surface), the sunlight is less intense sunlight, the energy is more spread out, and have lower average temperatures.  Because Earth is a sphere, sunlight strikes the curved surface more directly closer at the equator and less directly as you move farther from the equator.  **What participants do:**  Participants review and share their learnings from L1/Day 1 to transition to Day 2 content. Models will be used to observe and identify patterns in light striking an object (representing Earth) at different angles. Participants will use their observations to answer the focus question and unit central question and develop questions for the DQB.  **Resources**   * BSCS Journal * Science Notebook * STeLLA PD Binder * STeLLA Strategies Booklet * STeLLA Conceptual Framework poster * CSW poster * Sun’s Incoming Energy Diagram 1 and Diagram 2 * Charts   + Day 2 Agenda   + Focus Questions |  | 1. **Content Deepening (5 min)**   **PDL Note:** The Teacher Set-up for Lesson 2 should build on the content deepening session from Day 1 and include “the story so far...” Plan to model telling the story so far. This will help teachers develop the science content storyline over the unit and help prepare them for the unit review scheduled for Day 5.  In addition, the Teacher Set-up should prepare them to think about the ideas being developed in the lesson and the teacher main learning goal.   1. Invite participants to return to the science notebook to review the learning (and activities) from L1/Day 1. 2. Then have them turn to a partner and practice telling the story of student learning (not the activities) in L1. 3. Call on someone to model OR PDL model telling the story so far. Your example should focus on student thinking not doing activities and figuring out, not learning about!    * 1. How was that story similar to or different from yours?      2. What made it similar or different.   **PDL Note:** Remind participants that the science learner experiences model the STeLLA-based strategies but are designed to engage them as adult learners. This is the time to take their teacher hat off.  **PDL Note:** Refer to the Day 1 PDL notes about supporting participants in taking on a learner hat. |
|  | 1. **CD: Teacher Set-up (5 min)** 2. Introduce the NEW focus questions for the content deepening session today. 3. Distribute the staged investigation materials on each table. |
|  | 1. **Unit Central Q. (5 min)**    1. Revisit the unit central question by emphasizing that we will try to figure out why we see these patterns in temperature on Earth? |
|  | 1. **Model (physical representation) (10 min)**    1. Model the construction of an Analogy Map of Forest Fire. Note that including the “different” column is optional.    2. Orient participants to the materials in the investigation. Invite participants to complete the “model” and “real world” columns of the Analogy Map and note that during the investigation, they’ll add to the analogy map. |
|  | 1. **Energy Angles Investigation (10 min)**    1. In this lesson we will figure out (at least part of) the answer to the question: What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator?    2. Invite participants to refer to the Energy Angles Investigation (HO p. \_\_). Provide an overview of the beginning part of the experience along with a few minutes for participants to use the materials.    3. Pre-make the light image cut-outs with numbers of squares identified. Display cut-outs in random fashion on a chart like the one on the next slide. Sequence the cut-outs randomly within a column to promote observations of patterns across columns rather than within a column. |
|  | 1. **What do you notice? (10 min)**   **PDL Note:** Refer to the CSW poster and remind participants to use the stems for categories 2, 3, 6, and 7 (and others as appropriate).   * 1. Negotiate observations of the data collected through the flashlight/tray investigation.   2. Highlight that the “circles” are not sequenced vertically in each column to emphasize the pattern we need to see ACROSS columns rather than within a column.   **PDL Note**: At some point in the investigation, lay a circle pair over one of the blow up globes at the equator and near the poles to help them link the pattern they identified to places on Earth. |
| Hidden Slide | 1. **Analogy Map (HIDDEN)**    1. Analogy Map Example. Use the hidden slide as needed. |
|  | 1. **Connections (Earth 1) (10 min)**    1. Refer to Energy Angles Investigation P. 3. Q. 1 (HO p. \_\_).    2. Emphasize that each “ray” represents an amount of light energy!    3. Use this diagram to help participants think about scale. Earth’s size is an orange on the 50 yd line and the Sun’s size is the size of the Orange Bowl and the whole parking lot. If the Earth is a marble in this room, then the Sun is 2 football fields away. The Sun is much farther away than it is big.    4. Be ready to challenge the common idea that temps are higher at the equator b/c it’s closer to the sun! |
