PD Leader Master

5th-Grade Guide to Video Clips for Day 4

Video clip 1: Dieken classroom—The teacher poses use-and-apply scenarios for students to explain (strategy 6).

Identify

Key ideas for each Identify question:

1. This is a use-and-apply task because students are using new science ideas they just studied to explain five different scenarios in a variety of contexts.
2. All of the scenarios challenge students to think about changes in heat energy and how they affect water molecules and changes of state.
   - Scenario 1 focuses on evaporation.
   - Scenario 2, the cup of water in the plastic bag, demonstrates both evaporation of water molecules from the cup and condensation of water on the inside of the baggie (changing from water vapor back to liquid water as heat energy is lost).
   - Scenarios 3 and 4 (cold water bottle/cold soda can) both demonstrate condensation. Water-vapor molecules in the air near the cold can or bottle lose heat energy, slow down, and join together to form droplets of liquid water.
   - Scenario 5, the teakettle, illustrates both evaporation and condensation. As the water boils, water molecules in the liquid state speed up, move apart, and escape into the air as water vapor. At the end of the spout, nothing is seen—water vapor is there, but it is invisible. But then the water vapor loses heat energy (cools) as it hits the cooler air above the spout; the molecules slow down, join together, and form liquid water droplets in the air above the spout. We see this as a cloud of steam. The steam is made up of liquid-water droplets. These water droplets quickly evaporate again as they gain energy and speed when they encounter faster-moving molecules in the air.
3. The video clip appropriately includes **challenge questions** because the goal of strategy 6 is to push student thinking forward. See transcript examples of the teacher challenging student thinking at video segments 19:58, 21:10, 21:25, 22:32, 22:37, 22:41, 23:17, 23:26, 24:35, 24:44, 24:46, 24:50, 25:05, 25:20.

Analyze

Analysis question: What student thinking is revealed by engaging students in using and applying new science ideas in a variety of contexts?

Claim: Although the teacher indicates that students' ideas about how water droplets are forming on the cold soda can need only minor revisions (segment 0:21:19, "So you were really close"), I don't think students understand that the water-vapor molecules in the air around the can lose heat energy (cool), slow down, and join together to form liquid-water droplets. The teacher's questioning guides them closer to this science idea.

Evidence and reasoning:

0:21:22	The student says, "So water turned into cold air." This is not an accurate statement. When probed, the student doesn't have an idea about how this could happen.
0:21:52	The student again says, "Water turns into [cold air]." This leads to some discussion about how water can be hot and then cold. However, this is a missed opportunity to

probe student thinking by asking, "What do you mean when you say, 'Water turns into [cold air]'?"

0:22:32–0:22:57 Students accurately recognize that you can see water vapor when it's cold, and they link that to the fact that they can see their breath when it's cold outside. However, one student attributes this phenomenon to the "heat in your breath" affecting the cold air rather than the cold air causing the water-vapor molecules to lose heat energy and condense. A student comes closer to an accurate idea at segment 0:22:57 ("When the … warm molecules meet the cold molecules, you can see it.").

0:23:17–0:24:00 This student is comparing condensation to sweating and observes that you can see a can "sweating" on a really hot day: "It's giving off the bad water or salt in your body" (0:23:44). The student does not give a good answer for how this is similar to the soda can "sweating" (0:24:00).

0:24:10–0:25:31 In this section, the teacher guides students to think about individual water-vapor molecules in the air around the can that "[turn] into water" (0:24:49) because the can is cold. At 0:25:25, a student talks about water-vapor molecules coming together to form liquid water. However, no one ever made the connection that the cool air around the can is causing the water-vapor molecules to slow down and "form together." So I'm not convinced that students can really explain this phenomenon well.

Alternative: I would have liked the teacher to ask one student to give a complete explanation summarizing their conversation.

Conclusion: Students need more use-and-apply practice! They're just beginning to put all these ideas about molecules, heat energy, and condensation together.

Video clip 2: Anderson classroom —A small group of students is predicting what they think will happen in the water-changes system (review of STL strategies 1–6).

Question: Are Student Thinking Lens strategies 1–6 visible in this video clip?

Strategy 1: Elicit Question
Prior to clip: What do you predict will happen when we heat this flask?

Strategy 2: Probe Questions
00:17.6 So [the water-vapor molecules will] turn into the liquid state right here?
00:45.6 What do you mean by "denses back [up]"?
01:16.6 It [the gas] would be in the tube. Is that correct?
01:19.9 So the gas wouldn't get pushed out? It would just stay in the tube?
01:33.5 What do you mean by "so much in there"?
01:44.2 So the individual water molecules … they're going to be pushing each other?

Strategy 3: Challenge Questions
00:17.6 It [the water] won't turn into the liquid state anywhere else?
00:34.5 Why is [the water] doing that?
01:44.2 What evidence do you have that they [water molecules] do that?

Strategy 4: Analyzing and Interpreting Data and Observations
Students aren't analyzing data and observations in this clip. However, they are drawing from previous observations of water boiling (see video segment 00:03.7).

Strategy 5: Constructing Explanations and Arguments

Students in this clip are in the prediction phase. They haven't yet observed the water-changes system, so they aren't yet ready to construct explanations and arguments about the system. However, they are foreshadowing possible claims in their predictions. For example, they predict that water vapor will go into the tubing (video segments 00:03.7–00:09.2; 01:16.6–01:19.5) and will turn back to liquid water in the test tube (00:17.6–00:46.9). They don't yet have any evidence to support these claims, but they're using science ideas to support their predictions (e.g., 00:46.9, "[Water vapor] loses energy and turns back into a liquid"; 01:52.2, "[Water-vapor molecules in the tubing are] bouncing around, and they push the other molecules out of the way").

Strategy 6: Using and Applying New Science Ideas

This video clip is a strong example of strategy 6. Students are expected to draw from their knowledge about water molecules gaining and losing energy during evaporation and condensation to make predictions about the water-changes system. There is evidence that they're using these ideas to make their predictions (although they're not always 100% accurate).

00:03.7–00:46.9	One student states that the "hot plate heats up the water and turns into evaporation" (not 100% accurate). Then the water vapor travels through the aquarium tube and turns back into liquid in the test tube because it "denses back up … like, it loses energy and turns back into a liquid."
00:54.4–01:52.2	In this conversation, the student reasons that there will be water vapor in the aquarium tubing, and that some of the water vapor will be pushed out because the molecules are "bouncing around, and they push the other molecules out of the way."