## SSUP: Winter Institute - PD Leader Guide Day 2

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| Grade Level | 5 | Day | 2 | STeLLA Strategies Focus | STL 4, 5, 6 and 7 | Subject Matter Focus | Matter |
| Teacher Learning Goals | * The goals of the STeLLA PL program are to deepen knowledge of teaching and learning, increase ability to analyze and reflect on teaching and learning, increase ability to use content knowledge and knowledge of teaching and learning to transform classroom practice, deepen teacher content knowledge, and increase student learning in science. * Deepen our understanding of the properties of matter and the particulate nature of matter and apply that knowledge to figure out what was mixed with the pond water. | | | | | | |
| Focus Questions | * How can we build coherence within and across lessons to help students craft a storyline of key science ideas?​ * How can we be intentional about how we move student thinking forward? ​ * How can we use our understanding of matter to figure out what was mixed with pond water that could have changed the water? | | | | | | |
| Ideal Teacher Response | How can we build coherence within and across lessons to help students craft a storyline of key science ideas?​  Lessons with a strong science content storyline include a connected thread of content-related talk and activities leading from the focus question through a flow of events and science ideas to the summary of the lesson. For students to construct a coherent science content storyline, activities should have a purposeful set up, be designed to require links between the activity and science ideas, and a follow-up that focuses attention on how the activity contributed to the storyline.  How can we be intentional about how we move student thinking forward? ​  Science ideas should be explicitly linked to other science ideas, both within the lesson and between lessons so that students can construct a coherent science content storyline and develop an explanation of phenomena and/or design solutions to problems, Further, the key science ideas and focus question should be highlighted throughout the lesson. Teacher’s intentional use of elicit, probe, and challenge questions help students make links and progress toward a more accurate understanding of science.  How can we use our understanding of matter to figure out what was mixed with pond water that could have changed the water?  Properties of certain types of matter (pollutants) can be problematic in water systems. Pollutants that are soluble can enter waterways and travel some distance. Understanding the particulate nature of matter can help us model and explain how the pollutants (matter) enter, interact and travel through the school and pond system. | | | | | | |

| Preparation | Materials | Videos and Transcripts |
| --- | --- | --- |
| **Planning/Preparation Tasks:**   * Study PDLG, PPTs, video clips, and handouts. Make changes to PPTs, if needed. * Link clips * Look at the Matter Mashup Key ahead of time * Create a chart for the end of day tasks to prep for the following day (clean up tables, organize materials for the day, prep next day’s materials, create charts, etc.)   **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:**   * Review the PhET simulation and get it prepared to demonstrate (select States). <https://phet.colorado.edu/sims/html/states-of-matter-basics/latest/states-of-matter-basics_en.html>   **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 * Communicating in Scientific Ways poster * Program Goals chart * Day 2 Agenda chart * Norms poster * Day 3 Focus Questions chart * Mash Up Poster * Parking Lot chart * Class consensus chart * Effective Science Teaching and Learning Chart   **Handouts in PD binder front pocket or in Pre-Tab:**   * Z-fold chart: Student Thinking Lens Strategies * Program Goals * Week-at-a-Glance   **Handouts in SSUP PD binder**   * Norms * Lesson 6: Distillation Apparatus Diagram * Matter Idea Mashup * Placemats for Lessons 6 and 7   **Resources:**   * STeLLA Strategies booklet * BSCS Journal (norms pasted into the journal) * Content Deepening Notebook * Classroom Curriculum Binder | * Video Clip 1: Belcastro\_L5\_C1 * Distillation Apparatus Video:   <https://drive.google.com/file/d/1OhD-taL2YlJYldUiKwsLNLoYYdxBFfvZ/view?usp=sharing> |

**DAY 2 SESSION OUTLINE: 8:00-3:00**

| **Time** | **Purpose** | **Content** | **Activities** |
| --- | --- | --- | --- |
| Opening  8:00 - 8:15 am  15 min  Slides 1-6 | **Purpose:** Continue to build community and set the stage for learning throughout the winter institute and into the academic year. | **Content:** Share agenda and focus questions for the day | **Opening**   * Day 2 Reflection discussion * Goals, Agenda, and Norms * Focus Questions |
| Video Analysis  8:15-9:15  60 min  Slides 7-8 | **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategy 5, (engage students in analyzing and interpreting data and observations) and Strategy 7 (engage students in constructing explanations and arguments) and how their use help students use science ideas to make sense of data and observations. | **Content:** Strategy 5, engaging students in analyzing and interpreting data and observations, allows students to connect observations or patterns to science ideas or use data and observations to answer a question. This supports Strategy 7, engage students in constructing explanations and arguments, as students are given opportunities to discuss their claims, evidence, and reasoning to come to a common understanding of the science content storyline. | **Video Analysis**   * Set Up: Norms/Basics/Process * Lesson context * Identify/Analyze/Reflect |
| Content Deepening: Lesson 6 & 7  9:15 – 11:10  110 min (work a 5-minute break in here as you can)  Slides 9 – 29 | **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/problem 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 as well as focal STeLLA strategies for each lesson:   * L6: STL 4/6 * L7: STL 5/7 | **Content Deepening: Lessons 6 and 7**   * Teacher Set-up * Anchor Experience for Adult Science Learners |
| Teacher Follow-up  11:10-11:30  20 min  Slides 30-32 | **Purpose:** The purpose of this session is to collaboratively reflect on the learning that took place in Lessons 6 and 7 as well as the unit as a whole. | **Content:** The STeLLA model asks teachers to link content deepening experiences to teacher learning goals. | **Teacher Follow-up**   * Reflect on learning from throughout the unit. * Reflect on the focal strategies in lessons 6 and 7 * Reflect on Effective Science Teaching and Learning |
| Lunch  11:30-12:00 |  |  |  |
