

RESPeCT Summer Institute Professional Development Leader Guide (PDLG)

Grade Level	5	Day	8	STeLLA Strategy	SCSL Strategy F: Link Science Ideas and Activities SCSL Strategy G: Link Science Ideas to Other Science Ideas SCSL Strategy H: Highlight Science Ideas and Focus Question	Subject Matter Focus	Food Webs
Focus Questions	<ul style="list-style-type: none"> • How can science content storyline coherence be enhanced by explicitly implementing STeLLA strategy F (Make explicit links between science ideas and activities), strategy G (Link science ideas to other science ideas), and strategy H (Highlight key science ideas and focus question throughout)? • How will the Student Thinking Lens and the Science Content Storyline Lens strategies help you teach the Food Webs lessons in the fall? • An organism can use food molecules (1) for growth as they become part of its body; (2) for energy as the molecules are broken down; (3) as wastes; and (4) as matter passed on to other organisms. Why should these fractions of food matter in an organism add up to 1? • How can we use conservation of matter to create fraction problems with a scientific context? 						
Main Learning Goals	<p>Participants will understand the following:</p> <ul style="list-style-type: none"> • Strategies F, G, and H are all useful in constructing a coherent science content storyline. Strategy F ensures that students are thinking about science ideas before, during, and after each activity; strategy G focuses on making connections among key science ideas that are developed within and across lessons; and strategy H makes sure that key science ideas are highlighted for students throughout a lesson. • All of the SCSL and STL teaching strategies are highlighted in the Food Webs lesson plans that teachers will use in the fall. These lessons will support teachers in using and deepening their understandings of the STeLLA strategies. • The fractions of food molecules in an organism that are used in a food web in four possible ways should add up to 1 because 1 represents the total amount of food matter in the organism, and the fractions represent the portion of that whole being used in each way. • Mathematically, conservation of food matter is expressed through an equation involving four quantities. By specifying three of the four, we can set up a problem to solve for the other quantity. Since these quantities are expressed in terms of fractions, we obtain a fraction problem. • Instead of using a numerical count of the molecules that make up food matter, scientists use fractions to describe these amounts, since the number of molecules involved in most food chains and food webs is so large that it's impractical to count them. 						
Preparation				Materials		Videos	
Daily Setup Tasks				Posters and Charts		Video clips from one Food Webs lesson:	
<ul style="list-style-type: none"> • Check that video clips are correctly linked to PowerPoint (PPT) slides. 				<ul style="list-style-type: none"> • STeLLA Framework and Strategies poster • Day-8 Agenda (chart) 		<ul style="list-style-type: none"> • <u>Video Clip 8.1</u>: Torres classroom (strategy F, before the activity); 	

- Set up PowerPoint.
- Make sure video clips play correctly with good sound.
- Arrange furniture and food.
- Arrange participant materials.
- Put up posters and charts.

Planning and Preparation Tasks

- Study the PDLG, PowerPoint slides (PPTs), video clips, and handouts. Make changes to PPTs if needed. Modify text highlighted in light-blue font on slides and/or in PDLG to make it specific for your group.
- Review the content deepening slides and determine the amount of time to allot for each slide based on the needs of your group. Add timing cues to PPTs, if desired, to help you stay on track.
- Review the reflections from day 7 and create a summary slide (PPT 2).
- Watch the video clips and anticipate participant responses.
- Prepare charts for the day's agenda and focus questions.
- Prepare two charts to use during the lesson plan review (see slides 16 and 17). These charts will highlight which STL and SCSL strategies are covered in each lesson.
- Insert some possible meeting dates for school-year study-group meetings on PPT slide 20.
- Decide how you want to celebrate the end of the Summer Institute and insert those plans on the relevant PPT slide. (See some celebration suggestions in the leader notes for slide 44.)

- Day-8 Focus Questions (chart)
- Norms for Working Together (chart)
- Effective Science Teaching chart (from day 1)
- Strategy charts from days 1–7 (STL strategies 1–7 and SCSL strategies A, B, C, D, I)
- Chart of STL strategies highlighted in Food Webs lesson plans (see PPT slide 16 for model)
- Chart of SCSL strategies highlighted in Food Webs lesson plans (see slide 17 for model)
- Parking Lot poster

Handouts in RESPeCT PD Binder Front Pocket

- Z-fold summary chart: Science Content Storyline Lens Strategies

Handouts in RESPeCT PD Binder, Day 8

- 8.1 Analysis Guide F: Making Explicit Links between Science Ideas and Activities
- 8.2 Transcript for Video Clip 8.1
- 8.3 Transcript for Video Clip 8.2
- 8.4 Transcript for Video Clip 8.3
- 8.5 Transcript for Video Clip 8.4
- 8.6 Overview of School-Year RESPeCT Study Groups
- 8.7 Pie Charts and Tape Diagram

Handouts in RESPeCT Lesson Plans Binder

- 5.2 Rotting Is a Good Thing! (from Food Webs lesson 5b)

PD Leader Masters, Days 5–8

- PD Leader Master: 5th-Grade Guide to Torres Video Clips for Day 8

Supplies

- Science notebooks
- Pencils or pens
- Scissors (1 pair per participant)
- Glue sticks (1 per participant)

- 8.1_stella_FW_torres_L5_c1
- Video Clip 8.2: Torres classroom (strategy F, during the activity); 8.2_stella_FW_torres_L5_c2
- Video Clip 8.3: Torres classroom (strategy F, after the activity); 8.3_stella_FW_torres_L5_c3
- Video Clip 8.4: Torres classroom (strategies F, G, and H); 8.4_stella_FW_torres_L5_c4

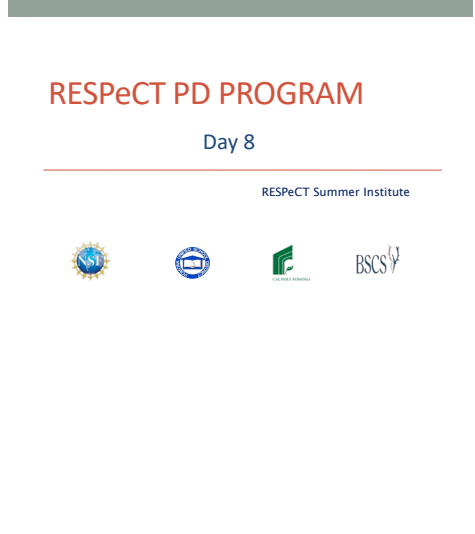
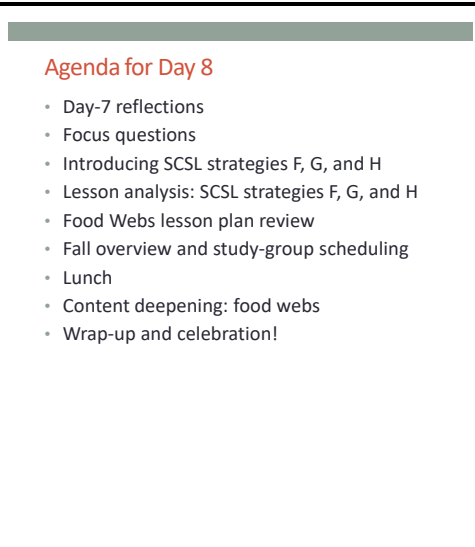
	<p>PD Resources</p> <ul style="list-style-type: none">• STeLLA strategies booklet• RESPeCT PD program binder• RESPeCT lesson plans binder <p>Resources in Lesson Plans Binder</p> <p><i>Resources section:</i></p> <ul style="list-style-type: none">• Food Webs Content Background Document• Common Student Ideas about Food Chains and Food Webs	
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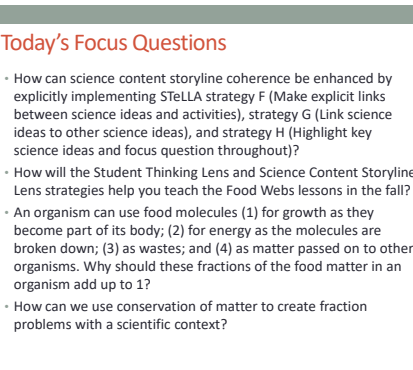
DAY 8 SESSION OUTLINE

