

## PD Leader Master

### 5th-Grade Guide to Video Clips for Day 2: Elicit, Probe, and Challenge Questions

**Remember:** The focus of this analysis is understanding the differences in the purposes of elicit, probe, and challenge questions. Following are examples of these questions in the video clips. It's fine if participants want to disagree with these examples as long as they use good rationales based on how the questioning strategies are defined in the STeLLA strategies booklet.

**Video clip 1:** Amber interview (identify elicit and probe questions)

**Video clip 2:** Duin classroom video—whole-class discussion of observations and ideas about boiling water (identify probe and challenge questions and missed opportunities; analyze student thinking)

**Video clip 3:** Dieken classroom video—whole-class discussion of the meaning of the “water cycle” (identify probe, challenge, and leading questions and missed opportunities; analyze student thinking)

#### Video Clip 1: Amber Interview

**Elicit questions** (asking for a variety of student ideas, but *not* necessarily a correct answer):

- 12:11.08 Are clouds made of anything else besides water? [The interviewer is asking for new ideas about Amber hasn't mentioned but is not necessarily looking for a correct answer.]  
14:17.23 Is there gas water anywhere else in this picture besides the clouds?  
14:48.02 Is there any solid water [in the picture]?

**Probe questions** (to find out what the student is thinking, *not* leading her to a correct answer):

- 11:26.21 Why do you think that the clouds have water inside of them?  
12:03.12 So clouds are made of water. So even if it didn't pick up the water, it still has water by itself?  
12:44.04 So you were saying that the water in the clouds is actually gas water?  
12:52.19 Why do you think that?  
13:27.06 So mist is the same as gas?  
13:42.29 So you know water can turn into a gas, and you think that gas is what makes up the cloud?  
13:54.10 OK. Other things. You think other stuff that's, like, in the air?  
14:36.23 You also said a little bit here by the trees?  
15:23.02 OK. So that might be solid water?  
15:36.10 I'm curious, thinking back to these clouds and how they pick up water—and you called that evaporation?  
15:53.16 So water is traveling up to the cloud, and that's evaporation?  
15:58.01 So what's ... what's making the water travel up to the clouds?  
16:20.19 So when you say that the water is being taken up—or how do you say it, rising up to the clouds?  
16:29.19 Is it liquid water that's rising up?  
16:40.14 So somewhere you ... you learned something about gas being visible or not visible.  
16:48.00 What ... can you tell me about that?

**Analyze student thinking (slide 15):**

**Claim 1:** Student thinks that clouds are made of gaseous water that evaporates from earth and goes up to the clouds in the sky (no idea about condensation or clouds being made of liquid water).

**Evidence:**

- 12:18.01–12:33.06 Student indicates that clouds are made up of gas.  
12:32.12; 12:51.22 Student says that the water in clouds is gas.  
12:55.18–13:24.10 Student offers an explanation for concluding that the water in clouds is gas, not liquid, and gives an example of a plane flying through the clouds without the windows getting wet.

**Claim 2:** Student thinks that sometimes you can see gaseous water, and sometimes you can't see it (e.g., clouds, mist, steam).

**Evidence:**

- 12:18.01–12:33.06 Student indicates that clouds (which you can see) are made of gaseous water.  
13:15.17 Student indicates that mist on airplane windows (which you can see) is “kind of like a gas.”  
16:49.15—17:12.12 “Some of the gases you could see, like if you're boiling water.... It starts to, like, blow smoke out. That's like a gas.”  
17:17.00—17:30.21 Student indicates that you can't see water evaporating above a pond.

**Possible additional probe questions:**

- 16:14.06 Tell me more about how gravitation helps water travel up to the clouds.  
16:14.06 Any other ideas about what makes water travel up to the clouds?  
16:34.02 So you said it's liquid water going into the air from the lake, but it's gas water in the clouds. Can you tell me more about how that works?

**Video Clip 2: Duin Classroom Video, Whole-Class Discussion of Boiling-Water Observations and Ideas****Probe questions (slide 16):**

- 00:25.2 When the water gets hotter, the water is moving a lot?  
00:29.6 What do you ... what are you seeing that is proving that it's moving a lot? [Some might argue that this is a challenge question, but the teacher is not really trying to move students to a correct science idea here.]  
00:41.1 Oh, the top of the ... like the surface area?  
00:52.6 OK, it's pushing more water. What do you mean by “pushing”?

**Challenge questions (slide 16):**

There are *no strong challenge questions* that are clearly trying to move students toward a more-scientific understanding. Emphasize that this is *appropriate* for a lesson that is focused on eliciting students' initial ideas about the boiling water. The teacher should *not* be challenging students to move toward a scientific understanding yet. They don't yet have enough evidence and information. However, the following question does push students to back up an inference with details about the observation, so some might call it a challenge question:

- 00:29.6 What do you ... what are you seeing that is proving that [the water is] moving a lot?