| Curriculum Binder  12:00-12:50  50 min  Slide 33 | **Purpose:** The purpose of this session is to develop a shared understanding of the structure and content of the lesson planning documents and prepare to teach the lessons in the spring. | **Content:** STeLLA Lesson plans are designed based on the STeLLA approach and structured to make explicit the integration of STL and SCSL strategies and support teachers in enacting the strategies. Three dimensional, phenomena/problem-driven learning is highlighted throughout the lessons. | **Curriculum Binders:** |
| Lesson Plan Analysis  And Telling the Story  12:50-1:50  60 min  Slides 34-36 | **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategies and the science ideas developed throughout the lessons and prepare to teach the lessons in the fall. | **Content:** STeLLA lessons plans are structured to make explicit the integration of STL and SCSL Strategies and support teachers in enacting the strategies. Three-dimensional, phenomena/problem-driven learning is highlighted throughout the lessons. The ability to identify and articulate what students are learning, as opposed to what students are doing, is important to successfully enact the STeLLA lessons. | **Telling the Story**   * Articulate coherence across lessons * Tell the Story   + Content storyline   + STeLLA Strategy storyline |
| Closing  1:50-2:40  50 min  Slides 37-39 | **Purpose**: The purpose of this session is to plan for ongoing program activities.  Transformative professional learning experiences require sustained, collaborative work. It is important to reflect on and celebrate the work together and prepare for continued learning and reflection. Celebration of the work and learning of the week provides closure to the institute. | **Content:** A strong culture of ideas and trust contributes to the development of a community of teacher learners where we can learn while deprivatizing our practice. Analysis of practice based on a conceptual framework and done through video, student work, and common units of instruction provide a powerful focus for PLCs/study groups. | **Closing**   * Planning for Spring * Celebration and final reflection * Distribute CSW posters and kit materials as appropriate. |

### DAY 2

| **Time and Focus** | **Purpose and Content &**  **What Participants Do** | **Slides** | **Process** |
| --- | --- | --- | --- |
| 8:00 - 8:15 am  15 min  Slides 1-6 | **Opening**  **Purpose:** The purpose of the opening session is to continue to build community and set the stage for learning throughout the week and into the academic year.  **Content:** The STeLLA program is designed with the following goals in mind:   * Deepen knowledge of teaching and learning * Increase ability to analyze and reflect on teaching and learning * Increase ability to use content knowledge of teaching and learning to transform classroom practice * Deepen teacher content knowledge * Increase student learning in science   To achieve these goals, it is important to develop a strong community of learners to create a safe and respectful environment to make teacher thinking and practice visible.  **What Participants Do:**  Participants introduce one another and orient to the day’s activities and focus questions.  **Resources**   * Name Tags * Journals * Norms Poster * PD Binder   + Institute-at-a-Glance   + Norms * STeLLA Strategies Booklet * STeLLA Conceptual Framework poster * Charts   + Day 2 Agenda   + Day 2 Focus Questions   + Parking Lot   + Effective Science T&L   + Program Goals chart |  | 1. **SSUP Program Day 2 (0 min)** 2. Greet participants as they enter the room. Help them pick up their materials and find their small group. |
|  | 1. **Welcome and Introduction (5 min)**   **PDL Note:** Update slide with trends from gots and needs from day 1.   1. Welcome the team to Day 2. 2. Share patterns from Gots and Needs from day 1   **Transition:** *As we consider our reflections, let’s review the STeLLA program goals.* |
|  | 1. **Program Goals (5 min)** 2. Briefly share the program goals (p. \_\_). 3. Forecast that we will work toward these goals together throughout the week and academic year. Note that one of the sessions later today will help us think together about why we think this program will “work”. 4. Ask participants to consider how these goals resonate with their expectations for the week. Invite participants to record some ideas in their notebook.   **PDL Note:** Be sure to link what we will do during day 2 of the winter institute to work toward these goals. |
|  | 1. **Institute-at-a-Glance (5 min)** 2. Refer participants to p.\_\_ in the PD binder. 3. Point to the Day 2 agenda chart (note that there will be homework). 4. Remind participants how we will work.    1. Parking lot    2. Breaks/take care of your own needs |
|  | 1. **Norms (5 min)** 2. Refer participants to p.\_\_ in the PD binder. 3. Ask participants to consider their progress on the norm they selected on Day 2 and invite them to consider selecting another norm for today. 4. Remind participants that we’ll continue to revisit the norms periodically and take some time tomorrow morning to customize them for our work together. |
|  | 1. **Focus Questions (5 min)** 2. Note that focus questions are a hallmark of this program. 3. Share the focus questions for Day 2. Link back to the program goals.   **Transition:** *To help us answer our last focus question, let’s dig into the Matter Unit.* |
| 8:15-9:15  60 min  Slides 7-8 | **Video Analysis**  **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategy 5, (engage students in analyzing and interpreting data and observations) and Strategy 7 (engage students in constructing explanations and arguments) and how their use help students use science ideas to make sense of data and observations.  **Content:** Strategy 5, engaging students in analyzing and interpreting data and observations, allows students to connect observations or patterns to science ideas or use data and observations to answer a question. This supports Strategy 7, engage students in constructing explanations and arguments, as students are given opportunities to discuss their claims, evidence, and reasoning to come to a common understanding of the science content storyline.  **What participants do:** Participants read the summary document for STL 5 (engage students in analyzing and interpreting data and observations and 7 (engage students in constructing explanations and arguments). Participants watch and discuss their analysis of a video that highlights STeLLA Strategies 5 & 7. They identify the use of the strategies in revealing student thinking and what students understand (or not) about properties of matter.  **Resources:**  - Video Clip 1: Belcastro\_L5\_C1  -Transcript: Belcastro L5\_C1  -LAP Belcastro L5-C1  -STeLLA Strategies Booklet |  | 1. **Preparing for Video Analysis: The Context (5 min)**    1. Provideinstructions for watching the video clip and using the transcript to identify places where students are engaged in analyzing and interpreting data and observations; and constructing explanations and argument.    2. Invite participants to read the context for this clip at the top of the transcript |