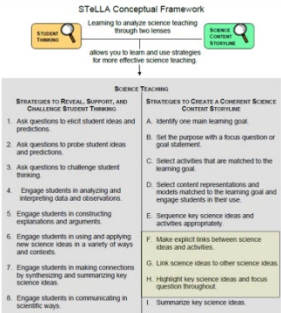
Time	Activities	Purpose
8:00–8:15 15 min	Getting Started: Housekeeping, Agenda, Day-7 Reflections, Norms, Focus Questions	<ul style="list-style-type: none"> • Build community by sharing participants' reflections from day 7. • Set the stage for a day of learning.
8:15–8:55 40 min	Introducing SCSL Strategies F, G, and H	<ul style="list-style-type: none"> • Deepen participants' knowledge of the purposes and key features of SCSL strategies F, G, and H. • Develop participants' understandings of the similarities and differences among strategies F, G, and H.
8:55–10:30 95 min (Includes 10-min break)	Lesson Analysis: SCSL Strategies F, G, and H	<ul style="list-style-type: none"> • Develop participants' ability to identify and analyze strategies F, G, and H in Food Webs lesson video clips. • Deepen participants' science-content knowledge of food webs through lesson analysis.
10:30–12:00 90 min	Food Webs Lesson Plan Review and Fall Overview/Logistics	<ul style="list-style-type: none"> • Deepen participants' understandings of the Food Webs lesson plans and the opportunities they provide to practice using STeLLA STL and SCSL strategies. • Help participants understand and feel comfortable with the fall activities and logistics.
12:00–12:45 45 min	LUNCH	
12:45–3:00 135 min (Includes 10-min break)	Math Content Deepening: Food Webs	<ul style="list-style-type: none"> • Refresh participants' understandings of basic mathematical operations using fractions and the concepts of whole versus unit in the interpretation of fractions. • Deepen participants' ability to visualize fractions and the addition of fractions in terms of whole versus unit, and use this visualization to think about the use of food matter in an organism. • Deepen participants' ability to compare and contrast different representations of fractions that help visualize the use of food matter in organisms. • Help participants understand that fractions can be used to support the idea of conservation of food matter in food webs. • Help participants understand why fractions are more useful than whole numbers in representing movement and conservation of matter in food chains/webs.

Time	Activities	Purpose
3:00–3:30 30 min	Wrap-Up and Celebration	<ul style="list-style-type: none"> • Help participants understand the relationships among the Science Content Storyline Lens strategies and when each strategy occurs in the lesson flow. • Facilitate understanding which SCSL strategies must be addressed in the planning process and which need to be anticipated in planning but occur responsively during the actual teaching of the lesson. • Recognize and celebrate participants' learning so far and anticipate further growth in the coming year.

DAY 8

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
<p>8:00–8:15 15 min</p> <p>Getting Started</p> <p>Slides 1–5</p>	<p>Purpose</p> <ul style="list-style-type: none"> • Build community by sharing participants’ reflections from day 7. • Set the stage for a day of learning. <p>Posters and Charts</p> <ul style="list-style-type: none"> • STeLLA Framework and Strategies poster • Day-8 Agenda (chart) • Day-8 Focus Questions (chart) 	 <p>RESPeCT PD PROGRAM</p> <p>Day 8</p> <p>RESPeCT Summer Institute</p>  <p>Agenda for Day 8</p> <ul style="list-style-type: none"> • Day-7 reflections • Focus questions • Introducing SCSL strategies F, G, and H • Lesson analysis: SCSL strategies F, G, and H • Food Webs lesson plan review • Fall overview and study-group scheduling • Lunch • Content deepening: food webs • Wrap-up and celebration! 	<p>Display Slide 1. RESPeCT PD Program (5 min)</p> <p>a. Take care of any housekeeping issues.</p> <p>Display Slide 2. Agenda for Day 8 (2 min)</p> <p>a. Talk through today’s agenda.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>Display Slide 3. Trends in Reflections (5 min)</p> <p>a. Give participants time to review your feedback on their reflections from day 7 and offer reactions, comments, or follow-up questions.</p>
			<p>Display Slide 4. Today's Focus Questions (2 min)</p> <p>a. Introduce the focus questions that will guide today's work.</p>

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		 <p>The diagram illustrates the STeLLA Conceptual Framework. At the top, it states 'Learning to analyze science teaching through heuristics allows you to learn and use strategies for more effective science teaching.' Below this, two boxes represent 'Science Teaching' and 'Science Content Coherence'. A central box lists 11 strategies for science teaching, divided into two columns: 'Strategies to Revital, Renew, and Challenge Science Teaching' and 'Strategies to Create a Coherent Science Content Coherence'.</p>	<p>Display Slide 5. STeLLA Conceptual Framework (1 min)</p> <p>a. “Today we’ll focus on three Science Content Storyline Lens strategies, all of which make explicit links to science ideas:</p> <ul style="list-style-type: none"> • Strategy F explicitly links science ideas to activities that students are doing. • Strategy G explicitly links science ideas to other science ideas. • Strategy H explicitly highlights key science ideas and links them back to the focus question.” <p>b. “We won’t address strategy E about sequencing science ideas and activities until the school year, since you’ll learn a lot about sequencing from teaching the RESPeCT lesson plans.”</p>
<p>8:15–8:55 40 min</p> <p>Introducing SCSL Strategies F, G, and H</p> <p>Slides 6–8</p>	<p>Purpose</p> <ul style="list-style-type: none"> • Deepen participants’ knowledge of the purposes and key features of SCSL strategies F, G, and H. • Develop participants’ understandings of the similarities and differences among strategies F, G, and H. <p>Content</p> <ul style="list-style-type: none"> • While strategies F, G, and H help students construct 	<p>Lesson Analysis: Focus Question 1</p> <p>How can science content storyline coherence be enhanced by explicitly implementing STeLLA strategy F (Make explicit links between science ideas and activities), strategy G (Link science ideas to other science ideas), and strategy H (Highlight key science ideas and focus question throughout)?</p>	<p>Display Slide 6. Lesson Analysis: Focus Question 1 (Less than 1 min)</p> <p>a. Read the focus question on the slide.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>meaning from the science content storyline, each strategy has its own specific purpose.</p> <ul style="list-style-type: none"> In strategy F, activities that students carry out should be explicitly linked to the science content storyline so the science ideas are made visible to students before, during, and after an activity. In strategy G, science ideas introduced in a lesson should be clearly and explicitly linked to the main learning goal(s) within and across lessons. In strategy H, the science content storyline is easier for students to construct if the main learning goal, supporting science ideas, and flow of events are highlighted at key points during the lesson. <p>What Participants Do</p> <ul style="list-style-type: none"> Make, share, and discuss charts summarizing the purposes and key features of strategies F, G, and H. <p>PD Resources</p> <ul style="list-style-type: none"> STeLLA strategies booklet SCSL Z-fold summary chart (front pocket of PD binder) 	<p>SCSL Strategies F, G, and H: Purposes and Key Features</p> <p>Group 1:</p> <ul style="list-style-type: none"> What are the purposes and key features of strategy F? Why is this strategy important for science content storyline coherence? <p>Group 2:</p> <ul style="list-style-type: none"> What are the purposes and key features of strategy G? Why is this strategy important for science content storyline coherence? <p>Group 3:</p> <ul style="list-style-type: none"> What are the purpose and key features of strategy H? Why is this strategy important for science content storyline coherence? <hr/> <p>SCSL Strategies F, G, and H: Discussion Question</p> <p>What's similar and different about these three strategies?</p>	<p>Display Slide 7. SCSL Strategies F, G, and H: Purposes and Key Features (30 min)</p> <p>a. Small groups: Divide participants into three groups to make charts that capture the purposes and key features of strategies F, G, and H. Direct groups to refer to their Z-fold summary charts and the STeLLA strategies booklet.</p> <p>b. Whole group: Have small groups share their charts with the entire group.</p> <p>c. Challenge participants to imagine themselves in their Teacher Leader roles. Ask them, "How would you explain these strategies to the teachers you're leading?"</p> <hr/> <p>Display Slide 8. SCSL Strategies F, G, and H: Discussion Question (10 min)</p> <p>Note: This slide may be skipped if similarities and differences were addressed in the previous discussion.</p> <p>a. Individuals (3 min): "Look at your three strategy charts, your Z-fold summary charts, and the strategies booklet as you think about the question on the slide."</p> <p>b. Whole group: Have participants share their ideas about the three strategies.</p>

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			<p>Key ideas about strategies F, G, and H:</p> <ol style="list-style-type: none"> 1. Similarities: <ol style="list-style-type: none"> a. These strategies are all focused on linking complete sentence-length science ideas: Strategy F links science ideas to activities, strategy G links science ideas to other science ideas, and strategy H highlights key science ideas and links them to the focus question throughout the lesson. b. All of these strategies emphasize making the links explicit, not just assuming that students will see the intended links. c. All of these strategies can and should occur throughout the lesson. 2. Differences: <ol style="list-style-type: none"> a. Strategy F explicitly links science ideas to student activities. b. Strategy G explicitly links science ideas to other science ideas. c. Strategy H explicitly highlights key science ideas and links them back to the focus question.

