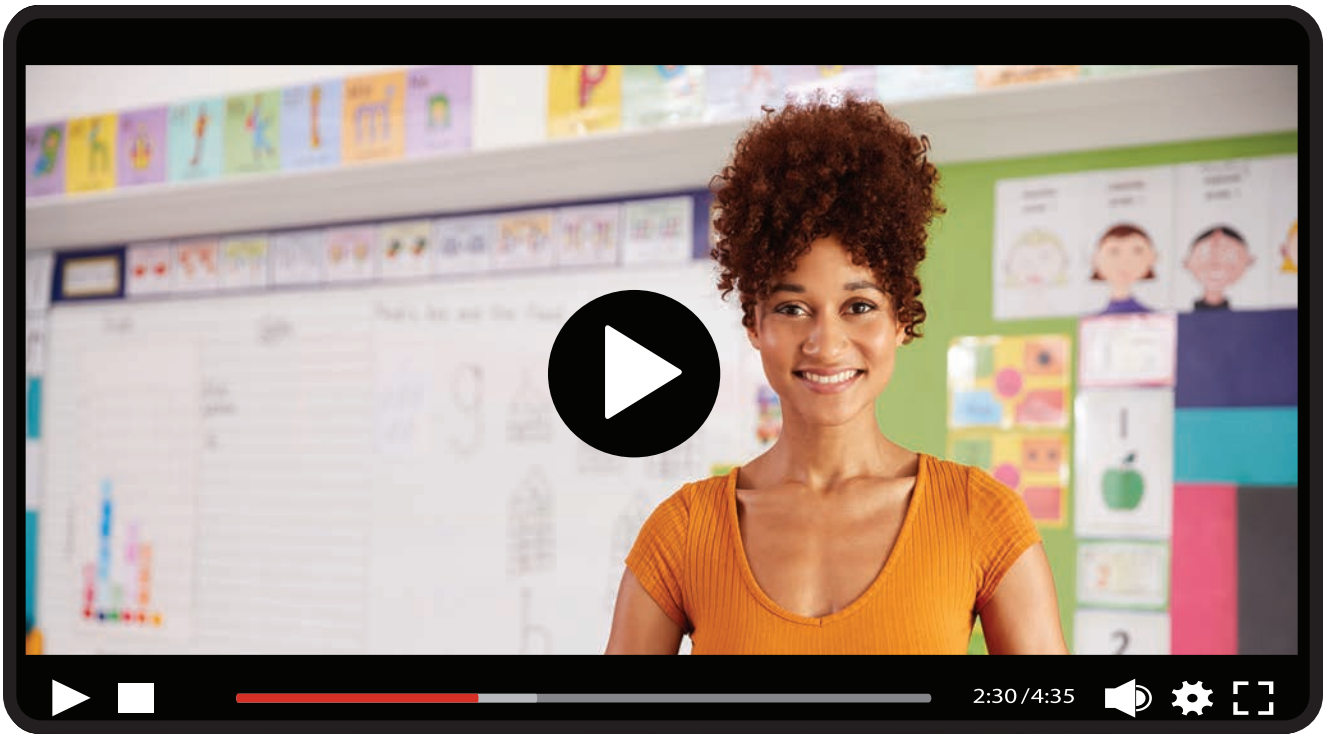

RECORD, REPLAY, REFLECT

VIDEO PROVIDES THE PERFECT VEHICLE FOR LESSON ANALYSIS

BY JODY BINTZ AND NICOLE I.Z. WICKLER

One of the challenges leaders face is how to help teachers examine their classroom practice. The use of video technology as a tool for teacher self-reflection, peer collaboration, and coaching has been gaining in popularity for just this purpose.

Video can bring teachers together to look in on classroom moments and study interactions. This approach makes classroom interactions more visible and supports teachers in deepening their understanding of teaching and learning (Knight, 2014).

In addition to technological and logistical resources, tools to support successful video coaching ensure the conversations it sparks are focused and productive. Discussion protocols are a well-established way to focus on problems of practice and student work (McDonald et al., 2007), and they are useful when combined with video.