|  | 1. **Video Analysis (55 min)**   **Identify (25 min)**   * 1. Invite participants to take out their LAP and review the questions for the Identify phase.   2. Show the video clip.   3. Individually: Give time for teachers to review the transcript and mark any time students are engaged in analyzing and interpreting data and observations or constructing explanations and arguments.   **PDL Note:** Clear examples of STL 5 and STL 7 include:   * 1. STL 5:  1. 1:23- T: “Which two pollutants had electrical conductivity?” 2. 2:02- T: “...What do you notice? What would we see here if there is fertilizer in the water?” 3. 2:24- SN: “There might be more—I mean like a- more of like purple--” 4. 3:21- S: “When I looked through the turbidity disk, I saw like a- it—I did see it, but like, it made it a lot more murky than it was.”    1. STL 7: 5. 0:03 – 0:25- S: “There also could be not just one pollutant in the water...” 6. 2:44- T: “No. So which of these claims would that support?” 7. 4:38- T: “Yeah, right? We know that it conducts electricity...” 8. 6:19 – 7:18: T: “So which of these claims is true?...”   **Video Analysis (25 min)**   * 1. Have participants consider the analysis question individually.   2. Invite participants to share their ideas about what students understand (or not) about properties of matter, and/or the use of the strategies to reveal, support, or challenge student thinking (or not).   3. Responses could include:  1. Students have a basic understanding that some matter conducts electricity and others do not. 2. Students also understand that, when matter is mixed with water, there can be a difference in the pH level. 3. The teacher supported students’ thinking by eliciting and probing student responses related to their observations and the data. 4. The teacher asks students to clarify which claim is being supported by the data.   **Reflect and Apply (5 min)**   * 1. Invite participants to respond to the prompt in their journals.   2. Have several participants share their ideas with the whole group. |
| 9:15 – 11:10  110 min (work a 5-minute break in here as you can)  Slides 9 – 29 | **Content Deepening: Lessons 6 & 7**  **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/problem 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 as well as focal STeLLA strategies for each lesson:   * L6: STL 5/8   **What Participants Do:**  Participate in Lessons 6 and 7 as learners.  **Resources**   * Journals * Science Notebook * STeLLA Conceptual Framework Poster * PD Binder * Handouts * Charts   + Class consensus chart   + Mash up poster |  | 1. **Matter: Lesson 6 (0 min)**    1. Tell the group that we will now dive back into the unit, picking up at lesson 6. |
|  | 1. **Content Deepening: Teacher Set-up (5 min)**    1. Review the questions on the slide and provide time for the task.    2. Ideas should include:    3. The pollutants in the water have different properties.    4. The pollutants in the water had electrical conductivity.    5. There is matter in the pond water that dissolved: it vanished but did not disappear.    6. Pollutants mixed with water can change the pH of the water.    7. The pollutants (matter) are made of small particles too small to be seen    8. Students may struggle with the idea that matter is made of particles- too abstract. |
|  | 1. **Link to Our Last Lesson (5 min)**   **PDL Note:** Point teachers to their science learner journals. This part of the session should attend to teacher learning goals. Mark that we are returning to learner hat for this next part of the session.   * 1. Explain that we will review an important idea we have developed in earlier lessons. We have discussed that this container of polluted pond water is made up of particles that are too small to be seen.   2. Ask participants to turn and talk with a partner and compare the models they visualized. What things are similar? different? How did they represent the pond water when zoomed way, way in?   3. Ask a few participants to share briefly from their discussion.   4. Say something like, Thanks for sharing your ideas. The key ideas I hear you saying are that:   5. Water is made of particles too small for us to see.   6. The pollutants, salt and detergent, are also made up of particles too small to be seen.   7. We might be picturing the particles of the pollutants differently from each other because they have different properties.   **PDL NOTE:**Adjust the next sectionto reflect participants’ ideas on the Driving Question Board. If the group didn’t generate any questions around removing the pollutants from the water, introduce the day’s Focus Question yourself as the next step the lesson will need to investigate to help us figure out what to do with the pond water. |
|  | 1. **Return to the Driving Question Board (5 min).**     1. Return to the driving question board and say something like “let’s take a look at some of the ideas you all clustered together on our Driving Question Board during our last lesson.”    2. If possible, find a cluster of questions related to how we can remove the pollutants that are in the water. Say something like “We are going to focus on this clump of questions today. After our last lesson, we know that there are salt and detergent in the water.” |
|  | 1. **Lesson Focus Question (0 min)** 2. Tell participants that during this next lesson we’ll work together to figure out this Focus Question: **Can we get the water to be safe again?** |
|  | 1. **Removing Pollutants (5 min)** 2. Ask participants to consider how we might remove pollutants from the pondwater. 3. Conduct a brief discussion about methods for removing pollutants from water. As participants share their ideas, chart their ideas to create a public record. Separate responses into two columns: physical and chemical processes.   **PDL Note:** As participants share their ideas, chart their responses into two columns but do not label them yet.   1. Physical processes include filtering or evaporation/ vaporization. 2. Chemical processes include displacement or oxidation-reduction (redox) reactions. Participants may not use these terms but instead suggest something like “chemical reaction” or “chemically break apart” the materials. 3. Once their ideas have been charted, ask participants to consider the two “types” of processes suggested and label each column, using participants terms if possible. 4. Refer participants back to the content deepening document in their curriculum binder (2nd to last page) and clarify that the processes we have been using in the lessons so far all represent a physical process. **Could we boil water in a pond to clean it if needed?**   **Transition**: *We will now examine more closely the physical process of evaporation as we continue to think about how we might get the pondwater clean again.* |