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<p>8:55–10:30 95 min (Includes 10-min break)</p> <p>Lesson Analysis: SCSL Strategies F, G, and H</p> <p>Slides 9–13</p>	<p>Purpose</p> <ul style="list-style-type: none"> Develop participants’ ability to identify and analyze strategies F, G, and H in Food Webs lesson video clips. Deepen participants’ science-content knowledge of food webs through lesson analysis. <p>Content</p> <ul style="list-style-type: none"> In strategy F, activities that students carry out should be explicitly linked to the science content storyline so the science ideas are made visible to students before, during, and after an activity. In strategy G, science ideas introduced in a lesson should be clearly and explicitly linked to the main learning goal(s) within and across lessons. In strategy H, the content storyline is easier for students to construct if the main learning goal, supporting science ideas, and flow of events are highlighted at key points during the lesson. Decomposers, such as mold, recycle matter by breaking down dead organisms into carbon dioxide, water, and minerals that plants can use again. 	<p style="background-color: #cccccc; padding: 5px;">Preparing for Video-based Lesson Analysis</p> <p>Read Analysis Guide F, part 1.</p> <ol style="list-style-type: none"> What is the difference between the main learning goal and supporting science ideas? What is similar about the main learning goal and supporting science ideas? 	<p>Display Slide 9. Preparing for Video-based Lesson Analysis (5 min)</p> <ol style="list-style-type: none"> “Next, we’re going to watch a series of three classroom video clips on strategy F from Food Webs lesson 5. The first clip takes place before students start working on the strawberries activity; the second clip shows students while they’re working on the activity; and the third clip shows the teacher following up with students after the activity.” Have participants locate Analysis Guide F (handout 8.1) in their PD program binders. Tell participants that part 1 of the guide provides the context for the video clips. Individuals: “Read part 1 of the analysis guide and be prepared to discuss the two questions on the slide.” Whole group: <ul style="list-style-type: none"> Discuss the questions on the slide. Ask whether participants have any questions about the activity they’ll be observing in the video clips. <p>Key ideas:</p> <ul style="list-style-type: none"> <i>Difference between the main learning goal and supporting science ideas:</i> The main learning goal is the big idea that is the focus of the lesson. Supporting science ideas are smaller, connected ideas that build upon each other to support the main learning goal. See examples in part 1 of the analysis guide.

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	<p>What Participants Do</p> <ul style="list-style-type: none"> Identify and analyze the use of strategy F in three classroom video clips. Identify and analyze the use of strategies F, G, and H in one classroom video clip. <p>Videos</p> <ul style="list-style-type: none"> Video Clip 8.1, Torres classroom (before the activity) Video Clip 8.2, Torres classroom (during the activity) Video Clip 8.3, Torres classroom (after the activity) Video Clip 8.4, Torres classroom (strategies F, G, and H) <p>Handouts in PD Binder</p> <ul style="list-style-type: none"> 8.1 Analysis Guide F 8.2 Transcript for Video Clip 8.1 8.3 Transcript for Video Clip 8.2 8.4 Transcript for Video Clip 8.3 8.5 Transcript for Video Clip 8.4 <p>Handouts in Lesson Plans Binder</p> <ul style="list-style-type: none"> 5.2 Rotting Is a Good Thing! (from Food Webs lesson 5b) <p>PD Leader Masters</p> <ul style="list-style-type: none"> PD Leader Master: 5th-Grade Guide to Torres Video Clips for Day 8 	<p style="text-align: center;">Lesson Analysis: Strategy F</p> <ol style="list-style-type: none"> For each of the video clips, read the context at the top of the corresponding transcript and then watch the clip. For each clip, use the criteria in part 2 of Analysis Guide F to analyze how well science ideas were linked to the activity. <p style="text-align: center;"><small>Link to video clips: 8.1_stella_FW_torres_L5_c1; 8.2_stella_FW_torres_L5_c2; 8.3_stella_FW_torres_L5_c3</small></p>	<ul style="list-style-type: none"> <i>Similarity between the main learning goal and supporting science ideas:</i> The main learning goal and supporting science ideas are all expressed as complete-sentence science ideas (not as topics, phrases, or activities). <p>Display Slide 10. Lesson Analysis: Strategy F (60 min—20 min/clip)</p> <ol style="list-style-type: none"> Have participants review part 2 of Analysis Guide F. After they watch each video clip, ask them to study the corresponding transcript, answer the questions in part 2 of the analysis guide, and then analyze the links between science ideas and activities that were (or were not) made before, during, or after the activity. Have participants read the context for video clip 1 at the top of the transcript (handout 8.2 in PD program binder). Show video clip 1 and then guide participants through these tasks: <ul style="list-style-type: none"> Individuals: “Study the video transcript and then complete part 2, section 1 of the analysis guide, Setup for the Activity.” Whole group: Ask participants to share their analyses of the video clip. Have participants read the context for video clip 2 at the top of the transcript (handout 8.3 in PD binder). Show video clip 2 and then guide participants

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	<p>PD Resources</p> <ul style="list-style-type: none"> • STeLLA strategies booklet 		<p>through these tasks:</p> <ul style="list-style-type: none"> • Individuals: “Study the video transcript and then complete part 2, section 2 of the analysis guide, During the Activity.” • Whole group: Ask participants to share their analyses of the video clip. <p>f. Have participants read the context for video clip 3 at the top of the transcript (handout 8.4 in PD binder).</p> <p>g. Show video segments 3a and 3b.</p> <p>h. Before showing segment 3c, have participants read Food Webs lesson handout 5.2 (Rotting Is a Good Thing!) in their lesson plans binders.</p> <p>i. Then show segment 3c and guide participants through these tasks:</p> <ul style="list-style-type: none"> • Individuals: “Study the video transcript and complete part 2, section 3 of the analysis guide, Follow-up to the Activity.” • Whole group: Ask participants to share their analyses of the video clip. <p>Note: For sample analyses of each video clip using Analysis Guide F criteria, see PD Leader Master: 5th-Grade Guide to Torres Video Clips for Day 8.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p style="text-align: center;">Lesson Analysis: Strategies F, G, and H</p> <ol style="list-style-type: none"> 1. Read the context of the video clip at the top of the transcript (handout 8.5). <ul style="list-style-type: none"> • What evidence of your assigned strategy might you find in the video? 2. Watch the video clip. <p style="text-align: center;"><small>Link to video clip: 8.4_stella_FW_torres_L5_c4</small></p>	<p>Display Slide 11. Lesson Analysis: Strategies F, G, and H (7 min)</p> <ol style="list-style-type: none"> a. “Now we’re going to watch another short video clip from the same lesson. In this clip, be on the lookout for evidence of strategies F, G, and H at the beginning and end of the lesson.” b. Have participants read the context at the top of the video transcript (handout 8.5). c. Small groups: Divide participants into three groups (or pairs). Group 1 will focus on finding evidence of strategy F in the clip, Group 2 will focus on strategy G, and Group 3 will focus on strategy H. d. Ask each group: “What evidence of your assigned strategy might you find in the video?” (Encourage participants to refer to the STeLLA strategies booklet or strategy charts if they need to review the key features of each strategy.) e. Show the video clip. f. Whole group: Discuss the evidence each group came up with for their assigned strategy. <p>Note: For sample analyses of the video clip using Analysis Guide F criteria, see PD Leader Master: 5th-Grade Guide to Torres Video Clips for Day 8.</p>