In this article, we share how teachers benefit from using a Lesson Analysis Protocol to analyze video clips of classroom interactions anchored in a professional learning program.

ABOUT THE PROGRAM

Science Teachers Learning from Lesson Analysis (STeLLA) is an intensive one-year video-based program composed of classroom, professional

learning, and leadership development curricula that use a framework of strategies for science teaching and learning.

Guided by the Next Generation Science Standards, design teams of curriculum experts, content experts, and K-12 teacher specialists developed the classroom materials by identifying science ideas that are challenging for students and teachers, useful in explaining a variety of phenomena in teachers' and students' experiences, and linked to important crosscutting concepts and science practices.

The curriculum serves as a set of educative lesson plans that scaffold teachers' use of the strategies, provide anticipated student responses to questions and activities, and highlight how students develop the science content storyline over time.

The program combines high-leverage teaching strategies with video-based lesson analysis, in which teachers study videos of other science teachers as they implement the strategies through a model unit of instruction.

The combination helps teachers examine ideas related to their science content knowledge, pedagogical content knowledge, and teaching strategies. The program has been tested in multiple contexts and grade levels with positive impact on student learning (Taylor et al., 2017; Wickler et al., 2018).

COLLABORATIVE AND RIGOROUS ANALYSIS

Collaboration is key to effective professional learning (Learning Forward, 2011). For STeLLA, this means developing small learning communities in which teachers analyze science teaching and learning using classroom video clips with transcripts and related student work.

The classroom artifacts are initially part of a prepared video case that includes video clips of experienced STeLLA teachers engaged in model lessons in their classrooms with their students. Later, teachers in study groups analyze classroom video clips of themselves engaged in the same model unit in their own classrooms with their own students.

Analysis tools and processes led by a skilled leader scaffold teacher learning and promote analysis of classroom artifacts. One such tool, the Lesson Analysis Protocol, structures three phases of analysis.

In the first phase, teachers watch a three- to seven-minute video clip and use a transcript to identify instances of the use of one or more specified strategies. The leader encourages teachers to cite time stamps and justify their identification by referring to text from a strategies booklet.

In the second part of the protocol, teachers analyze the video clip with a particular analysis question in mind.

In the third phase, teachers reflect on and apply what they learned from lesson analysis. This reflective dialogue allows teachers time to enrich their understanding and develop as a community of learners.

Let's look at an example of a study group of 4th- and 5th-grade teachers. The clip they watch is from a unit about the sun's effect on climate and seasons. In the unit, students identify temperature patterns at different places on Earth at different times of the year to figure out that the combination of the curvature of Earth's surface, nearly circular orbit around the sun, and Earth's tilt explain the pattern.

During the lesson, students model Earth's orbit around the sun using a light bulb (the sun), a Styrofoam ball (Earth), and a Hula Hoop (the orbit of the Earth around the sun), and consider strengths and limitations of the physical model. Early in the lesson, students discuss their initial ideas for the focus question: Why are places closer to Earth's equator hotter than places farther away from the equator?

IDENTIFY PHASE

The following excerpt is an example of teachers working through the first (identify) phase of the Lesson Analysis Protocol using a video clip of one of the teachers in the study group. The leader asked teachers to identify instances of asking questions that probe and challenge student thinking and instances of developing and using models.

Leader: Now that you've had a few minutes with the transcript, let's share some clear examples. Let's start with a clear probe question.

Teacher 1: At 56.7 when Amy [the teacher in the video] says, "OK, so Christina, are you saying that the sun is hitting more in the Northern Hemisphere or on the equator?"

Leader: And what makes you say that's a clear example [of a probe question]?

Teacher 1: Amy is trying to clarify what Christina said earlier by asking the question.

Leader: What do others think?

Teacher 2: We said it was more of a challenge question.

Leader: OK. So we don't all agree on the nature of the question. Do you agree with [Teacher 1's] justification?

Several teachers: Yes. That's a probe.

Leader: And how do you know?

Teacher 3: Here, in the text. [pointing to the transcript]

Leader: OK, let's see if we can find a clear example [of a probe question].