|  | 1. **Distillation Apparatus (5 min)** 2. Distribute HO Distillation Apparatus Diagram and ask participants to look at the picture on the handout. Explain that this is called a ‘distillation apparatus.’ And say something like: “We have a video that shows what happens when we turn on the hot plate. Let’s name a few different parts of this system. The water is in a flask. This part is called aquarium tubing. On the other side is a test tube sitting in a beaker.” 3. Quickly clarify/review the parts of the diagram. Clarify that they don’t need to remember those names, but you can use them if it helps to refer to different parts of the system. 4. **ASK: What do you think will happen when the hot plate is turned on? Why?** 5. Explain that in the flask on one side, there is some salt water*.*Say something like:   “Based on our work with properties, we know salt and detergent share several of the same properties – they both spread out evenly when they’re mixed with water, and they stay in the water when we filter the mixture.   1. Clearly state that **it isn’t safe to boil water with detergent in it.** Therefore, we will study salt water in this video only. Since our investigations have provided evidence that salt and detergent have similar properties, what we learn about salt can be applied to detergent and the question can we separate water and detergent from each other.   **PDL Note:** Boiling soapy water is generally considered unsafe because the water can boil away leaving only the soap which can then result in spattering and perhaps chemical changes. The soapy water can also foam over.   1. Ask participants to think about what we know about the properties of salt water.**Ask: What evidence from our lessons indicate that salt is in the water?** Ask a few participants to share their thoughts before you introduce the video of what happens when the hot plate is turned on and the saltwater boils. 2. Ask participants to take a moment to think about what they predict will happen when we boil this water. Ask if anyone would anyone like to share their predictions and their reasoning. Check for agreement among the group members around predictions that are shared before starting the video. 3. Direct participants to look at the diagram as you watch what happens to the salt water. Then explain that they will use this diagram to represent what happened while it was running. Say something like, “As we watch, I invite you to share what you notice. I want you to think about how our understanding of this saltwater mixture as being made of different types of tiny particles too small to see may help explain what you notice. See the ‘zoom in’ circles on here? When we’re done watching the video, you’ll show what you think was happening with the particles in each of those circles.” 4. Encourage the group to use our CSW sentence stems. While we watch, try to use 2. Observe, 1. Ask why and how questions, 4. Think of an idea that explains your data and observations, 6. Listen to others’ ideas and ask clarifying questions, and 7. Agree or disagree with others’ ideas or add onto someone else’s ideas. |
|  | 1. **Video of Distillation (10 min)**   ***PDL NOTE:*** *Play the video and elicit observations as it plays. Once the video is done, have participants represent what they think happened on their diagrams of the distillation apparatus. Emphasize the zoomed in circles and that participants need to show what they think was happening with the particles at each stage. You might note as they work who shows water and salt particles in the flask and only water particles in the test tube. Also look for the configuration of the particles where there is water vapor. Do participants represent liquid and gas particles differently? If you note differences, you may want to ask those participants to share their models or explain their thinking with the full group.*   1. Ask participants to look at how others represented what they thought was happening in the distillation apparatus. Direct participants to put all the papers together in front of the group and take a couple minutes to just observe each other’s ideas. 2. After a few minutes signal that it’s time to start discussing, sharing similarities and differences that they notice among all the diagrams. 3. Clarify this isn’t a time to agree or disagree with each other, but they may want to ask clarifying questions of each other to understand why some of their teammates represented their ideas in a particular way. 4. Ask “Who would be willing to describe or show us some of the similarities, differences, and questions that came up during your discussions?” and have a few members share out.   ***PDL NOTE:*** *If you don’t consistently see matter represented as particles, you may want to ask if anyone noticed a diagram that was effective in showing how the matter in the distillation apparatus was made of particles too small to be seen. You may want to show a clear example of this with a document camera if it feels like some would benefit from seeing that concept represented. If you end up showing an example, give time for participants to add particles to their diagrams.* |
|  | 1. **Can we get the water to be safe again? (10 min)** 2. Review with the group that in our models of the distillation apparatus, we all started to think about what happened to the salt. Explain that thinking about the salt will help us answer our lesson focus question: Can we get the water to be safe again? 3. Ask: **What evidence do we have to help us answer the question of whether there is salt in the test tube in the end?** 4. Introduce the idea that we have evidence that could support either claim: there is salt in the test tube or there is not water in the test tube. Ask the group to consider: Which claim’s evidence is stronger? 5. Introduce the petri dishes with the different water samples by saying something like: “I have something else I’d like to show you as we think about this question. These petri dishes had samples of different water and pollutant mixtures in them. They’ve been sitting out for about a week now. Be careful to not touch them as you look at them because they're very delicate. What do you see? “ 6. Ask the group to consider if the following questions:    1. If mixtures had water in them and now this is all that’s left behind after a week, what do you think happened?   *The water disappeared and the pollutants stayed behind.*  ***What evidence do we have to support that?***  *We can see there isn’t any water here but this looks like salt crystals.*   * 1. How do these petri dishes connect to what we observed in the distillation video?   *The water left both of them and the pollutants stayed behind.*   * 1. What does that tell us about whether and how we can make polluted water safe again?   *You can make water safe again by boiling it, but we don’t know how you can boil water in a pond.*   1. Forecast that now that we’ve figured out that we can separate the water from the pollutants, we’re going to dig a little more into what happened with the water in this setup. |