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		<p style="text-align: center;">Lesson Analysis: Strategies F, G, and H</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Strategy F:</p> <ol style="list-style-type: none"> Find examples in the video clip where students are linking science ideas to a lesson activity. Suggest one specific way to strengthen strategy F in this lesson. </div> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Strategy G:</p> <ol style="list-style-type: none"> Find examples where two or more science ideas are being linked together. Suggest one specific way to strengthen strategy G in this lesson. </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Strategy H:</p> <ol style="list-style-type: none"> Find an example where the teacher is highlighting key science ideas or referring back to the focus question. Suggest one specific way to strengthen strategy H in this lesson. </div> </div>	<p>Display Slide 12. Lesson Analysis: Strategies F, G, and H (10 min)</p> <p>Note: If time is running short, have participants work only on part A of their assigned task.</p> <ol style="list-style-type: none"> Go over the directions on the slide. Emphasize the importance of using the STeLLA strategies booklet and strategy charts as resources. Individuals: “Study the transcripts for video clip 4 and search for examples of your assigned strategy being used during the lesson. Be ready to share your ideas with the group, and make sure to support your answers with evidence.” Whole group: Have participants share their findings. Encourage listeners to agree or disagree, ask clarification questions, and add on. <p>Note: For examples of the strategies being used in the lesson, see PD Leader Master: 5th-Grade Guide to Torres Video Clips for Day 8.</p>
		<p style="text-align: center;">Summary: Strategies F, G, and H</p> <ul style="list-style-type: none"> Use linking strategies to make the science ideas explicit to the whole class (strategies F and G). Engage students in linking science ideas to activities before, during, and after an activity (strategy F). Engage students in linking science ideas to other science ideas (strategy G). Highlight key science ideas throughout the lesson (strategy H). Keep returning to the focus question throughout and at the end of the lesson (strategy H). 	<p>Display Slide 13. Summary: Strategies F, G, and H (3 min)</p> <ol style="list-style-type: none"> Read the summary statements on the slide or give participants time to read them silently. Ask participants whether they have a brief comment or question about the summary.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
10:20–10:30 10 min	BREAK		
10:30–12:00 90 min Food Webs Lesson Plan Review and Fall Overview/ Logistics Slides 14–20	<p>Purpose</p> <ul style="list-style-type: none"> • Deepen participants’ understandings of the Food Webs lesson plans and the opportunities they provide to practice using STeLLA STL and SCSL strategies. • Help participants understand and feel comfortable with the fall activities and logistics. <p>Content</p> <ul style="list-style-type: none"> • The Food Webs lesson plans highlight STeLLA strategies and support teachers in using these strategies. <p>What Participants Do</p> <ul style="list-style-type: none"> • Share key aspects of an assigned Food Webs lesson plan. • Chart which STeLLA strategies are highlighted in each lesson. • Decide on academic-year study-group meeting dates after the PD leader describes what will happen in the fall. <p>Handouts in PD Binder</p> <ul style="list-style-type: none"> • 8.6 Overview of School-Year RESPeCT Study Groups <p>PD Resources</p> <ul style="list-style-type: none"> • STeLLA strategies booklet 	<p>Lesson Analysis: Focus Question 2</p> <p>How will the Student Thinking Lens and Science Content Storyline Lens strategies help you teach the Food Webs lessons in the fall?</p> <hr/> <p>Food Webs Lesson Plan Conversation</p> <ol style="list-style-type: none"> 1. The science content storyline across lessons <ul style="list-style-type: none"> • Review the main learning goal for each lesson sequentially. 2. The science content storyline within lessons (5–7 min for each two-part lesson) <ul style="list-style-type: none"> • How does this lesson fit into the arc of all the lessons? • What are the main learning goal and focus question? • Describe the main activity (or activities). • How will the activity help students better understand the learning goal for the day? • What STeLLA strategy/strategies are highlighted in this activity? • What concerns or suggestions do you have about this activity? 3. Practical issues and questions 	<p>Display Slide 14. Lesson Analysis: Focus Question 2 (Less than 1 min)</p> <p>a. Read the focus question on the slide.</p> <hr/> <p>Display Slide 15. Food Webs Lesson Plan Conversation (60 min in conjunction with the next two slides)</p> <p>Note: Create charts like the samples on the next two slides so that participants can view both as they report out.</p> <p>Timing note: Make sure you limit the time for each lesson conversation so you can get through them all. Aim for 5–7 minutes for each lesson.</p> <p>a. Give a brief overview of the science content storyline across lessons and then begin the lesson conversation.</p> <p>a. For step 1 on the slide, review the main learning goal for each lesson sequentially, and how it connects to the lesson before and after it. (5 min)</p>

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	<ul style="list-style-type: none"> • RESPeCT lesson plans binder 		<p>b. For steps 2 and 3, ask each participant to report on her/his two-part lesson, which was assigned on day 5.</p> <p>Note: Encourage participants to present the big picture using the questions in step 2 on the slide, not to walk through every step in their lesson plans. They should bring up details only when they have some concern, question, or suggestion about a modification.</p> <p>c. As participants give their reports, fill in the charts you've created, checking off the main strategies highlighted in each lesson. (See the chart format on the next two slides.)</p> <p>Note: Encourage participants to pick just one or two Student Thinking Lens strategies and one or two Science Content Storyline Lens strategies that are actually highlighted in the lesson. (Each lesson uses several strategies.)</p> <p>Ideal pattern to highlight for the Student Thinking Lens strategies:</p> <ul style="list-style-type: none"> • Elicit and probe strategies are very important in lesson 1. They also appear as students are engaged in making predictions in lessons 2, 4, and 5. • Probe and challenge strategies are used throughout all the lessons. • Strategies 4 (analyzing data) and 5 (constructing explanations) are highlighted in the middle lessons (lessons 2, 3, 4, 5) to help students construct new science ideas in evidence-based ways. • Strategy 6 (use and apply new science ideas) starts appearing after some new ideas have been introduced (lessons 3 and 5), but they become


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			<p>the main focus of the final two lessons.</p> <ul style="list-style-type: none"> • Strategy 7 (synthesizing and summarizing) appears at the end of each lesson. <p>Ideal pattern to highlight for the Science Content Storyline Lens strategies:</p> <ul style="list-style-type: none"> • To ensure that each lesson has a coherent science content storyline, all lessons include the following: <ul style="list-style-type: none"> • Strategy A: one main learning goal • Strategy B: focus question or goal statement • Strategy C: activities matched to the learning goal • Strategy F: links between science ideas and activities (before, during, after) • Strategy I: summaries of key science ideas • Strategy D (content representations) appears in two types of lessons. First, content representations are used in lessons where students analyze data and construct explanations (lessons 3 and 4). Second, they're a central part of a use-and-apply lesson (lesson 6) in which students use what they've learned to construct their own content representations. • Strategies G (link science ideas to other science ideas) and H (highlight key science ideas) appear consistently after the first lesson as new science ideas are encountered.

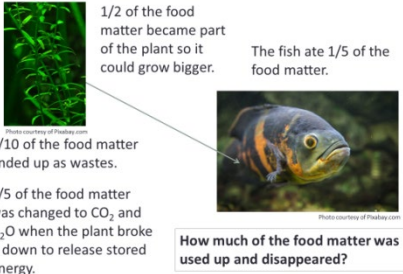
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process																																																																																																																																							
		<p style="text-align: center;">STL Strategies Highlighted in the Food Webs Lessons</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Lesson</th> <th>1a</th> <th>1b</th> <th>2a</th> <th>2b</th> <th>3a</th> <th>3b</th> <th>4a</th> <th>4b</th> <th>5a</th> <th>5b</th> <th>6a</th> <th>6b</th> <th>7a</th> <th>7b</th> </tr> </thead> <tbody> <tr><td>1. Elicit</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>2. Probe</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>3. Challenge</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4. Analyze/ Interpret</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5. Explain/ Argue</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6. Use/Apply</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7. Synthesize/ Summarize</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Lesson	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b	1. Elicit															2. Probe															3. Challenge															4. Analyze/ Interpret															5. Explain/ Argue															6. Use/Apply															7. Synthesize/ Summarize															<p>Display Slide 16. STL Strategies Highlighted in the Food Webs Lessons</p> <p>a. As participants report out, complete the chart, indicating with check marks the STL strategies highlighted in the Food Webs lessons.</p> <p>b. Discuss the reasons certain strategies appear at specific times in the lesson sequence. (See ideal patterns on slide 15 and refer to the summary charts in the STeLLA strategies booklet as needed.)</p>															
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		<p style="text-align: center;">Overview of Study-Group Sessions</p> <ol style="list-style-type: none"> 1. Purpose: To practice, analyze, and learn from the use of the STeLLA strategies in your science teaching. 2. Review the focus of each study-group session: <ul style="list-style-type: none"> • What is the main focus for fall study-group sessions 1–3? • What is the purpose of the 2-hour meeting in December? • What is the main focus for spring study-group sessions 4–6? 	<p>Display Slide 18. Overview of Study-Group Sessions (5 min)</p> <ol style="list-style-type: none"> a. Have participants locate handout 8.6—Overview of School-Year RESPeCT Study Groups—in their PD program binders. b. Emphasize: The purpose of the study-group sessions is to practice, analyze, and learn from using the STeLLA strategies in your teaching of the Food Webs lessons in the fall and the Water Cycle lessons in the spring. c. Talk participants through Study Groups 1–3 on the handout. d. Pause for questions and a summary task. Ask participants, “What is the main focus for fall study-group sessions 1–3?” e. Talk participants through the 2-hour meeting in December/January and Study Groups 4–6 on the handout. f. Pause for questions and a summary task. Ask participants, “What is the purpose of the 2-hour meeting in December/January?” and “What is the main focus for spring study-group sessions 4–6?”

