SPEAKER 1: This video shows one way for students to summarize the big unit concepts into a checklist of generalizable ideas to later help them write evidence based explanations. Tasks, talk and tools play critical roles 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 a particular talk moves facilitate students' summary of explanatory ideas?

In this unit, students are learning about the energy transformations that occur in circuits and are reasoning about why a flashlight would stop working after being left on for 30 days. This unit had a big idea about energy transformations. As students are engaged in multiple activities over the course of the unit, the teacher asks the students to compare activities and find similarities. This makes students go beyond merely retelling what they did and moves them into thinking about the bigger picture concepts that link activities together.

In this next clip, note how the teacher references a prior activity and sets up today's task of comparing different types of circuits.

SPEAKER 2: Everyone has different circuits. Like one group had the lemon law circuits, one group had a solar panel that they powered with the overhead light because the sun wasn't bright enough.

STUDENT: And one group had [INAUDIBLE].

SPEAKER 2: One group had the totally new, kit which I think they made the spinny thing that flew off in the air with the motor that would release it. This group had that same thing. And this one with this [INAUDIBLE] to the corner and they had to go get it. And then the group over here, poor people with no screwdrivers, really worked hard to make their crank light work. So we all had things that had circuits.

STUDENT: [INAUDIBLE] I didn't--

SPEAKER 2: Well, but Kate-- Kate helped us out on that one. So we all had things that had circuits. So I'm interested in, what are some similar ideas-- this is kind of a tricky question. So, listen carefully. With all these different circuits, the lemon clock, the battery powered motor spinny thing-- I don't know what the technical name is-- right? The [INAUDIBLE] light, where you use your arm muscles--

STUDENT: [INAUDIBLE] spinny thing.

SPEAKER 2: The spinny thing? Yeah. It sounds good. Technical, right.

STUDENT: Yes.

SPEAKER 2: So, with all these different circuits-- the solar panel, that wasn't powered by a battery, that was powered by a light. But all of these different circuits, what are some similar things that are happening in each of these circuits? It's a tricky question.

STUDENT: They're all going [INAUDIBLE].

SPEAKER 2: Take a minute to think about it.

STUDENT: I got sweets, [INAUDIBLE].

SPEAKER 2: And maybe, try to think of more than one thing they have in common. Turn and talk, what similarities are between all of these circuits that we've been talking about? What's something that's the same?

STUDENT: They both have energy in them and--

[INTERPOSING VOICES]

STUDENT: There's something that-- all of them have something that control. Some like-- let's say there's a button or a switch. They all have something controlling it. [INAUDIBLE]

Yeah. Energy makes them do [INAUDIBLE].

STUDENT: Try to make a dramatic moment here.

ELISE: All are a circuit.

[INTERPOSING VOICES]

SPEAKER 2: What were some of the ideas you [INAUDIBLE]?

STUDENT: We did.

ELISE: All can function with different power sources.

SPEAKER 2: Share with me.

STUDENT: What?

SPEAKER 2: Share with me. What'd you think?

STUDENT: They both have circuits--

[INTERPOSING VOICES]

SPEAKER 2: What did both of them do to the energy?

EMMA: OK, they all knew.

STUDENT: Use it.

[INTERPOSING VOICES]

STUDENT: They use the energy to make-- some make sound waves.

SPEAKER 1 (VOICEOVER): After talking with a partner and making their own list, students shared out to the class what similarities they discussed. The next clip illustrates how the first bullet, circuits transform energy for a certain reason or purpose, was co-constructed in a whole class effort. Notice how the teacher asks for students to agree on wording before writing on the checklist. Also note what talk moves the teacher makes to connect students' ideas.

SPEAKER 2: I popped in on some really good conversations about identifying some really general similarities. You guys didn't get stuck on the specifics of, like, well, that one had a lemon, and that one had a battery, and that one had a solar panel. But what's the similarity between the lemon and the battery and the solar panel? You guys really focused on some [INAUDIBLE] things.

So let's start on-- we're going to make our list of ideas. And you can just write it under your question. I had this extra bullet because I think the ideas we're about to discuss will be really helpful if we have to explain a circuit in the future. So I'm just going to make a list here. You can make your list in your notebook.