|  | 1. **What happened to the water in the system? (5 min)** 2. Explain that you will now show you some images that relate to gas. (*Display the slide with the images of the full and empty Helium canisters and the empty and full balloons.*). Ask participants to think about what each of these images shows and consider what you would see in these pairs of images if you were to zoom way, way in, just like we’ve been doing with our mixtures. 3. Direct participants, with a partner, to draw a quick sketch of what they picture inside an empty and full balloon and what you picture inside these two Helium gas canisters.   ***PDL NOTE:*** *Scan the sketches to see if anyone is applying a particle model to their representations of the CO2 gas. If anyone is, ask if they would be willing to share their sketch with the class. If someone draws an image to share that shows a particle model, display that for the group.*   1. Who can make a connection between the models we created of our liquid mixtures and our current sketches of helium?   ***PDL NOTE:*** *If no one applied a particle model to the gas, go right into the following transition into the next activity. “We’re going to look at a representation for how scientists picture gasses. I want you to think about whether you can make any links between what we’ve learned about our mixtures when we zoom way way in, and how a gas may look when we’re zoomed in.* |
|  | 1. **The PhET Computer Simulation (10 min)**. 2. Introduce the PhET simulation by saying something like, “We have observed a process, evaporation, that separated pollutants from the water. Now that we’ve captured some of our ideas about gasses, we’re going to look at the PhET simulation to extend our thinking about evaporation, as well as boiling point and melting point to picture the way matter changes from solids to liquids to gasses when we zoom way, way in.” 3. Pull up the PhET “States of Matter” simulation. Select Celsius as the temperature scale and neon as the substance in the liquid phase to start. Say something like:    1. “We’ve looked at how we represent particles that are liquid. Remind us, what do you notice when you look at how these particles look in a liquid.” “Next, just like we did today with the distillation apparatus, we’ll apply some heat.”    2. Keep applying the heat until all the particles are in the gas state. Then ask, “If we look at this model of gas particles, how does this zoomed in picture compare to what you all drew for the balloon and the CO2 canisters?”    3. “How many of you showed empty space in your sketches? How many of you showed ‘stuff’ but maybe not particles like we showed in our water and pollutant models? How many of you showed particles?    4. Direct participants to continue reducing the heat to return the particles to a liquid and then a solid to demonstrate how the simulation models changes in state of matter.    5. Suggest that as adult learners (students do not need this level of depth at this level – this is for teacher learning) participants also “play” with water molecules, and if there is time, oxygen as well to investigate what factors affect changing states of matter.    6. Conduct a group discussion and chart ideas to create a public record of their thinking. 4. Ideas to look for include: 5. Matter changes state at particular temperatures. 6. Water looks different than other substances as a liquid vs. solid – the solid particles are more spread out. 7. ***PDL NOTE:*** *If this idea comes up, validate the observation and note that students don’t need this level of understanding in fifth grade. That is why the student lessons stay in neon for this exploration – the particles look like circles instead of the H2O structure that is beyond grade-level standards.* 8. Different atoms and molecules change state at different temperatures. 9. The temperature at which matter changes (evaporates, condenses) is a property of that material.   **Transition**: *Now that we have investigated the way matter changes using the particle model, let’s apply this to our thinking about the distillation apparatus and diagram.* |
|  | 1. **Revising our Diagrams (5 min)** 2. Direct participants to “Turn and talk” to a partner about what happened to the water particles in the distillation apparatus earlier. Clarify that groups should use the words ‘liquid’ and ‘gas’ when talking about the water particles at each state in order for their ideas to be clear to the group. 3. When participants have finished discussing in pairs, direct the group to go back to their distillation apparatus diagram AND the sketches they made of the balloons and CO2 canisters. Tell the group to take a minute to go back to their diagrams and add to or change them based on their discussions.   ***PDL note:*** *As participants work, look to see if their sketches show that gas is made of particles too small to be seen. If this is not evident in their drawings, facilitate a conversation about what they observed/learned in the PhET simulation.*  **Transition:** *We have generated a lot of really good ideas today. Let’s pause and reflect on what we have figured out as well as add new questions.* |
|  | 1. **Idea Tracker (5 min)** 2. Provide time for participants to respond to the prompt individually in their science notebooks. 3. Invite participants to share their ideas with others at their table. Gather a few ideas from the whole group. 4. Ideal responses: 5. We figured out that filtering didn’t take out either of the pollutants. 6. Boiling water turns the liquid water into a gas and when it cools, the water turns back into a liquid. 7. Boiling the polluted water causes the water to leave but the pollutants to remain. 8. When water changes into a gas, the same amount of water is still there. 9. Water as a gas is still matter and is both liquid and gaseous matter are made up of particles too small to be seen, as is all matter.   **PDL Note:** Ensure teachers can answer this question by including more explicit use of the CSW sentence stems in the anchor.  **Transition:** *Thank you for engaging in the lesson as a learner. This marks the end of the common learner experience. We will now debrief the experience as educators. The last lesson (7) will be analyzed by looking at student work samples after we debrief lesson 6 from the learner lens.* |