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p>Teaching the Food Webs Lessons</p> <ol style="list-style-type: none"> 1. Before teaching lesson 1, give your students the classroom pretest. 2. Teach all the lessons and have one lesson video recorded. 3. Give your students the classroom posttest. 4. Hold on to your students' pre-post tests! You'll analyze them in preparation for Study Group 3. 	<p>Display Slide 19. Teaching the Food Webs Lessons (10 min)</p> <ol style="list-style-type: none"> a. Before going over this slide, have participants locate the Food Webs classroom pre-post test in their lesson plans binders (pretab section). <ul style="list-style-type: none"> • The classroom pre-post test: "This test is in your lesson plans binder. After you administer the pre- and posttest to your students, you'll need to save all of them, since you'll be analyzing them as part of our study-group work in the fall." b. Review the steps on the slide. c. Emphasize: "It's very important to follow these steps in order and save all of your classroom pre-post tests. Don't return them to students until after Study Group 3.
		<p>Scheduling School-Year Study Groups</p> <p>Proposed meeting day/time: Wednesdays 2:00–6:00 p.m. Meeting place: In our classrooms, rotating from school to school</p> <p>Possible dates for our study-group sessions:</p> <ul style="list-style-type: none"> • Study Group 1: [insert possible date] • Study Group 2: [insert possible date] • Study Group 3: [insert possible date] • 2-hour meeting to review Water Cycle lessons: [insert possible date] • Study Group 4: [insert possible date] • Study Group 5: [insert possible date] • Study Group 6: [insert possible date] 	<p>Display Slide 20. Scheduling School-Year Study Groups (15 min)</p> <p>Note: Include on this slide some possible dates for six 4-hour study-group meetings and the 2-hour meeting that occurs between Study Groups 3 and 4.</p> <ol style="list-style-type: none"> a. Suggest possible dates for the study-group sessions, starting with the Wednesday afternoon slot from 2:00 to 6:00 p.m. <p>Note: As you schedule the meetings, keep in mind that you'll need some time between the end of the school day and the beginning of the</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>meeting to get to the location and set up everything.</p> <ul style="list-style-type: none"> • Study Group 1: Early October. Round-1 teachers should have their classroom video recordings completed at least three weeks before this session. You will need three weeks to watch the classroom video(s), select the ones you'll use during the study groups, and prepare the video-clip selections and transcripts. • Study Group 2: Mid-November. Round-2 teachers should have their classroom video recordings completed at least three weeks before this session. You will need three weeks to watch the classroom video(s), select the ones you'll use during the study groups, and prepare the video-clip selections and transcripts. • Study Group 3: Early December. This session can occur anytime after Study Group 2 and before the holiday break. • 2-hour meeting: December/January. The purpose of this meeting is to review the Water Cycle lesson plans in preparation for teaching them. • Study Group 4: Early February. Round-1 teachers should have their classroom video recordings completed at least three weeks before this session. You will need three weeks to watch the classroom video(s), select the ones you'll use during the study groups, and prepare the video-clip selections and transcripts. • Study Group 5: March. Round-2 teachers should have their classroom video recordings


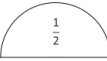
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>completed at least three weeks before this session. You will need three weeks to watch the classroom video(s), select the ones you'll use during the study groups, and prepare the video-clip selections and transcripts.</p> <ul style="list-style-type: none"> • Study Group 6. April. This session can occur anytime after, but preferably within a month of, Study Group 5.
<p>12:00–12:45 45 min</p> <p>LUNCH</p>			
<p>12:45–3:00 135 min (Includes 10-min break)</p> <p>Math Content Deepening: Food Webs</p> <p>Slides 21–41</p>	<p>Purpose</p> <ul style="list-style-type: none"> • Refresh participants' understandings of basic mathematical operations using fractions and the concepts of whole versus unit in the interpretation of fractions. • Deepen participants' ability to visualize fractions and the addition of fractions in terms of whole versus unit, and use this visualization to think about the use of food matter in an organism. • Deepen participants' ability to compare and contrast different representations of fractions that help visualize the use of food matter in organisms. • Help participants understand that fractions can be used to support the idea of conservation 		<p>Display Slide 21. Content Deepening: Food Webs</p> <p>Note: Throughout this content deepening phase, refer as needed to the Food Webs Content Background Document and Common Student Ideas about Food Chains and Food Webs.</p> <p>PD leader talk: “Now let’s dig into some math content deepening on food webs!”</p> <p>Timing note: To keep things moving so you don’t run out of time during this phase, adhere as closely as possible to the time you’ve allotted for each slide. If you’re running short on time, you may need to abridge or skip some of the group discussion.</p>

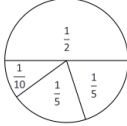
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>of food matter in food webs.</p> <ul style="list-style-type: none"> • Help participants understand why fractions are more useful than whole numbers in representing movement and conservation of matter in food chains/webs. <p>Handouts in PD Binder</p> <ul style="list-style-type: none"> • 8.7 Pie Charts and Tape Diagram <p>Supplies</p> <ul style="list-style-type: none"> • Science notebooks • Pencils or pens • Scissors • Glue sticks <p>Resources in Lesson Plans Binder</p> <p><i>Resources section:</i></p> <ul style="list-style-type: none"> • Content background document • Common Student Ideas 	<div data-bbox="793 277 1262 813"> <p>Content Deepening Focus Questions</p> <ul style="list-style-type: none"> • An organism can use food molecules (1) for growth as they become part of its body; (2) for energy as the molecules are broken down; (3) as wastes; and (4) as matter passed on to other organisms. Why should these fractions of food matter in an organism add up to 1? • How can we use conservation of matter to create fraction problems with a scientific context? </div> <div data-bbox="793 813 1262 1409"> <p>Where Does the Matter Go? A Math Problem!</p>  <p>1/2 of the food matter became part of the plant so it could grow bigger.</p> <p>The fish ate 1/5 of the food matter.</p> <p>1/10 of the food matter ended up as wastes.</p> <p>1/5 of the food matter was changed to CO₂ and H₂O when the plant broke it down to release stored energy.</p> <p>How much of the food matter was used up and disappeared?</p> </div>	<p>Display Slide 22. Content Deepening Focus Questions</p> <p>PD leader move: Read the focus questions on the slide to orient participants to the content deepening work they'll be doing in this phase.</p> <p>Display Slide 23. Where Does the Matter Go? A Math Problem!</p> <p>PD leader talk: “This mathematical problem is presented to students in lesson 5a. Each fraction represents a portion of the plant’s food matter being used in one of four possible ways in the food web: for growth, for energy, as wastes, or as food passed on to other organisms. To address the question “How much of the food matter was used up and disappeared?” we need to determine whether any portion of the food matter is unaccounted for. That means we need to determine whether the sum of the four portions constitutes the whole of the food matter in the plant.”</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>Purpose</p> <ul style="list-style-type: none"> Review basic mathematical operations using fractions and acknowledge the many steps of calculation. <p>Content</p> <ul style="list-style-type: none"> Fractions represent the portion of a plant's food matter being used for growth, for energy, as wastes, and as matter passed on to other organisms. <p>What Participants Do</p> <ul style="list-style-type: none"> Answer the first content deepening focus question in their notebooks. 	<div data-bbox="793 282 1255 326" style="background-color: #cccccc; height: 27px; margin-bottom: 10px;"></div> <p>Compute the Sum</p> <p>Find the sum $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5}$ by any method you know.</p> <hr/> <p>Content Deepening: Focus Question 1</p> <ul style="list-style-type: none"> An organism can use food molecules <ol style="list-style-type: none"> for growth, for energy, as wastes, and as matter passed on to other organisms. Why <i>should</i> these fractions of food matter in an organism add up to 1 (for <i>any</i> organism)? 	<p>Display Slide 24. Compute the Sum</p> <p>PD leader talk: “Work individually to compute this sum by any method you know and record it in your notebooks.”</p> <p>PD leader move: Even if some participants conclude very quickly (without any calculations) that the sum is 1, ask them to write in their notebooks the steps they would follow with their students. It will be useful to refer to those steps later in the session. If any participants have trouble with the calculation, jog their memories by reminding them to find a common denominator before performing the addition. One of the hidden goals of the session is to deepen their understandings of why they should compute this sum, but at this point, you just want them to execute the procedure. Before moving on to the next slide, confirm that everyone has computed a sum of 1.</p> <hr/> <p>Display Slide 25. Content Deepening: Focus Question 1</p> <p>PD leader talk: “Remember that our focus for the session is to explain why the fractions of food matter in an organism add up to 1. In an earlier session, we simulated the movement of food molecules through a food web using linking cubes.</p> <p>“The red, white, and blue linking-cube triplets we placed on an organism represented food matter becoming part of the organism’s body as it used the matter for growth. Then we popped the cubes apart</p>

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			<p>to represent food matter being used for energy. (The clicking sound represented energy being released.) Next, we moved the cubes to the base of the mat to represent matter being lost as wastes (falling off a plant as leaf litter, or falling from an animal as droppings). Finally, we moved the cubes to another mat to represent matter being passed on to another organism.</p> <p>“When we counted and tallied the number of cubes at the start and end of the simulation, we observed that the totals were the same. This form of conservation of matter is a different but related mathematical concept than the one we’re discussing here.</p> <p>“Why do we focus on fractions? Because in a real-world food chain, the molecules these linking cubes represent are so numerous that it would be impossible to count them all. Instead, scientists use fractions to estimate what portion of the whole represents each type of molecule.”</p> <p>PD leader move: Emphasize the words in bold italics on the slide.</p> <p>PD leader talk: “The goal of this activity is not to explain why the sum of the portions was 1 for the lesson example but to explain why the sum of the portions should be 1 no matter which organism we consider (plant or animal).”</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>Purpose</p> <ul style="list-style-type: none"> Analyze previous calculations and try to interpret each expression in every step. <p>Content</p> <ul style="list-style-type: none"> Fractions represent the portion of a plant's food matter being used for growth, for energy, as wastes, and as matter passed on to other organisms. <p>What Participants Do</p> <ul style="list-style-type: none"> Analyze previous calculations and attempt to identify the whole versus the unit in the sum both mathematically and in the context of the problem. 	<p style="text-align: center;">Analyze Your Thinking</p> <p>When you found the sum $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5} = 1$</p> <ol style="list-style-type: none"> What were the steps of your calculations? Describe what you did in words. What is the <i>whole</i> that each fraction represents part of? What was the <i>unit</i> being added in the sum? 	<p>Display Slide 26. Analyze Your Thinking</p> <p>PD leader talk: "Return to the calculation you just wrote in your notebooks and answer each of the questions on the slide to analyze your thinking. It's important to try to describe the steps of your calculation in words."</p> <p>PD leader move: Circulate among participants and check their descriptions. Most likely, they'll describe the calculation in short phrases, such as "Get a common denominator" and "Then add." A hidden goal of the session is to help participants appreciate the intermediate steps they may have performed without noticing and to give them words to describe those steps more accurately. Regardless of background, participants will likely be able to identify the whole as the food matter in the plant. If they're unfamiliar with the concept of the unit being added, offer the following example: If you have three apples and five oranges and want to know the total number of fruit pieces, then you compute $3 + 5$. The unit being added is 1 piece of fruit.</p> <p>PD leader talk: "Turn to an elbow partner and share the steps in your calculation, identifying the whole and the unit."</p>



PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>Purpose</p> <ul style="list-style-type: none"> • Represent fractions and fraction addition using portions of pie charts. <p>Content</p> <ul style="list-style-type: none"> • Fractions represent the portion of a plant's food matter being used for growth, for energy, as wastes, and as matter passed on to other organisms. <p>What Participants Do</p> <ul style="list-style-type: none"> • Select an appropriate pie chart from the handout and cut out relevant pieces representing each term. • Assemble the pie-chart pieces into a representation of the sum. <p>Supplies</p> <ul style="list-style-type: none"> • Scissors • Glue sticks 	<p>Representing Portions with Pie Charts</p> <ul style="list-style-type: none"> • Each of the fractions $\frac{1}{2}$, $\frac{1}{5}$, and $\frac{1}{10}$ is a unit fraction representing one specific portion of a whole. • For each fraction, select the appropriate pie chart from the handout and cut out the portion of that whole represented by that fraction. • Arrange the pieces to illustrate the equation.   $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5} = 1$	<p>Display Slide 27. Representing Portions with Pie Charts</p> <p>PD leader move: If you haven't already done so, distribute handout 8.7 (Pie Charts and Tape Diagram) to each participant, as well as a pair of scissors.</p> <p>PD leader talk: "From the pie charts on your handout, cut out pieces representing each of the fractions in the sum you calculated—$\frac{1}{2}$, $\frac{1}{10}$, $\frac{1}{5}$, and $\frac{1}{5}$—and write each fraction on the corresponding pie-chart piece as shown in the example on the slide. Then arrange the pieces to illustrate the equation shown."</p> <p>PD leader move: Circulate among participants, making sure they select the correct pieces (without further subdivisions) to represent each fraction. For example, it might be tempting to cut a half circle out of the 4-piece pie chart and label it $\frac{1}{2}$, but this doesn't match the example on the slide. Each piece they use to represent a fraction shouldn't contain any further subdivisions.</p> <p>PD leader move: After you confirm that participants have the correct pieces cut out and have arranged them to form a whole pie in some manner, ask them to paste their representations into their notebooks with a glue stick. Encourage participants to write the equation next to their representations. It's unlikely all participants will come up with exactly the same arrangement, but make a mental note if this occurs. You want to see some variety.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p style="text-align: center;">Representing Addition with Pie Charts</p> <ul style="list-style-type: none"> • Arrange the pieces to illustrate the equation $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5} = 1.$ • How can you use pie charts to illustrate the other steps in your calculation?  $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5} = 1$	<p>Display Slide 28. Representing Addition with Pie Charts</p> <p>PD leader move: Ask participants to share their pie-chart representations with the group. There are six different ways the pieces could be arranged, if you agree to regard as the same those representations that are rotations of one another.</p> <p>PD leader talk: “Let’s compare our pie-chart representations with the one on the slide and with each other’s. What’s similar and different about the representations we produced?”</p> <p>PD leader move: Wait for participants to respond and then ask elicit and probe questions to solicit their thinking and make visible the following ideas:</p> <ul style="list-style-type: none"> • All of the representations should form a whole pie. • The same counterclockwise order of pieces shouldn’t appear in all the representations. <p>PD leader move: If there are two different counterclockwise orders among the representations, ask the following challenge question: “What law of addition is represented by the fact that the pieces could be arranged in at least two different counterclockwise orders to form a whole pie?” The ideal response is “The commutative law of addition, which states that you can add numbers in any order and obtain the same result.”</p> <p>PD leader talk: “How can we illustrate the other steps of our calculation?”</p> <p>PD leader move: Ask participants to illustrate the</p>

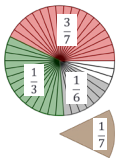
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>other steps on the slide by cutting out additional pie-chart pieces, arranging them, and gluing them into their notebooks next to their first representation, with an equals sign between them.</p>
		<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center; background-color: #d3d3d3; margin: -10px -10px 10px -10px;">Identifying the Unit</p> <p style="color: #c00000; margin-top: 0;">Identifying the Unit</p> $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5}$ $= \frac{5}{10} + \frac{1}{10} + \frac{2}{10} + \frac{2}{10}$ $= (5) \frac{1}{10} + (1) \frac{1}{10} + (2) \frac{1}{10} + (2) \frac{1}{10}$ $= (5+1+2+2) \frac{1}{10}$ $= (10) \frac{1}{10} = \frac{10}{10} = 1$ </div>	<p>Display Slide 29. Identifying the Unit</p> <p>PD leader move: Direct participants to write out the slide calculation in their notebooks, leaving plenty of space between each line so they can add comments to justify each of the equalities. While participants do this, prepare a chart with the heading “People have difficulty working with rational numbers because”</p> <p>PD leader talk: “Now that you’ve finished copying down this calculation, let’s share with one another in a round-robin what we understand about the reasoning behind each of these equalities. When it’s your turn, pick an equality that hasn’t been discussed yet and offer an explanation for why it’s true.”</p> <p>PD leader move: As each participant responds, ask probe questions to clarify that person’s language and/or use elicit questions to solicit what the rest of the group thinks. The goal is to facilitate a discussion that produces the justifications shown on the next slide. As each justification is locked down, encourage participants to write it in their notebooks between the corresponding equality lines.</p> <p>Note: Participants will likely write “Get a common denominator” as a justification for the first step.</p>



PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>Take a moment to emphasize that getting a common denominator is a procedure for obtaining the second line from the first, not a reason for why the two lines are equal. The goal is to justify each equality using their understanding of the number system, not to produce each line mechanically.</p> <p>Sample dialogue:</p> <p>Participant: We know that $\frac{1}{2}$ and $\frac{5}{10}$ are equal, and $\frac{1}{5}$ and $\frac{2}{10}$ are equal. That's why the first equality is true.</p> <p>PD leader: Do others agree or disagree with that justification? Can you tell us more about why you say that $\frac{1}{2}$ and $\frac{5}{10}$ are equal? Since they aren't literally the same, why do you say they're equal?</p> <p>Participant: Well, they represent the same part of the whole, 1 out of 2 equal pieces is the same portion as 5 out of 10 equal pieces.</p> <p>PD leader: So can we summarize this by saying that $\frac{1}{2}$ and $\frac{5}{10}$ are equivalent part-whole relationships? Great. Let's write that down in between the first two lines.</p>