**Missed opportunities for probe questions (slide 18):**

- 00:01.9 What do you mean by “evaporating”?  
00:01.9 You said some of the water is coming up with the steam. What do you mean by that?  
00:01.9 How are you defining steam?

- 00:55.1 You say the heat is “heating them upwards.” What do you mean by “them”? [I’m wondering if the student is thinking about water molecules.]
- 01:20.2 What do you think the bubbles are?
- 01:33.4 What do you mean by “evaporated”?
- 01:33.4 You say the water would be below the line because it evaporated. What’s the connection between evaporation and the water being below the line?
- 01:50.0 So you think the water will disappear. What do you mean by “disappear”?
- 02:01.6 Tell me more what you’re thinking about water molecules.
- 02:01.6 What do you think the miniwave is made of? [Is the student thinking about molecules?]

**Analysis of student thinking (slide 22):**

- 00:01.0–00:01.9 Ryan seems to be saying something like the common student idea that “when liquid water evaporates, the water goes into the air as steam.” However, his wording suggests that the evaporating water and the steam are two different things, because he says, “Maybe some of the water is evaporating, and it’s coming up with the steam.” A probe question here could have clarified what Ryan was thinking: “What do you think is coming up with the steam?” or “Are you saying that steam and the evaporating water are two different things?”
  
- 01:33.4–01:50.0 This student says that water from the beaker will evaporate and disappear (a common student idea). The student says that the water line in the beaker will get lower, and the water will disappear “after a while.” A probe question is needed to clarify whether the student means the water will no longer exist or the water will no longer be visible. A good probe question would have been “What do you mean by ‘disappear’?”
  
- 02:01.6 Although the class has not yet talked about molecules, this student is already trying to explain the boiling process in terms of the movement of water molecules. It’s interesting that the student is thinking that water molecules get pushed out of the water during the boiling process. I would like to ask a probe question: “You said a miniwave will push the water molecules. What is the miniwave made of?”

Video Clip 3: Dieken Classroom Video, Whole-Class Discussion about the Idea of a Water Cycle

**Probe questions (slide 23):**

- 00:29.2 Can you tell me what’s going on in those [processes—precipitation, evaporation, condensation], please?
- 01:28.7 Can you tell me anything more about this liquid thing?
- 01:55.8 A pattern in what way?
- 01:58.3 What does this pattern look like?
- 02:18.0 Something that you can use again?
- 03:14.2 Which means what?
- 03:19.2 What do you mean?

**Challenge questions (slide 23):**

- 02:54.2 Can you tell me something that the water molecules might be doing as they go into the steps of the water cycle? [The teacher is challenging students to use science ideas they've learned about molecular motion, evaporation, and condensation.]
- 03:05.2 What's going on with the water molecules in evaporation?

**Leading questions (slide 23):**

- 02:19.5 So with the water cycle, we're talking about a circle. What do you think is going in a circle in a water cycle?
- 02:36.2 We've been talking about water. Can you tell me more locali— smaller things that go in a cycle or in a circle?

**Missed opportunities (slide 23):**

- 00:36.3 What do you mean by "condensation"?
- 00:36.3 Say more about when "water ... turns into smoke."
- 00:48.7 You said in evaporation, "it disappears." What disappears?
- 00:48.7 What do you mean by "disappears"?

**Analysis of student thinking (slide 24):**

- 00:16.7–00:53.1 Justin knows the vocabulary words that describe the water cycle—*precipitation*, *evaporation*, and *condensation*. He accurately links precipitation to rain. However, he isn't accurate in his descriptions of evaporation and condensation, and he isn't using ideas the class has studied about molecular motion, the gaining and losing of heat energy, and changes of state. Justin states that condensation is when water turns into smoke. He is probably thinking about steam, which *is* formed by condensation, but he includes nothing about water molecules losing energy during condensation, or about water changing states from water vapor to liquid water. He describes evaporation as when water disappears into the air. Again, he doesn't describe evaporation in terms of molecules gaining energy and changing state. And he doesn't clarify what he means by "disappears." Does he mean the water ceases to exist or is no longer visible? I conclude that Justin has not yet internalized a molecular way of thinking about evaporation and condensation.
- 02:48.7–03:24.7 Like Justin, Tyler isn't using ideas they've studied about molecular motion and phase changes during evaporation and condensation. He stumbles and says "I forgot" when the teacher asks him to talk about what water molecules might be doing in the water cycle. When she simplifies the question and asks just about the molecules in evaporation, Tyler responds without talking about molecules: "When the water heats up, it evaporates." When the teacher probes him to explain what he means, he stumbles and says, "I don't know how to explain that." I think Tyler, like Justin, has not yet internalized the ideas about water-molecule behavior during evaporation and condensation.