Teacher 2: We said 1:55.0 "Can you say more about that?" That's an easy one.

Leader: What makes you say it's an easy one?

Teacher 2: It's in the strategies booklet.

Leader: Did everyone identify that as a clear example?

[Teachers nod.]

Leader: OK. What about a clear example of a challenge question?

Teacher 1: At 2:34.3 through 2:38.8 when Amy says Maris has one idea and Christina has another and she asks what others think.

Leader: Do we agree?

Teachers: Yep. We agree.

Leader: Let's go back to [Teacher 1] and [Teacher 3's] first example and see

LESSON ANALYSIS PROTOCOL FOR THE LESSON ON THE SUN'S EFFECT ON CLIMATE

1. Identify **the lens and strategy.**
- What instances of asking questions that probe and challenge student thinking do you observe?
- What instances of developing and using models do you observe?

2. Analyze **the video using the analysis question(s).**
- What do students seem to understand (or not) about the sun's effect on climate and seasons?
- How did the use of the identified strategies make student thinking more visible?

LESSON ANALYSIS STEP	TO DO	YOUR ANALYSIS
Claim	Turn an observation, question, or judgment into a specific claim that responds to the focus question.	**My claim:** Using the model, students reason the amount of light hitting different hemispheres at different positions in Earth's orbit influences the seasons in those hemispheres. They seem to have the beginnings of scientifically accurate understanding of patterns in temperature at different times of the year.
Evidence and reasoning	Point to a specific place in the video transcript, lesson plan, or student work that supports your claim. Connect your claim and evidence with reasoning based on STeLLA strategies, research on learning, your teaching experience, or scientific principles. Also look for evidence that challenges your claim.	**My evidence:** After the teacher's probe question at 35.1 and challenge question to use vocabulary at 50.2, students talk about the equator and Northern Hemisphere getting more light than the Southern Hemisphere when the Earth is at position 1 (summer). Christina says "more on the equator" and "it's also more bright on the Northern Hemisphere" at 1:10.2-1:06.2. A boy says, "It's [sunlight's] not as much [in the Southern Hemisphere]" at 1:18.0. Another boy agrees that "it's not as much" at 1:20.6. And at 1:22.1, another student says, "There's not as much sunlight, so, um, it's winter." From 1:25.8 to 3:13.0, students discuss position 3 and agree that this is winter in Northern Hemisphere (1:57). And that it's warmer in the Southern Hemisphere because it's getting more light (2:18). Students use the words "more bright" and "not as much" rather than talking about direct or indirect light. **My reasoning:** Next Generation Science Standards talk about reasoning with physical and mental models. In this clip, students reason with a visual model of the Earth and sun throughout the year. Students use the word "because" to link their observations of the diagram to a pattern they identified before, that places near the equator are warmer because they get more sunlight and the Northern Hemisphere is in summer when the North Pole is pointing toward the sun and the Southern Hemisphere is in winter.
Alternatives	Consider an alternative interpretation or explanation. Consider new questions this might raise. Consider alternative question(s), activity(s), or strategies.	Since the students were previously introduced to the terms "direct" and "indirect" light in the lesson with the trays, the teacher could have challenged them to use this language. For example, "How is your idea related to the idea of direct and indirect light?" I think students need a chance to write about their ideas and tentative explanations. I wonder how she'll help students use this model to get at the influence of day length on average temperatures at different times of year.

3. Reflect on and apply **lessons learned from the process.**
Teachers reflect on the experience.

if we can figure out if 56.7 is more of a probe question or a challenge question.

ANALYSIS PHASE

In the analysis phase, teachers revisit the video clip and transcript to develop and justify a claim that answers one of the protocol's analysis questions. After teachers have individual time to develop their claim, evidence, and reasoning, they share their analysis with the group. See example above.

During the analysis, teachers dig into student thinking, make explicit links between the use of the strategies

and student development of the science content storyline, identify strengths and limitations in the lesson plans, including the activities and content representations or models, and deepen their own understanding of the science content and lessons.

They also propose alternate interpretations of the responses to the analysis question, identify missed opportunities, and suggest different teaching approaches.

