SPEAKER 1: This video provides an example of how teachers can use oral prompts and written scaffolds to help students fully articulate their initial ideas about a specific science phenomenon. Tasks, talk, and tools play a critical role throughout this lesson. As you watch, observe what kinds of tasks students are engaged in to make their thinking visible. What tools help students communicate their ideas? And how does the teacher use talk to make students' ideas public?

At the beginning of a new science unit, the teacher wanted students to share their initial ideas. The guiding question provided in the curriculum broadly asked students, what do you know about electricity? This would result in a laundry list of disconnected ideas. This would not be useful in having students reason about science ideas.

To have a focused discussion about student circuit ideas, which was the heart of the unit, the teacher asked targeted questions specifically about an everyday flashlight. What causes a flashlight to stop working after being left on for 30 days? The teacher engages students in an observational task. Students make observations about how a battery wire and bulb can be positioned to create circuits. These observations will help them later in hypothesizing about how a flashlight circuit works.

SPEAKER 2: We're going to give you guys some light bulbs, like the one that's in there, some batteries. I like that one. And some wires, which in this case, there's a metal strip in here. But you guys will get a piece of metal instead. And try to figure out which ways make a light bulb turn on and which ways don't. And there, we're going to give you space in your notebook just to write down four, to draw four ways that work and four different ways that don't work. But I think there's a lot of ways that work and don't work.

SPEAKER 1: Students manipulated the materials to create different circuits and recorded their observations in their notebooks, using drawings and labels. In the next clip, the teacher has students share their observations with the class first before pressing students to think more deeply about how they think a circuit works. The teacher uses particular talk modes to help students clarify their descriptions and talk with each other about observations.

SPEAKER 2: Is that a way that worked or did not work?

AUDIENCE: I think it worked.

SPEAKER 2: You think it worked?

AUDIENCE: Oh yeah, it worked.

AUDIENCE: It makes it lighter.

SPEAKER 2: How is that one connected? Can you talk about it?

AUDIENCE: So I put that one.

SPEAKER 2: What's that, the battery?

AUDIENCE: Yeah, the minus, negative. And then I placed it to positive, and then it made it light.

SPEAKER 2: Where's the light bulb in your picture?

AUDIENCE: Right there.

SPEAKER 2: Is that the circle?

AUDIENCE: Yes.

SPEAKER 2: So you have two batteries? Were the batteries touching? I'm skeptical. Does anyone think that that way would work, if the batteries are not touching? Or if you think it would work.

AUDIENCE: That one is different.

SPEAKER 2: Hmm, are we divided? Are we confused? What do you-- OK, remind me of your name? Julia, what do you think? Do you think his way would work?

JULIA: No, because if batteries aren't touching--

SPEAKER 2: Hold on.

JULIA: If the batteries aren't touching, the energy--

SPEAKER 2: Are you listening to her? She's thinking about it. Come on, listen.

JULIA: --between the batteries and the wires. If the batteries are touching, the energy can't go around the battery.

AUDIENCE: I knew it wasn't working, so.

SPEAKER 2: Oh, so now you think it doesn't work?

AUDIENCE: I really knew it wasn't working. I just set it up there because--

SPEAKER 2: You wanted to see?

AUDIENCE: Yeah.

SPEAKER 2: So what could you add to your picture that you think would make it work then?

AUDIENCE: Well, like, if you put this one on the top of that, that would work.

SPEAKER 2: So they're touching?

AUDIENCE: Yeah.

SPEAKER 2: What's another way that you could make it? Because it seems like from what Julia was saying, that there has to be some way for the energy to get there, right? Is that-- that's what I was hearing her say. What's another way?

AUDIENCE: You could hook the other one up, down, and then push them together.

SPEAKER 2: So they have to touch. You push them together so they touch?

AUDIENCE: The bottom part has to touch.

SPEAKER 2: What if you took another wire? Could you add another wire?

AUDIENCE: I did that.

SPEAKER 2: You did that?