|  | 1. **Connections (Earth 2) (10 min)**    1. Refer to Energy Angles Investigation P. 3. Q. 2 (HO p. \_\_).    2. Participants can divide and conquer counting the lines.    3. Remind participants that each “ray” represents an amount of light energy!    4. Have them use what they’ve learned through the entire activity to talk about to Q. 3 and 4. |
|  | 1. **Explanation (15 min)**    1. Note that explanations are at the heart of science—they are the PRODUCT of a scientist’s work.    2. Provide instructions for the task.    3. Encourage teams to make their own model to help them answer the question.   **PDL Note:** It might be helpful for participants to link their Lesson 2 findings back to the average temperature bar graphs used in Lesson 1. Participants can explain why average temperatures near the equator are higher in both January and July. |
|  | 1. **Meta Moment (10 min)**    1. Share prompt and provide time for participants to review the content representations and respond to each question.    2. Gather ideas from the group. |
|  | 1. **Meta Moment (5 min)**    1. Provide instructions. |
|  | 1. **Meta Moment (5 min)**    1. Provide instructions for responding to the reflection question.  What we learned from L2The sun’s light hits the surface of Earth at different angles.The more directly the Sun’s light strikes the surface the more intense the light and the higher the average temperatures in that area and vice versa due to the spherical shape of Earth.Some places on Earth get more direct (more intense) sunlight while others get less direct (more indirect, less intense) sunlight.What we can say about the Central Question.We can say why some places on Earth are hotter than others.We can’t say anything about different times of the year b/c we haven’t looked at Earth's orbit.  * 1. Follow-up: What part of the question can we still not answer? |
|  | 1. **DQB (5 min)**   **PDL Note:** At some point, be sure to collect the L2 supplies and set up the materials for lesson 3. DO NOT distribute the hula hoop.   * 1. Cut for time as needed.   2. Ask participants:      1. What questions can we now answer?      2. What new questions should be added?   **Transition:** If possible, link to questions on the board or simply refer to L3 focus question.  *Let’s see what we can figure out by answering our second content-based focus question,**Why is it summer in the United States (North America) when it is winter in Argentina (South America)?*  **PDL Note:**The Lesson 3 focus question is intended to get at the second part of the Unit Central Question (see Slide 27). Teachers will be well-served by seeing the relationship among the Lessons 3 and 4 focus questions and the Unit Central Question. |
|  | 1. **Explore the Earth-Sun System (35 min)**    1. Invite each participant to draw a picture of the Earth-Sun system with as much detail as they can in about 3-4 min. They should label their diagram and draw it as if they were looking down on the Earth and Sun. Note that they’ll add to/revise their diagram later and will be asked to share how their thinking has changed (or not).    2. Begin by tossing a blow-up globe to a participant who may have less subject matter background and asking the questions below. You may invite them to toss the globe to someone else.       1. What questions would you ask yourself and what would you be doing with the globe to answer the question: Why is it summer in the United States (North America) when it is winter in Argentina (South America)?       2. Would everyone know to do/think what you did?    3. Participants are likely to point to the northern and southern hemispheres, the equator, possibly the tropics, and the poles. They may refer to the tilt and the North Star.    4. Invite a participant to represent the Earth-Sun system by asking the following questions.       1. What are the parts of the system?       2. How could we represent those parts?       3. How is what we are using similar to or different from the real world?    5. As they walk around the sun, participants are likely to spin the globe, walk in an ellipse, and tilt and/or wobble the globe (or not). Ask the following questions       1. Why are you doing that?       2. Would you expect everyone to do it that way?    6. Provide instructions for setting up    7. Use questions such those below to uncover, negotiate and/or highlight key science ideas. Distribute hula hoops as needed.       