|  | 1. **Lesson 7 Focus Question (0 min)** 2. Share the Lesson 7 Focus Question with the participants. 3. Note that we’ll move quickly through this lesson to get a sense for the thinking that rounds out the storyline. |
|  | 1. **The Pond–School System (10 min)** 2. Ask a few participants what they notice about this map. 3. If anyone notes that the pond moved, let them know that’s an error on the slide – the pond didn’t actually move. 4. Ask, “If the school was the source of the pollution, where could the pollutants have come from?” 5. Ask, “**If the pollution came from the school, how do you think it may have traveled from the school to the pond?**   ***NOTE TO PDL:*** *If the idea comes up that materials that we use inside schools, homes, and businesses is the source of non-point source pollutants, it’s important to address that these materials travel in a different system: they go into a water treatment system and not into natural bodies of water. We want to focus their ideas on substances used outdoors as the cause of this non-point source pollution.*  *If participants bring up reasonable ways that the salt and detergent could have been used outside like a car wash or a school custodian washing off the side of the building, use those participant-generated ideas for the next section. You may say something like, “Those are all realistic ways the pollutants might have ended up on the ground outside the school. If those things happened, take a moment to think about what might have caused them to go from the ground outside the school into the pond. If students don’t generate ideas about how the pollutants could have ended up outside the school, use the script below.*   1. “I have two new ideas the share with the class:” 2. “In the Winter, after a heavy snowfall, ice was added to the road to melt the ice and made it safer to drive.” 3. “In the Spring, the school held a car wash fundraiser and families drove their cars onto the school playground so students could wash the cars.” 4. Invite participants to think about these scenarios. Ask, “How does this new information affect your current ideas about the how the pond became polluted and how it might be represented in a class model of the school-pond system?” Invite participants to turn and talk to a partner to share their thoughts. |
|  | 1. **Creating A Class Consensus Model (10 min)** 2. Before participants begin developing the consensus model, we’ll consider what we have already learned and how we have represented our learning in previous lessons. Invite participants to quickly look at their notebooks and the co-created charts around the room.  * **What evidence have we collected already that would be useful in developing our model?** * **What models have we developed in past lessons that we can use here?** * **What information in our progress trackers should we consider?**   Give participants a few minutes to look through their notebook and charts around the room.   1. Invite participants to circle up around the chart with the school/pond system. 2. Ask for one/two volunteers to capture the group's ideas on the consensus model showing what may have caused the pollutants to get into the pond. Prompt participants to share the floor and to use the CSW sentence stems as they are helpful in communicating their ideas.   ***NOTE TO PDL:*** *Your role during the discussion will be to allow participants to guide the creation of the model and ask questions as needed. Push on participant thinking with elicit, probe and challenge questions about the way these pollutants interact with water that are consistent with the properties of those substances (salt dissolves, soap spreads evenly). The ideas below should be represented in a scientifically accurate way in the model and are places you may want to jump in with elicit, probe, or challenge questions.*   1. *The particle nature of matter – are they representing the particles? Are the particles of water and the pollutant represented differently?* 2. *Conservation of matter: are the “dots” or particles disappearing? Have they considered how the number of dots is represented at various parts of the model?* |
|  | 1. **Pause and Reflect (2 min)** 2. Invite participants to reflect on this question individually for a minute. They can capture notes in their student notebook if it’s helpful. 3. Have participants turn and talk about their responses to the question. |
|  | 1. **Pictures from Another School (2 min)** 2. Say something like, “You all have asked throughout these lessons if this was a real situation. In fact, here’s a picture (display image in slide) here’s a picture taken in another community where there are two small ponds downhill from a school and they recently had a bunch of fish die in that pond. Something changed in that water that made it unsafe for the fish that lived there. The thinking that we’re doing about pollutants and their properties matter in our everyday lives, such as in this community. That community needs to go through and do some of the types of investigations we’ve been doing together during these lessons.” |
|  | 1. **Content Deepening: Teacher Follow up (5 min)** 2. Say something like, “We have this this data table. This is the data collected by students in that community to determine what has polluted their pond water. The other class has sent their data to us because they know we have been conducting investigations on pond water pollutants.” 3. Invite participants to review the data table individually and jot their responses to these questions: 4. Of the pollutants that we studied, what could possibly be polluting their pond water? 5. What additional test or data would you like to collect to make you more confident in your claim? 6. Remind participants that claims need to be supported with data from the other class's data table or our own investigations. Claims also need to be supported with ideas we have learned during our own investigations. 7. Invite participants to briefly discuss their answers to these questions with a small group. Remind them to use CSW sentence stems as they are helpful in the discussion. |