AUDIENCE: I did three batteries. I connected two wires together, and then I placed the other one on the bottom and the other side and then placed on the other side. And then I realized that the more batteries, the more brighter it gets.

SPEAKER 2: Oh, that might be why our flashlight over here has two batteries in it, instead of one, so we could see better. Thank you, you can a seat.

AUDIENCE: After having a few students share their observations and take questions from their peers, the teacher had students help her create a public record of four functioning circuits to hang as a reference in the room. The next day, students worked on individual models to express their ideas about how they think a flashlight circuit works and what might happen if it were left on for 30 days.

The teacher provided them with a blank writing scaffold and told them they could cross out, add, and change anything on the page to help them communicate their ideas. In this next clip, notice how many ideas this student is using to make sense of the circuit and how he pulls in his background experiences to make sense of the phenomenon.

AUDIENCE: The battery has the energy stored inside. And after all the energy is stored inside of the battery, that's what you need to set this off. And then when you have inside of the battery, there's like-- I noticed that to light it up, there's a wire that's touching other wires that lights up.

And the wires are going outside like this little bubble that looks like a water bubble, but it's hard on the outside but watery in the inside like a pomegranate. So I think without the wires inside of there, it wouldn't be able to light up because nothing is touching the water to set it off. And when electricity gets wet, like a plug that has electricity in it, when it gets wet, it starts a fire. So I think that the other wire is causing it to not cause fire just get like a little hot, heating it.

SPEAKER 2: And that that's what gives us the light.

AUDIENCE: Yeah. So it's like a little bit of fire mixed with heat.

SPEAKER 2: OK.

AUDIENCE: Look at this one.

AUDIENCE: Hey, yo.

AUDIENCE: That water bottles so small.

AUDIENCE: Yo.

AUDIENCE: I think if you overuse the light bulb too much, the water-- the heat in there forces to heats it for the water thing to go off.

SPEAKER 1: These students marshaled observations from their circuit task and their own life experiences to make sense of the flashlight circuit and what might cause it to stop working. This video is only a small sample of the kind of talk that happened throughout the classroom during this lesson.

The teacher visited each table group and listened in on student thinking. As she listened in, she noted what ideas students had and where they fit within the unit plan. For example, the idea is these boys shared fit within the larger standards of the unit.

Energy inside the battery gets at the energy source and were useful in subsequent lessons where students learned about chemical energy and made their own batteries. Other ideas referenced system standards. The boys had some understanding that some materials carry current and others do not.

Finally, they referenced the idea that energy from the battery can transform into heat and light. His ideas contain partial understandings and some alternative conceptions which were revisited throughout the unit.

Let's revisit the tips about the kinds of talk, task, and tools that help students make their ideas public. Instead of using the broad question, what do you know about electricity? this lesson focuses in on a more manageable question about a flashlight circuit to anchor the discussion of ideas that were carried throughout the unit.

Recording and sharing observations provided students a starting point from which they began hypothesizing about the unobservable mechanisms that make a circuit work. These observations led directly into using a model scaffold to elicit students' thinking.

Without a scaffold, students often get stuck staring at a blank page or may not focus in on the target question. By providing students with a starting place for a diagram and writing, they have some guidance and can jump right in to getting their ideas on paper.

Briefly, let's unpack the important parts of this writing scaffold. First, it directly relates to an observable activity students were engaged with. Next, there is space for both drawing and writing. Lines cue students that writing is expected. Also, drawings that are partially started allow students to spend time thinking and writing rather than laboring over drawing the perfect light bulb, for example.

Finally, setting up a before and after scenario gives students a contrast a cause and effect relationship to consider. In this case, students considered a working flashlight before being left on and then after it was turned on for 30 days, and no longer functioned. They had to consider what caused the damage and how they think it happened.

The ideas students inscribed and shared gave insight into their thinking, which is a valuable planning tool. Based on the student models in the circuit unit, many students were puzzled about what was going on inside the battery and had a range of hypotheses. So the teacher followed this lesson by diving into battery systems and using corresponding lessons from the curriculum to help students make sense of this part of the circuit system.