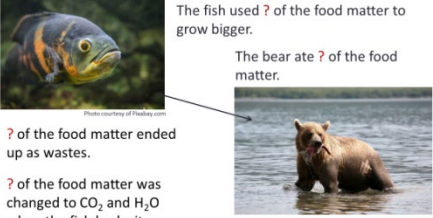
PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p style="text-align: center;">Identifying the Unit</p> $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5}$ <p style="text-align: right; color: red; font-size: small;">Equivalent Part-Whole Relationships</p> $= \frac{5}{10} + \frac{1}{10} + \frac{2}{10} + \frac{2}{10}$ <p style="text-align: right; color: red; font-size: small;">Multiples of a Common Unit</p> $= (5) \frac{1}{10} + (1) \frac{1}{10} + (2) \frac{1}{10} + (2) \frac{1}{10}$ <p style="text-align: right; color: red; font-size: small;">Distributive Law</p> $= (5+1+2+2) \frac{1}{10}$ <p style="text-align: right; color: red; font-size: small;">Total Units</p> $= (10) \frac{1}{10} = \frac{10}{10} = 1$ <p style="text-align: right; color: red; font-size: small;">Equivalent Part-Whole Relationships</p> <p>The unit is one tenth of the whole.</p>	<p>Display Slide 30. Identifying the Unit</p> <p>PD leader talk: “Here’s a summary of our justifications for each step of this calculation: To compute the sum, we replaced each part-whole relationship with an equivalent one so that the numerators of each fraction were counting the same type of part of a whole—in this case 1/10th. That part, one tenth of the whole, was then the unit being added in the sum. Did anyone else use a different unit in their original calculation?”</p> <p>PD leader move: Any multiple of 10 will work, although participants most likely chose the least common multiple 10 of the denominators 2, 5, and 10, because that’s the procedure they were trained to perform in school. It also involves the fewest number of parts of the whole (the least common multiple).</p>
		<p style="text-align: center;">Identifying the Unit</p> $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5}$ <p style="text-align: right; color: red; font-size: small;">Equivalent Part-Whole Relationships</p> $= \frac{50}{100} + \frac{10}{100} + \frac{20}{100} + \frac{20}{100}$ <p style="text-align: right; color: red; font-size: small;">Multiples of a Common Unit</p> $= (50) \frac{1}{100} + (10) \frac{1}{100} + (20) \frac{1}{100} + (20) \frac{1}{100}$ <p style="text-align: right; color: red; font-size: small;">Distributive Law</p> $= (50+10+20+20) \frac{1}{100}$ <p style="text-align: right; color: red; font-size: small;">Total Units</p> $= (100) \frac{1}{100} = \frac{100}{100} = 1$ <p style="text-align: right; color: red; font-size: small;">Equivalent Part-Whole Relationships</p> <p>The unit is one hundredth of the whole.</p>	<p>Display Slide 31. Identifying the Unit</p> <p>PD leader talk: “Don’t write this down, but here’s another calculation of this sum that achieves the same result. In this case, the unit is 1/100th of the whole. Can you think of other units that could have been used?”</p> <p>PD leader talk: “Okay, let’s step back for a moment. We’ve seen at least two ways to perform and justify this calculation using at least two different units. Why do you think people (kids and</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			adults) have difficulty interpreting addition with fractions? What aspects of this reasoning are hard to understand? Discuss these questions with an elbow partner.”
		<p>Identifying the Unit</p> <p>People have difficulty interpreting addition with rational numbers because</p> <ul style="list-style-type: none"> • different expressions can represent the same portion, and • the unit being added is determined relative to the parts being added. $\frac{1}{2} + \frac{1}{10} + \frac{1}{5} + \frac{1}{5}$ <p><small>Equivalent Part-Whole Relationships</small></p> $= \frac{5}{10} + \frac{1}{10} + \frac{2}{10} + \frac{2}{10}$ <p><small>Multiples of a Common Unit</small></p> $= (5) \frac{1}{10} + (1) \frac{1}{10} + (2) \frac{1}{10} + (2) \frac{1}{10}$ <p><small>Distributive Law</small></p> $= (5+1+2+2) \frac{1}{10}$ <p><small>Total Units</small></p> $= (10) \frac{1}{10} = \frac{10}{10} = 1$ <p><small>Equivalent Part-Whole Relationships</small></p> <p>The unit is one tenth of the whole.</p>	<p>Display Slide 32. Identifying the Unit</p> <p>PD leader talk: “Here are two key points you may want to record in your notebooks next to the calculation we justified. One difficulty is that different expressions, such as 1/2, 5/10, or 50/100, can represent the same portion of the whole. A second difficulty is that the unit being added is determined relative to the parts being added. We used the unit of 1/10 to add 1/2 + 1/10 + 1/5 + 1/5 because 10 is a common multiple of 2, 10, and 5. For a problem with different denominators, the unit may be totally different as well.”</p> <p>PD leader move: Record these ideas on the chart.</p>
		<p>Where Does the Matter Go? A Math Problem!</p>  <p>The fish used 1/4 of the food matter to grow bigger.</p>  <p>The bear ate 1/2 of the food matter.</p> <p>1/8 of the food matter ended up as wastes.</p> <p>2/16 of the food matter was changed to CO₂ and H₂O when the fish broke it down to release stored energy.</p> <p>How much of the food matter was used up and disappeared?</p>	<p>Display Slide 33. Where Does the Matter Go? A Math Problem!</p> <p>PD leader talk: “Here is the second problem we ask students to consider. Similar to the first problem, it specifies portions of the food matter in a fish that are used in some way in the food web. Again, there are four ways the food matter can be used: for growth, for energy, as wastes, and as matter passed on to other organisms. How much of the food matter is not accounted for in these portions?”</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>Compute the sum of the four portions by any means you know.”</p> <p>PD leader move: Participants should obtain this sum: $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{2}{16} = 1$, using a unit of $\frac{1}{8}$ or $\frac{1}{16}$ or the reciprocal of any multiple of 8. Since the result was 1, which represents the whole of the food matter, we know that all of the food matter was used up.</p>
	<p>Purpose</p> <ul style="list-style-type: none"> Understand that fractions of food matter at different points in a food chain should add up to 1 because no matter is lost or gained as the food moves through the food chain (100% of the matter is conserved). <p>Content</p> <ul style="list-style-type: none"> The conservation of matter can be expressed mathematically. <p>What Participants Do</p> <ul style="list-style-type: none"> Use portions of pie charts (or sections of a tape diagram) to represent fractions. Detect an error in the data using this content representation. <p>Supplies</p> <ul style="list-style-type: none"> Scissors 		<p>Display Slide 34. Detecting an Error</p> <p>PD leader talk: “Suppose we rewrote the problem using different fractions but didn’t think carefully about which numbers we recorded. The numbers on the slide can’t possibly be correct. Can you explain why? Work on the answer to this question independently and write it in your notebooks.”</p> <p>PD leader move: Give participants at least 3 minutes to answer the question. If anyone is confused about how to start, remind them that you computed the sum of the fractions in the previous two examples, so computing the sum in this example might be a good place to start.</p> <p>PD leader talk: “Discuss your answers with an elbow partner and challenge each other to explain your reasoning.”</p> <p>PD leader move: Allow participants to discuss their answers for 4 minutes; then have some of the participants share out. Ask probe questions to clarify responses, and challenge participants’ reasoning when appropriate. The main point that should</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<div data-bbox="793 391 1260 935"> <p style="text-align: center;">Detecting an Error</p> <ul style="list-style-type: none"> The sum of the supposed portions is greater than the whole. $\frac{3}{7} + \frac{1}{3} + \frac{1}{6} + \frac{1}{7}$ $= \frac{18}{42} + \frac{14}{42} + \frac{7}{42} + \frac{6}{42} = \frac{45}{42} = 1\frac{3}{42}$ <ul style="list-style-type: none"> The number of units being added exceeds the number available.  </div> <div data-bbox="793 935 1260 1352"> <p style="text-align: center;">Reflect: Content Deepening Focus Question 1</p> <ul style="list-style-type: none"> An organism can use food molecules <ol style="list-style-type: none"> for growth, for energy, as waste, and as matter passed on to other organisms. Why <i>should</i> these fractions of food matter in an organism add up to 1 (for <i>any</i> organism)? </div>	<p>emerge is that the sum of the portions is different from 1; in fact, it's greater than 1. Don't advance to the next slide until this point has been made.</p> <p>Display Slide 35. Detecting an Error</p> <p>PD leader talk: "There must be an error because the whole of the food matter is being used in exactly the four ways we discussed, and yet the sum of the supposed portions is greater than the whole. This is represented by the fact that the 1/7 piece of the pie doesn't fit in the remaining space. In this calculation, the unit is 1/42 of the whole, and the number of units being added is 45, which is greater than 42. This tells us that something is wrong, and that food matter has been created that wasn't in the fish."</p> <p>Display Slide 36. Reflect: Content Deepening Focus Question 1</p> <p>PD leader move: Direct participants to return to focus question 1 and answer it in their notebooks. Emphasize that the point is to articulate why these fractions should add up to 1 for any organism (e.g., a plant, a fish, an insect).</p>
10-MINUTE BREAK			