1. What if I claimed that Earth is closer to Sun in the summer? Winter? What evidence would you offer to support/refute my claim? How could you use your model?       2. What if I claimed the orbit of Earth around the Sun is an ellipse? What evidence would you offer to support/refute my claim? How could you use your model?       3. What if I claimed the Earth is always tilted toward the Sun/away from the Sun? What evidence would you offer to support/refute my claim? How could you use your model?    8. Ideas to uncover, negotiate and/or highlight include:       1. Scale and proportion including distance from Sun to Earth at different times of year and the distance from Sun to equator and poles.       2. The optical illusion of a strongly elliptical orbit.       3. The nearly circular orbit of Earth (use    9. **PDL Note:** Get as far as possible with L3 and continue with L4 (slides 22-23) as possible. Use questions such as those below to uncover, negotiate and/or highlight key science ideas.       1. What if I claimed that Earth is closer to Sun in the summer? Winter? What evidence would you offer to support/refute my claim? How could you use your model?       2. What if I claimed the orbit of Earth around the Sun is an ellipse? What evidence would you offer to support/refute my claim? How could you use your model?       3. What if I claimed the Earth is always tilted toward the Sun/away from the Sun? What evidence would you offer to support/refute my claim? How could you use your model?    10. Ideas to uncover, negotiate, and/or highlight include:        1. Scale and proportion including distance from Sun to Earth at different times of year and the distance from Sun to equator and poles.        2. Optical illusion of a strongly elliptical orbit.   **PDL Note:** Revisit DQB if you have time.  **Transition:** *Let’s step into teacher mode and consider what one could learn.* |
|  | 1. **CD: Teacher Follow-up (10 min)**   **PDL Note:** This Teacher Follow-up should continue teacher learning from the content deepening experience. This part of the session should engage teachers as learners and support them in explaining and reflecting on their experience. The teacher follow-up should include attention to the STeLLA strategies studied so far and how the STeLLA strategies may have supported that learning. Given that teacher’s homework included STL Strategies 1, 2, and 3, you could expect them to make their current thinking visible. Take note of naïve conceptions and stay focused on the bigger picture of making thinking visible.   * 1. What can we add to our “learning” charts? IF the charts have headers, invite participants to record ideas on sticky notes and work with a partner to place them on the charts. If the charts don’t have headers, then the PDL will continue to add ideas to the charts and add headers at this time.   2. Probe ideas about EPC questions that teachers suggest for chart 4. Examples could include:      1. How did that question influence your thinking? Learning?      2. Why was that important?      3. What did you notice about the sequence of Qs?   **Transition:** *We’ve had an opportunity to experience a second STeLLA lesson as a learner and as an educator. When we come back from break, we’ll examine how STeLLA Strategies 1, 2, and 3 help make student thinking visible and move their thinking forward. OR*  *Now that we’ve experienced several lessons and thought about how the STeLLA lessons incorporate strategies to make student thinking visible, we’ll continue to deepen our understanding of and ability to use these strategies with some focused practice.* |
| 3:20 - 4:10  50 min  Slides 39-43  **Study Group Teams** | **Practice Probe and Challenge**  **Purpose:** The purpose of this session is to continue to develop a common understanding of elicit, probe, and challenge questions, to support teachers as they develop the ability to effectively ask probe and challenge questions, and to emphasize the importance of planning.  **Content:** Probe questions are used to gain additional information about a student’s current thinking and build on the ideas they have made visible. They help guide a teacher’s instruction and are a powerful resource for student learning. Challenge questions help students think more deeply about science ideas and prompt students to link ideas and/or reconsider their ideas. Challenge questions (and probe Qs for that matter) avoid leading students to the right answer. Teachers need deep content knowledge to ask productive elicit, probe, and challenge questions.  **What participants do**  Participants practice planning for and using probe questions and then repeating the process to practice challenge questions.  **Resources**   * Card set of elicit questions (1 set/2 participants) |  | 1. **STeLLA Strategies 1,2, and 3 (10 min)**   **PDL Note:** If you are short on time, only practice PROBE Questions.   1. Point to the strategies highlighted on the slide – we will again focus on the Student Thinking Lens questioning strategies – elicit, probe, and challenge. 2. Note that we’ll dive more deeply into these strategies in two practice rounds. It’s one thing to study these strategies, analyze their use by others in video or content deepening and it’s another to use them ourselves. 3. Invite participants to pull out their completed Z-fold and Strategies Booklet |