The following excerpt follows this same study group as its members move into the second part of the Lesson Analysis Protocol and discuss their analyses.

Leader: Now that you and your partner have had a chance to respond to one of the analysis questions, let's hear your thinking. Who took the first question?

Teacher 2: I'll go. Our claim is that this one group of students seems to understand that direct sunlight hits Earth near the equator — well, just a little above or below the equator at some times during the year, and they make the link to seasons.

Leader: Could you say what you mean by "they make the link to seasons"?

Teacher 2: That the hemisphere that is receiving more direct sunlight is experiencing summer and the one with less direct sunlight is winter.

Leader: Did others make a similar claim or agree with the claim?

Teacher 1: We did.

Leader: Does anyone disagree with the claim?

Teacher 5: We mentioned early on, the girl holding the bulb didn't seem to get it, but later we think she probably did.

Leader: Do you have a time stamp for that?

Teacher 5: No, we weren't sure. She pointed when she said it, but we couldn't find where in the transcript.

Leader: OK. [Teacher 1], could you pick up your analysis?

Teacher 1: Our evidence for that is from 19.5 through 1:09.8. Students point to areas of "more light" just above the equator. And then at 40.2, one student says, "It's going more here by the equator." The teacher asks them to use their vocabulary words, and the one girl says Northern Hemisphere. That was at 56.7. She says, "More on the equator, but it's also a lot of bright light on the Northern Hemisphere, just to give enough light." Then a new student says, "It's summer."

Teacher 4: We didn't get it all down, but we said that the ideas from lesson 2 worked out. They got the idea that the hemisphere with direct light is summer and less direct light is winter. They didn't say temperature. Which was a missed opportunity. I mean, the teacher could have asked them that question as a challenge question.

Leader: Where do you think the teacher could have asked the question? And then what question would have made sense?

Using video, teachers can analyze selected classroom moments by slowing down normally fast-paced interactions. Study group members also frequently identify key questions asked by the teacher in the video clip and add those questions to their teacher's guide as a reminder when they later teach the lesson.

In this example, the leader uses a probe question to ask the teachers what they meant by the link between direct light and seasons to uncover teachers' science content knowledge. The last question she posed is intended to uncover teachers' pedagogical content knowledge and abilities to use the STeLLA strategies intentionally.

STeLLA FRAMEWORK: STRATEGIES FOR EFFECTIVE SCIENCE TEACHING

Student thinking lens: Strategies to reveal, support, and challenge student thinking	**Science content storyline lens:** Strategies to create a coherent science content storyline
1. Ask questions to elicit student ideas and predictions.	A. Identify one main learning goal.
2. Ask questions to probe student ideas and predictions.	B. Set the purpose with a focus question.
3. Ask questions to challenge student thinking.	C. Select activities that are matched to the learning goal.
4. Engage students in communicating in scientific ways.	D. Select content representations and models matched to the learning goal.
5. Engage students in analyzing and interpreting data and observations.	E. Sequence key science ideas and activities appropriately.
6. Engage students in using content representations and models.	F. Make explicit links between science ideas and activities.
7. Engage students in constructing explanations and arguments.	G. Link science ideas to other science ideas.
8. Engage students in using and applying new science ideas in a variety of ways and contexts.	H. Highlight key science ideas and focus question throughout.
9. Engage students in making connections by synthesizing and summarizing key science ideas.	I. Summarize key science ideas.

REFLECT AND APPLY PHASE

Teachers may adapt and strengthen the model lessons based on what

they learn with the Lesson Analysis Protocol. For example, toward the end of the study group above, teachers revised the instructions for setting up the model of the Earth-sun system to improve students' use of the model and their abilities to make consistent observations.

Through the study groups, the teachers begin using common language and developing classroom cultures that value student thinking and students' development of a coherent science content storyline. These instructional practices help students make connections between the classroom experiences and the science ideas and practices they are intended to learn.

Too often, students miss these connections, even when teachers engage their students in the kinds of experiments and hands-on activities that experts recommend. If used well, analysis of classroom artifacts, including video, can help improve teacher practice, elicit student thinking, and boost student learning.

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