SPEAKER 1: This video shows how an elementary student revises his thinking during a fifth grade science unit about circuits. Students initially recorded their thinking about how and why a flashlight would stop working if it were accidentally left on. Here, one student explains his initial thinking about what would cause the light bulb to stop working. Listen to what kinds of experiences he draws on to make sense of why a bulb would stop working.

SPEAKER 2: All right. So the battery has the energy stored inside. And after like all the energy is stored inside of the battery, that's what you need to set this up. And then when have-- inside of the battery, there's like-- I noticed that to light it up, there's wire that's touching other wires that lights up.

SPEAKER 3: Told you there's the independent wire.

SPEAKER 2: And the wires are going inside 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 it wouldn't-- electricity gets wet-- a plug that has electricity in it, when it gets wet, it starts fire.

So I think that the other wire is causing it to not cause fire, just get a little hot heating it.

SPEAKER 1: And that's what gives us the light?

SPEAKER 2: Yeah. So it's like a little bit of fire mixed with heat.

SPEAKER 1: OK.

[INTERPOSING VOICES]

SPEAKER 4: It's the water bottle like so small. I think if you overuse the light bulb too much, the water-- the heat in there forces it, heats it for the water thing to go off.

SPEAKER 1: Pause and reflect on what experiences the student used and what language he used to describe his hypothesis. This eliciting of students' initial ideas is part of the ambitious teaching framework. The framework includes four-core science teaching practices. After the teacher plans for student engagement, the teacher elicits students' ideas. In the prior clip, you saw how students had materials to build circuits and a drawing scaffold to create models of their thinking.

After eliciting ideas, the teacher engages students in a series of activities and investigations to support ongoing changes in their thinking. In the circuits unit, students built their own batteries, tested conductors and non-conductors, observed parts inside light bulbs, learned about electrons, and gathered evidence for how and why batteries, light bulbs, and wires all work together to make a circuit.

In this next clip, we hear from the same student again near the end of the circuits unit after eight days of sense making activities. Listen to how he now describes how a circuit works.

SPEAKER 2: Well, before, I thought that the glass bead that was in between the wires that held up the filament was like it had water in it, and when it got wet, it caused the wires to make something catch on fire. But now I got over that thought, and it wasn't very reasonable. So now I think that glass bead, what it's used for, is once the energy travels through the battery, it goes through the wire, once it does that, then the batteries-- I mean the light bulb.

Then once it goes to the light bulb, it has energy that makes the light bulb like get hot. And once it gets hot, it travels through the wire and gets up to the filament. And the filament is like it's in an oven or in a toaster, it has the filaments inside that get really hot. And what I think is when it gets really hot, it causes a little bit of light. And how it makes a lot of light is because the glass bead that's in the middle of the the two wires, it reflects off of that glass bead and makes it brighter.

SPEAKER 1: OK, so you've heard the light bulb. So how does the energy get to the light bulb? And where does it come from?

SPEAKER 2: It comes from the battery, from the electron side of the battery. Once you set them off by plugging the battery to something that's going to make it cause it to turn on, once you do that, it starts going through everything, the electrons. It could be if you had metal, plastic, or anything.

SPEAKER 1: Does it go through everything?

SPEAKER 2: No, it doesn't go through everything, it just goes through mostly metals. And once it gets set off and it's something that's conductive, it goes all the way through it, and that's what I think.

SPEAKER 1: This student provides one example of how student thinking shifts over a unit of instruction. This happens when students are engaged together in co-constructing understanding that aims for explanations that not only tell what happened but also explains how and why a particular phenomenon occurred. This kind of sense-making talk, aimed at building explanations, with a focus on cause and effect relationships, are part of the Next Generation Science Standards. The Circuits unit also addresses the energy strand. For more information about Ambitious Science Teaching, please visit our website at tools4teachingscience.org.