|  | 1. **Practice Probe (10 min)** 2. Describe the task – we will practice probe questions by interviewing each other. The challenge is to pose an elicit question to a colleague and then follow up by ONLY asking probe questions. 3. Pass out a different elicit question to each participant. 4. Prepare to interview each other. |
|  | 1. **Group Discussion/Interview (5 min)** 2. Discuss the questions on the slide. 3. If time, ask: How might doing more of this type of practice (with a partner or small group) help your teaching? |
|  | 1. **Practice Challenge (10 min)** 2. Describe the task – we will practice challenge questions by interviewing each other. The challenge is to pose an elicit question to a colleague and then follow up by asking probe questions and at least one challenge question. 3. Pass out a different elicit question to each participant. 4. Prepare to interview each other. |
|  | 1. **Group Discussion/Interviews (15 min)** 2. Discuss the questions on the slide. 3. If time permits, ask participants how doing more of this type of practice (with a partner or small group) help your teaching practice. |
| 4:10 - 4:30  20 min  Slides 44-49    **Study Group Teams** | **Closing and Reflection**  **Purpose:** The purpose of this session is to reflect on the day’s experiences and learning and prepare for Day 3.  **Content:**  Focus Questions:   * What causes the average temperatures on Earth near the equator to be higher than the average temperatures on Earth far from the equator? * Why is it summer in the United States (North America) when it is winter in Argentina (South America)? * How can lesson analysis help us better understand how elicit, probe, and challenge questions reveal and challenge student thinking? * How can we develop a classroom culture focused on student thinking?   **What participants do**  Participants reflect on learning from both days 1 and 2.  **Resources**   * BSCS Journal * PD Binder   + Day 2 Daily Reflection (if applicable) * STeLLA Strategies Booklet * SCSL Z-fold * Charts   + Effective Science T&L |  | 1. **Focus Questions (0 min)** 2. Highlight the day 2 focus questions. |
|  | 1. **Summarize and Synthesize (5 min)** 2. Provide instructions for the task. 3. Note that they should be prepared so share some of the ideas they’ve written down.   **PDL Note:** Check the Parking Lot for questions and comments. Respond as needed. |
| Hidden Slide | 1. **Walk-n-talk (15 min) (HIDDEN)**   **PDL Note:** Add if you have time.   1. Provide instructions for Walk-n-talk 2. After groups return, gather a few ideas from the group using questions such as,    * 1. Would anyone be willing to share something really smart they heard from their partner?      2. Who would be willing to share something they added to their journal responses? 3. Chart ideas shared by the group.   **PDL Note**: Revisit T&L charts if you have time. |
|  | 1. **Reflection (10 min)** 2. Direct participants to the daily reflections sheet (PD Binder p.\_\_). Completed sheets can be left in the center of each table. 3. Remind participants that the parking lot is available for any concerns or questions. |
|  | 1. **Homework (5 min)** 2. Refer to STeLLA Strategies Booklet and STL/SCSL Z-folds. 3. Provide instructions for homework. 4. Remind participants that we’ll begin in the whole group for Day 3. They will need their Z-folds, STeLLA Strategies Booklet, the Walk-about-Review HO (p.\_\_) from their PD binder, a writing utensil, and a few 3X3 sticky notes.   **PDL Note:** Use participant ideas from the Synthesize and Summarize journal entry to emphasize the role of EPC, classroom culture, and planning/enacting lessons to begin the transition.  Transition: *Today we’ve increased our understanding and abilities to intentionally use EPC. You've also talked today about the importance of "knowing the science content" to help you decide what Qs to ask.*  *Tomorrow, we will build on this idea as we begin to think about the purpose of our questions, the role of Strategies A, B, I/9 in preparation for T&L and how summarizing key science ideas gives students a chance to consider how their thinking has changed.* |
|  | 1. **BSCS (0 min)** |