|  | 1. **What is your explanation for the mystery pollutant? (5 min)** 2. Mark that in the classroom, students will complete this task individually. For our purposes today, rather than write our explanations, we’ll have a **brief** discussion. During this discussion, it will be key to use data and our investigations together as evidence to support claims or to explain where we might need more information. 3. ***NOTE TO PDL:*** *The data mostly closely matches the properties identified for fertilizer (soluble, does not conduct electricity, etc.) however, as described a few of these properties that students may want additional clarity. For example, during the conductivity test, the was some fizzing in the water. The data from the other class does not mention this fizzing. Fertilizer also can make the water bluish, but this is not listed. Finally, the pH has a range (4-5) and students may suggest repeating that test. Students may also follow a line of reasoning about what the mystery pollutant is NOT (oil because it is soluble or salt because it is non-conductive). This line of reasoning is fine as long as the claim is clear and there is evidence to support it. However, the process of elimination requires a more complex approach to the written form of the explanation, which is the next step in this lesson. Still, this may be a productive means of sorting out ideas about the evidence during group discussions.* 4. Note that if we had more time, we would again return to the Driving Question Board to see what we’ve now answered and which of our questions go beyond what we’re able to explore in this unit. Encourage participants to research or investigate lingering questions they have but note that we’re wrapping up our collective work here. |
|  | 1. **Content Deepening: Teacher Follow up (5 min)** 2. Direct participants to the Mashup handout in their binder and provide instructions for the task. 3. Review ideas where there is disagreement. Help participants make links between ideas and lessons/activities. |
|  |  |  | 1. **One last visit to the DQB**    1. Look together at which questions were answered within the unit and which questions weren’t.    2. Depending on timing, if there are unanswered questions that would be supportive of teachers’ unit-related content knowledge, take this time to answer those questions. |
|  | Break – One 10-minute break or two 5-minute breaks wherever needed and you can fit it in throughout Lessons 6 and 7 | | |
| 11:10-11:30  20 min  Slides 30-32 | **Teacher Follow-up**  **Purpose:** The purpose of this session is to collaboratively reflect on the learning that took place in Lessons 6 and 7 as well as the unit as a whole.  **Resources:**   * Journals * PD Binder: Mashup from Day 1 * Curriculum Binder   + Matter Unit Scope and Sequence   + Matter Unit Relevant Standards * Chart   + Effective Science Teaching and learning |  | 1. **Content Deepening: Teacher Follow-up (5 min)** 2. Direct participants to the Mashup handout in their binder and provide instructions for the task. 3. Review ideas where there is disagreement. Help participants make links between ideas and lessons/activities. |
|  | 1. **Content Deepening: Teacher Follow-up (10 min)**    1. Hand out the placemats for Lessons 6 and 7. Invite a few minutes for individual think time about the key STeLLA strategies in each lesson and instructional notes while it’s fresh in their minds.    2. Invite participants to stand up with their placemats and find a group of 3-4 people they haven’t worked with much yet today to share their thinking. Encourage people to add ideas to their placemats as they hear ideas that resonate.    3. Whip around the groups to get one key idea from each group.    4. ***PDL NOTE:*** *If you do not hear participants noting CSW and 6. Engage students in using content representations and models for Lesson 6 or 5. Engage students in analyzing and interpreting data and observations and 7. Engage students in constructing explanations and arguments for Lesson 7, you may want to mark these as focal strategies for those lessons and invite participants to add that to their placemats.* |
|  | 1. **Effective Science Teaching and Learning Strategies (5 min)** 2. Remind participants that we began our work together in the summer institute by charting our ideas about effective science teaching and learning. Direct participants’ attention to their chart. 3. Invite participants to individually reflect on their experiences and learning since we began our work in the summer institute and consider what they would add, revise, or delete on their chart. Provide a few moments of individual think time. 4. Provide time for participants to work as a group to make any changes to their chart with a different color marker. |
| 12:00-12:50  50 min  Slide 33 | **Lesson Analysis: Curriculum Review**  **Purpose:** The purpose of this session is to develop a shared understanding of the structure and content of the lesson planning documents and prepare to teach the lessons in the spring.  **Content:**  STeLLA Lesson plans are designed based on the STeLLA approach and structured to make explicit the integration of STL and SCSL strategies and support teachers in enacting the strategies. Three dimensional, phenomena/problem-driven learning is highlighted throughout the lessons.  **What participants do: Participants use a j**igsaw strategy to review Lessons 1-5 and identify STeLLA Strategies in the Lesson Guide.  **Resources**  · STeLLA Strategies Booklet  · Lesson 1-7 Placemats  · Curriculum Binder |  | 1. **Curriculum Binders (50 min)**    1. Share that to help us form this vision, we have detailed Lesson Plans that can help us form ideas of what these strategies might look like and sound like in practice.    2. Ask: In our first unit, what was in the Lesson Plans that could help us do this? (Use probe and challenge questions to help participants think beyond the STeLLA Strategy column. Other possible answers: “teacher talk and questions” column as well as “possible teacher/student dialogue” column.)    