READING WRITING IN THE DISCIPLINES

Supporting Claims with Evidence and Reasoning Video Transcript

Martin Berryman:
The liquid has gone from a greenish blue color to what? Clear. So what's one thing that interests you about what you see?

Student:
The final empirical formula is...

Berryman:
I want to give you a brief bit of information about a claim. A claim should be one or two sentences only and it should be a statement about the results of your lab work. And it should answer the beginning question.

If you ask students, "What is this problem really about?" They can't say. They can't make those connections easily. So the way I develop literacy skills in the classroom, I focus on claims, evidence, and reasoning. And the way I do that is through experiment. Today's lesson was based on what we did the previous lesson.

Hey guys, take a note of what you should be doing right now on the board..

Berryman:
The students heated up a hydrated salt to determine the empirical formula of it.

Student:
The rust is, like, on the bottom.

Berryman:
What makes their initial investigation slightly different than what's typically done is, they were working off of a beginning question.

Does the empirical formula of a hydrate depend on the initial mass?

Instead of just doing the lab to verify results, the students will do an experiment, they will collect their data, and then they will make a claim based on that data.

So all of the different groups look at the data and from that data, they construct a claim. But first, they need to figure out what makes a good quality claim.

On each lab bench, I have two claims: Claim A and Claim B. I want you to determine as a group which claim is the strong claim.

Student:
This has a dependent and independent variable.

Student:
Yeah, because that's just... that's just like an observation.

Student:
This is with temperature. And Claim B is, "My product was a yellow solution." Do you think B?

Student:
I think it's A.

Student:
It's not B, because, I mean, like, based on, like, the actual solution, it's like, it went from, you know, like a blue-green to, like, clear.

Student:
This is like an observation more.

Student:
Yeah.

Berryman:
So, guys, make sure that you get these observations into your notebook because what we're doing here is we're developing evidence, and it's going to be the evidence that supports the claim that comes later in the class.

Student:
He definitely encourages us to help each other. He wants us to ask other people in our group to make sure that we all understand it as a whole.

Student:
With this one, it's saying, if the temperature increases, the product goes yellow.

Student:
If it... because it's shorter, it would say like, "The temperature is lower."

Student:
But, see, that's the point, that's the point. That's another thing that makes this one better because reading this, you have a good idea what the beginning question is.

Student:
True, yeah, yeah, yeah.

Student:
While this one, you're just like, "What?"

Student:
Kind of guessing.

Student:
Yeah.

Berryman:
And then the students work to construct their own quality claims about their lab.

Does the empirical formula of a hydrate depend on the initial mass of the hydrate? Based on your observations, what can you claim about that, all right?

Student:
I think the answer is no because there's a number of different initial masses up there. Either way, the ratio is still two.

Berryman:
Go ahead, tell us what you have.

Student:
So we put the empirical formula of a hydrate does not depend on the initial mass.

Berryman:
Okay, great. So at this point, you've got your claims. Let's come back to the desk so we can look at that next part, the evidence. What are the characteristics of strong evidence? It includes supporting data, it explains the meaning behind the data. What do we think about the data? What is the data telling us about our beginning question and our claim? And one last question for five points, what does it depend on? If it doesn't depend on the mass, Carly, what does it depend on?

Carly:
The mole ratio?

Berryman:
It depends on the mole ratio, guys. And, guys, to wrap up, just summarize that. What does the empirical formula of a hydrate depend on?

In science, you're mainly looking at the diagrams, graphs, tables, figures. They have to interpret those figures, graphs, and tables.

Tell us, where is your evidence? Our evidence is the data chart.

Student:
We used, like, the mathematical evidence.

Berryman:
Tell me about your mathematical evidence real quick.

Student:
So, like, seven groups were given... every group was given a different initial mass and six of the seven groups got the same mole-to-mole ratio which is two to one, which give us the same empirical formula.

Berryman:
Okay.

And then they have to write in words what's happening.

How do we express what we find in the lab to each other and to the world?

Karen:
He gives us a lot of information about how other scientists will portray their information in order for us to build our own developmental ways of writing like a scientist or a chemist.

Berryman:
Is it accurate? How do we know it's accurate? Do we know it's accurate? No. We have no idea unless, for a five-point card, we do what? Does anybody have an idea what we need to do? What's the next step?

Student:
We compare it to the other groups' data?

Berryman:
We compare it to other groups' data. Like, in this room, or in the school, or...?

Student:
It could be also other groups outside of the classroom.

Berryman:
Awesome.

When the students get a result, they should be able to compare that to a literature value. A really useful strategy is to have them compare that answer to published work.

Berryman:
One more five-point card. What else could we compare it to? We could compare it to other groups in other high schools. Who thinks they know another idea here? Anthony?

Anthony:
Chemists. Like, actual chemists.

Berryman:
So we could compare it to professionals. And the way we compare it to professionals is by reading scientific journals where people, as chemists, republish our results. So we're not looking for accuracy here. We're just looking for the process of collecting the data and analyzing the data. So you don't have to get the right answer.

If the students feel that they don't always have to be correct, then they're willing to take the risks necessary to do good work. You know, even at the high school level.

So for next class, I will give you a paper where we have published results of this value and you can compare your answer to the "actual" value, all right? Have a great day, guys. The homework will be posted on the website.