And I call this list the gotta have checklist. Because it's kind of the general-- if you're going to talk about circuits, you got to have certain ideas that you're talking about, even if you're going to explain the lemon clock or the spinny technical name, spinny swoopy thing, or the Dynamo crank flashlight. They all have the ideas we're about to share.

OK, Sarah, do you have something to share?

SARAH: They all use energy.

SPEAKER 2: They all use energy.

[INTERPOSING VOICES]

SPEAKER 2: They all use energy or make energy. OK.

SARAH: Energy is involved.

SPEAKER 2: Energy is involved? Is that what you said.

SARAH: Yes. Yeah.

SPEAKER 2: Energy is involved in all of them. How is the energy used, or, you said may be made or evolved. What's happening? So we have this energy idea. So what's happening with the energy in our circuit? That's going to be maybe [INAUDIBLE]. People adding on to this energy use making-- Steven.

STEVEN: They all have electrons and atoms.

SPEAKER 2: They all have electrons and atoms. So that's, talking about the matter. That's the stuff. So we'll have that as a second thing too. So I'm going to hold that for a second. Let's finish this energy idea. Do you have an energy idea, [INAUDIBLE], about energy? Emma, about energy? OK, let's stay on the energy thing for a second. Yes?

EMMA: They all have-- wait. They all transform it.

SPEAKER 2: Ah. Sarah, do you agree with what Emma just said? Because I was thinking-- and then Collin too.

STUDENT: It's part of the reason they're there, to transform energy. What's the point of having a knife?

SPEAKER 2: Ah.

STUDENT: [INAUDIBLE] a light that needs the Sun to power a flashlight, I mean, that doesn't store it.

SPEAKER 2: Ah, oh.

STUDENT: But if it's a fan, then it could be hot, you can do it.

SPEAKER 2: They transform energy. And maybe that's for a specific purpose. Would that be good to add, [INAUDIBLE], for a specific purpose, or just [INAUDIBLE]?

SPEAKER 3: I heard, yeah, a couple people saying that they all do something. Right? They have some kind of--

SPEAKER 2: Should I say specific purpose, or a certain job, or--

SPEAKER 3: Function.

SPEAKER 2: --function? What kind of wording do we want here?

STUDENT: Function.

SPEAKER 3: Function.

SPEAKER 2: Function? For a certain-- for a certain--

STUDENT: Reason.

SPEAKER 2: --reason or function. I like having synonyms. Because that way, if we forget what one word means, we have the other word is kind of a backup. Or function. I know function comes up a lot in science, though. So I do like to have that word up there too.

SPEAKER 1 (VOICEOVER): Ideally, students help to create and add to this checklist over the course of the unit, adding important ideas over time. However, in this Circuits unit, students helped create this checklist towards the end of the unit as a pre-writing task.

This checklist becomes a writing tool for students to use when they write their explanations to answer the unit question, what causes a flashlight to stop working after being left on for 30 days? Students use the checklist to explain a circuit they made as part of their unit assessment as well. They use circuit kits and had to explain the function of the circuit and how and why the circuit worked using ideas from the checklist and evidence they collected during the unit.

Let's revisit the tips about the kind of talk, task, and tools that help students summarize key unit ideas. When planning the unit, the teacher identifies key ideas that students must understand in order to explain a particular science phenomenon. Each activity provides students with evidence for a piece of the overall scientific explanation. In order to make a gotta have checklist, students must identify similar ideas that hold true across activities or models. These become generalizable, gotta have ideas when explaining the phenomenon.

Use talk moves to orchestrate a whole class conversation to add to or change items on the checklist. Remember to use student language alongside science terms so it's an useful tool for students later on when they use this checklist to write evidence-based explanations about the science phenomenon.

Ideally, add and change items on the checklist over the course of the unit so students can see that they can change ideas over time based on new evidence. In this case, however, it worked well as a pre-writing activity.

According to the Next Generation Science Standards list of science practices, students in grades 3 through 5 should combine information from multiple sources and use it to construct or support parts of an explanation. These are key parts of creating and adding to a gotta have explanation checklist. Additionally, this unit addresses the energy strand found in the Next Generation Science Content Standards.

For more information about this or other science teaching practices, please visit our website at toolsforteachingscience.org.