3. Remind participants that one of the STeLLA Program goals is to *increase ability to use knowledge of teaching and learning to transform classroom practice*. Share that in this second STeLLA unit, we will use and apply our knowledge of the STeLLA Strategies to deepen our understanding and practice of effective science teaching and learning. Therefore, participants have an important task in this second unit: identifying where key STeLLA Strategies are occurring and planning for their intentional use during instruction. Reveal that when they receive their curriculum binders in a moment, the STeLLA Strategy column will be blank. Note that the work they’ve done with placemats was meant to help with this work.    4. Pass out Curriculum Binders. Share that study groups will jigsaw lessons 1-7 to identify where key STeLLA Strategies are happening in the Lesson Plan. Participants will have time now during the session and as homework to complete before tomorrow’s session, where they will share out to the rest of their study group. Suggest that they start with the focal strateg(ies) they identified on the lesson placemat and then fill in supporting strategies as they identify them. Remind them that they should use their STeLLA Strategies Booklet to check their understanding of focal strategies. Encourage participants to highlight key text in the teacher talk and dialogue columns that led them to identify a particular strategy. You might say something like: *Where are those magic moments where you will leverage that strategy? Where can you find Teacher/Student dialogue that captures what this strategy might look like in practice? – Label the strategy next to the places where they are really happening. Highlight the text that led you to do so.*    5. Share who will be doing what lesson and give participants time to work.   **PDL NOTE**: Consider lesson assignments. Placemats for lessons 1 and lesson 5 were done in whole group and therefore may be easier to identify STeLLA Strategies. |
| 12:50-1:50  60 min  Slides 34-36 | **Lesson Analysis**  **Purpose:** The purpose of this session is to develop a shared understanding of STeLLA Strategies are enacted and the science ideas developed throughout the lessons and prepare to teach the lessons in the fall.  **Content:**  STeLLA lesson plans are structured to make explicit the integration of STL and SCSL strategies and support teachers in enacting the strategies. Three dimensional, phenomena/problem-driven learning is highlighted throughout the lessons. The ability to identify and articulate what students are learning, as opposed to what students are doing, is important to successfully enacting the STeLLA lessons.  **What Participants Do:**  Participants work in small groups to tell the science story of their lesson. They consider the STeLLA Strategy storyline and reflect on how the strategies support students in constructing a coherent science content storyline. |  | 1. **Lesson Plan Analysis (5 min)**    1. Provide instructions for the task. The next slide will show the sentence stems participants might use as they tell the story of their lesson. (5 min) |
|  | 1. **Tell the Story . . . (30 min)**   **PDL Note:** Hang the Focus Questions and other lesson charts together where participants will stand so they can use them as they tell the story of the unit.   1. Provide 10 minutes for participants to work together to prepare to tell the story of their lesson. As participants work, circulate among groups asking elicit and probe questions as needed. 2. Invite participants to stand in a circle and begin telling the story of the unit from lesson 1. Encourage them to check for additions or revisions between handing off to the next group. (10 min) 3. Highlight that we will tell the story again with different lesson leads. Invite participants to regroup with their lesson team to make any adjustments to their story. (5 min) 4. Tell the story of the unit again, beginning with lesson 1. (5 min) |
|  | 1. **Lesson Plan Analysis: STeLLA Strategies (25 min)**   **PDL Note:** This slide is animated.  **If needed, cut or trim this slide for time**   1. Provide instructions for the task. Provide 10 minutes for participants to work together to prepare to tell the STeLLA Strategy story of their lesson. As participants work, circulate among groups asking elicit and probe questions as needed. 2. Invite participants to stand in a circle and begin telling the STeLLA Strategy story of the unit from lesson 1. Encourage them to check for additions or revisions between handing off to the next group. (10 min) 3. Advance the slide to show the second prompt. Provide a few minutes of think time and invite participants to share their ideas with the whole group. Ask probe and challenge questions to encourage participants to provide specific examples from the lessons and how the strategies supported their own construction of a coherent science content storyline. (10 min) 4. If time permits, invite participants to share something they want to take with them from this lesson analysis session. |
| 1:50-2:40  50 min  Slides 37-40 | **Planning for Study Groups and Closing**  **Purpose:** The purpose of this session is to plan for ongoing program activities. Transformative professional learning experiences require sustained, collaborative work. It is important to reflect on and celebrate the work together and prepare for continued learning and reflection. Celebration of the work and learning of the week provides closure to the institute.  **Content:**  A strong culture of ideas and trust contributes to the development of a community of teacher learners where we can learn while deprivatizing our practice. Analysis of practice based on a conceptual framework and done through video, student work, and common units of instruction provide a powerful focus for PLCs/study groups.  **What Participants Do:**  Participants use a working lunch to plan for implementing the unit, video a classroom lesson, and ongoing study group activities.  They consider how their ideas about the day’s focus questions have changed as a result of their experiences and engage in a final reflection and celebration of their work throughout the winter institute.  **Resources**   * Calendars * Way to capture who is signing up to film which lesson * Any resources necessary for the reflection (small sheets of paper for snowballs; chocolate for Golden Nuggets; or journals if capturing individually) |  | 1. **Planning For Spring (40 min)** 2. Provide instructions for spring planning. Remind participants of the focal STeLLA Strategies for each lesson and forecast that they should be sure to video the portions of their lesson that include the focal strategies. (10 min) 3. Share any needed logistics for scheduling videotaping, SWIVL, etc. |
|  | 1. **Focus Questions (0 min)** 2. Remind participants of the focus questions for the day. Invite them to privately reflect on how their thinking has changed (or not) over the course of our work together. |
|  | 1. **Reflection (5 min)**    1. Provide instructions for responding to the prompt and provide time for participants to consider their response.    2. Invite participants to share their response to the prompts in a whip around. |
|  | 1. **BSCS (0 min)** 2. Thank participants for their thoughtful work during the winter institute. |