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p style="text-align: center;">Content Deepening: Focus Question 2</p> <p>How can we use conservation of matter to create fraction problems with a scientific context?</p>	<p>Display Slide 37. Content Deepening: Focus Question 2</p> <p>PD leader move: Read the second content deepening focus question aloud.</p>
	<p>Purpose</p> <ul style="list-style-type: none"> Show participants how the mathematical expression of the conservation of matter can be used to generate fraction problems with a food-webs context. <p>Content</p> <ul style="list-style-type: none"> Expressing the conservation of matter mathematically can be used to generate fraction problems with a food-webs context. <p>What Participants Do</p> <ul style="list-style-type: none"> Create a problem using 	<p style="text-align: center;">A Fraction Problem</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>1/2 of the food matter became part of the plant so it could grow bigger.</p> </div> <div style="text-align: center;">  <p>The fish ate 1/5 of the food matter.</p> </div> </div> <p>? of the food matter ended up as wastes.</p> <p>1/5 of the food matter was changed to CO₂ and H₂O when the plant broke it down to release stored energy.</p> <p style="text-align: center;">What portion of the food matter in the plant ended up as wastes?</p>	<p>Display Slide 38. A Fraction Problem</p> <p>PD leader talk: “Consider this mathematical problem from the Food Webs lessons. Work with an elbow partner to solve the problem as you would expect your students to, and then use pie charts to illustrate your computations.”</p> <p>PD leader move: Ask pairs to share their results and illustrations. Prompt them to identify the unit being added or subtracted in their calculations. Most likely participants will respond, “The unit is 1/10th of the whole,” but 1 over any multiple of 10 is also a valid answer.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>conservation of matter in which the fourth portion of food matter in a food-web organism can be solved by specifying three out of the four portions during an interval of time.</p>	<div data-bbox="789 277 1260 651"> <h3>Applying Conservation of Matter</h3> <ul style="list-style-type: none"> There are only four ways the food matter in an organism is used. $\frac{1}{2} + \frac{1}{5} + \frac{1}{5} = \frac{5}{10} + \frac{2}{10} + \frac{2}{10} = \frac{9}{10}$ of the food matter was used for growth or broken down for energy or passed on to the fish. So $1 - \frac{9}{10} = \frac{10}{10} - \frac{9}{10} = \frac{1}{10}$ of the food matter must be lost to wastes. The portion lost to wastes must be what is left of the whole after taking away the other three portions. There is only one unit unaccounted for after summing the first three. </div> <div data-bbox="789 667 1260 1008"> <h3>Design Your Own Fraction Problem</h3>  <p>The fish used ? of the food matter to grow bigger.</p> <p>The bear ate ? of the food matter.</p> <p>? of the food matter ended up as wastes.</p> <p>? of the food matter was changed to CO₂ and H₂O when the fish broke it down to release stored energy.</p> <p>The unit is 1/14. What portion of the food matter in the fish _____ ?</p> </div>	<p>Display Slide 39. Applying Conservation of Matter</p> <p>PD leader talk: “The main point is that there are only four ways the food matter in an organism is used: for growth, for energy, as wastes, and as food for other organisms. The portion lost as wastes must be what is left of the whole after taking away the other three portions. In this problem, there is only 1 unit of 1/10th of the whole unaccounted for after summing the other three.”</p> <p>Display Slide 40. Design Your Own Fraction Problem</p> <p>PD leader talk: “Let’s conclude our content deepening work with a challenge. Design a fraction problem with scientific context following the previous example of the fish and the bear. The challenge is to choose fractions for the question marks on the slide so that the unit being added in the computation is 1/14. Work on this problem independently and write the answers in your notebooks.”</p> <p>PD leader move: Circulate and observe participants creating their fraction problems. Pick one or two of the problems to share with the group. It’s best to select problems that ask for different quantities (e.g., one asking for the fraction of food matter used for energy, and one asking for the fraction of food matter lost as wastes).</p> <p>PD leader move: When everyone is finished creating their problems, ask the two participants whose work you selected to share their problems</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
			<p>with the group. Since the prime factors of 14 are 2 and 7, the fractions involved should have denominators of 2, 7, and 14, or multiples of 14.</p> <p>PD leader talk: “These examples show how we can use the science of food webs to create mathematical problems with context. Checking students’ solutions to a problem involves another application of mathematics to science. How could students detect whether they’ve made an error when solving your problem? What could they do?”</p> <p>PD leader move: Guide the discussion with probe and challenge questions to evoke the idea that students should add the three given fractions to the one found and obtain 1.</p>
		<hr style="border: 2px solid #808080;"/> <p style="color: #C00000;">Reflect: Content Deepening Focus Question 2</p> <p>How can we use conservation of matter to create fraction problems with a scientific context?</p>	<p>Display Slide 41. Reflect: Content Deepening Focus Question 2</p> <p>PD leader move: Direct participants to answer the focus question in their notebooks.</p>

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
<p>3:00–3:30 30 min</p> <p>Wrap-Up and Celebration</p> <p>Slides 42–45</p>	<p>Purpose</p> <ul style="list-style-type: none"> • Help participants understand the relationships among the Science Content Storyline Lens strategies and when each strategy occurs in the lesson flow. • Facilitate understanding which SCSL strategies must be addressed in the planning process and which need to be anticipated in planning but occur responsively during the actual teaching of the lesson. • Recognize and celebrate participants' learning so far and anticipate further growth in the coming year. <p>Content</p> <ul style="list-style-type: none"> • Many of the SCSL strategies must be completed during the planning stage. Strategies B, F, G, H, and I are moves the teacher makes while teaching. But planning and anticipating how these strategies will help develop the lesson is critical to success. • The RESPeCT lesson plans provide examples of how strategies B, F, G, H, and I might be used during the lessons. • Strategies F, G, and H should be used throughout the lesson. 	<p>Today's Focus Questions</p> <ul style="list-style-type: none"> • How can science content storyline coherence be enhanced by explicitly implementing STeLLA strategy F (Make explicit links between science ideas and activities), strategy G (Link science ideas to other science ideas), and strategy H (Highlight key science ideas and focus question throughout)? • How will the Student Thinking Lens and Science Content Storyline Lens strategies help you teach the Food Webs lessons in the fall? • An organism can use food molecules (1) for growth as they become part of its body; (2) for energy as the molecules are broken down; (3) as wastes; and (4) as matter passed on to other organisms. Why should these fractions of the food matter in an organism add up to 1? • How can we use conservation of matter to create fraction problems with a scientific context? <p>Summarizing Science Content Storyline Lens Strategies</p> <ul style="list-style-type: none"> • What does the organization of the summary chart in the STeLLA strategies booklet highlight about the Science Content Storyline Lens strategies? • Do you want to make any revisions or additions to our poster on effective science teaching? 	<p>Display Slide 42. Today's Focus Questions (5 min)</p> <ol style="list-style-type: none"> Give participants a couple of minutes to think about today's focus questions and then answer them in their notebooks. If time allows, have a share-out of ideas. <p>Display Slide 43. Summarizing Science Content Storyline Lens Strategies (10 min)</p> <p>Note: Display one question at a time on the slide.</p> <ol style="list-style-type: none"> "This week we focused on the Science Content Storyline Lens and strategies. Let's synthesize and summarize our learning by looking at the summary chart in your strategies booklet—Summary of the STeLLA Science Content Storyline Lens Strategies." <ul style="list-style-type: none"> Note: Participants may also refer to their SCSL Z-fold summary charts for this activity. Individuals: "Look at this summary chart and how it's organized. What do you think the organization highlights? Write your observations in your notebooks." Whole group: "What did you notice about the organization of this chart? What does it highlight about the science content storyline strategies?"

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
	<p>Strategy B is used at the beginning of a lesson, and strategy I is used at the end.</p> <p>What Participants Do</p> <ul style="list-style-type: none"> Participants study the SCSL summary chart in the STeLLA strategies booklet to identify key patterns and relationships among the strategies. <p>Posters and Charts</p> <ul style="list-style-type: none"> Effective Science Teaching chart <p>Supplies</p> <ul style="list-style-type: none"> Science notebooks <p>PD Resources</p> <ul style="list-style-type: none"> STeLLA strategies booklet Optional: SCSL Z-fold summary chart (front pocket of PD binder) 		<p>d. Reveal the second discussion question on the slide and invite participants to suggest additions or changes to the chart on effective science teaching.</p> <p>Key ideas:</p> <ol style="list-style-type: none"> Many of the SCSL strategies must be completed during the lesson planning stage. For example, the main learning goal and activities that match them must be selected ahead of time. Strategies B, F, G, H, and I are moves the teacher makes while teaching the lesson, but planning and anticipating how these strategies will help develop the lesson is critical to success. The RESPeCT lesson plans provide examples of how strategies B, F, G, H, and I might be used during the lessons. Strategies F, G, and H should be applied throughout the lesson. Strategy B is used at the beginning of a lesson, and strategy I is used at the end. Each strategy has its own distinct purpose(s), but all of them contribute to creating a coherent science content storyline.

PD Model: Time/Phase	Purpose, Content, and What Participants Do	Slides	Process
		<p style="text-align: center;">Let's Celebrate!</p> <p>Design your own end-of-program celebration and insert any comments or instructions here.</p>	<p>Display Slide 44. Let's Celebrate! (15 min)</p> <p>a. Decide how you'll celebrate the end of the RESPeCT PD program and modify the slide accordingly. Here are a few ideas:</p> <ul style="list-style-type: none"> • Have refreshments and toast the group's success with a bubbly, nonalcoholic drink. • Have everyone write on an index card a "golden nugget" that represents something they're taking away from the Summer Institute experience. Pass around a bowl filled with chocolates wrapped in gold paper, and have participants take a piece of chocolate when they drop their cards in the bowl. After the bowl is passed around, share the golden nuggets with the group. • Take a group photo.
		<p style="text-align: center;">Thank You!</p> <p>Thank you for participating in the RESPeCT PD program!</p>	<p>Display Slide 45. Thank You! (Less than 1 min)</p> <p>a. Before dismissing participants, thank them for participating in the RESPeCT PD program.</p>