READING WRITING IN THE DISCIPLINES

Thinking and Communicating Like a Biologist Video Transcript

Dr. Amy Sheck:
We're going to do 200 microliters. So Connor, why don't you do solution number two, okay?

Student:
Okay, and that's 20 milliliters?

Sheck:
The biggest hurdle in science literacy is the reading. It's so full of vocabulary, so specific and specialize in vocabulary. That is very hard to master. I'm an evolutionary biologist. When I read outside my field -- which I do all the time with these students -- I'm learning new vocabulary. So it's a struggle for me, too.

John:
When I'm reading a science paper, every word matters, you know? If there's a word that you don't understand, you have to look it up. Same as in an English class. But why you don't understand the word is usually different. It's because you aren't familiar with the science concept. You have to then research the concept.

Sheck:
Step number one is to choose a paper that you know is going to be somewhat readable and should have some way they can relate to it. The paper we chose today was really nice because it had to do with biofilms, which are an important issue in hospitals and I thought it was something they would find important. And then step number two is they just read it. They're only going to get 50% of the paper, and that's okay. But they work really hard at that, and they highlight and they struggle. Then we come back and meet as a group. Another really nice technique with the paper is to break it down into smaller chunks. And if you chunk it, it's a lot less intimidating. So for example, I could give two students paragraph one, figure one, and they just focus on that, and another set of student paragraph two and figure two, and they talk in this very small group and then they report back. They find when they do that, "Oh, we really do understand and we can explain it to everybody else."

How did you feel about your understanding of that paper?

Student:
It was a lot better after we talked, yeah.

Sheck:
It was pretty dense.

Anne:
We got a really difficult paper. I think it was one of the hardest that I've ever read. And that was the first paper we read. And so she gave it to us for a week to kind of, like, look over, read over, pick up any questions we might have. And then she actually had the person who wrote the paper come in to talk to us about it.

Sheck:
So if they have questions, they can ask. There's the author, right there.

Anne:
She was really helpful in offering insights about her paper. And especially, like, talking through the figures and diagrams, we learned what to look for in scientific literature.

Student:
Doesn't the Rim15 display weaker colony morphology?

Sheck:
The other thing is, how do scientists talk to each other? Scientists read and discuss what they've read.

Student:
These specific clinical strains were becoming... adapting these biofilms.

Student:
Maybe the clinicals were different from, you know, just the average standard for a yeast.

Sheck:
Every week we have read something and we sit down and we talk about it. So I very much modeled my class after what scientists do.

Student:
We wanted to test clinical yeast and a few other types of strains to compare the two under different types of environments, specifically environments that may

have to do with the human body -- like salt concentration, temperature -- to see how strong the biofilms would be at those particular points in comparison.

Sheck:
What you saw today was juniors doing their first experiment ever. And that's why I call it the touchstone because they refer back to it as their first experiment. The first scientific paper they read, the first experiment they set up, the first data set they analyzed that was their own data, so it's very important and meaningful to them, and a point of reference. The juniors, our younger set of students, came in and proposed their experiment, what they wanted to do, and the seniors -- the older students that were sitting around the edge of the classroom -- were listening.

John:
Since it was our first experiment that we were designing together, the seniors and Dr. Sheck were going to help us out.

Student:
Maybe there are one or two that you think might be different. Then that would be better than testing all four.

Anne:
Right, because if you're going to get the same results anyways -- or, if that's what you think -- then there's really no point in wasting your time testing multiple strains.

I think that it's important to be guiding them in the right direction.

John:
It's sometimes easier for a student to explain something to you in different words, and it makes you more sure that you know what you're talking about when you can explain it to someone else.

Sheck:
My objective was to have them finesse their scientific thinking, which had to do with the experiment, all their choices, justifying some of those choices, changing some of those choices, accepting constructive criticism.

Student:
On the side we have different salt concentrations.

Sheck:
The diagram is sort of my pet project. That's... I think in those boxes. My students sort of... it's almost an inside joke, is how do you turn every experiment into a box? But they read the paper and then they were able to associate that with the diagram.

John:
Dr. Sheck taught us that we needed to put things into diagrams and put them into more visual representations than just trying to verbally explain them. Ways that we could see it more quickly and visualize exactly what we were doing and what it encompassed.

And then we had... on the bottom, we had the different strains. And we said one clinic... we said about four clinicals. But we might cut it down so it will just be, like, more strains. And then on the side we had different salt concentrations.

Sheck:
How many?

John:
We had four.

We were able to take apart what we were saying and figure out what the variables were.

Sheck:
There were five strains, so that's one side of the box--boom, boom, boom -- five strains. Another side of the box was temperature, and there were three temperatures. So we're drawing a box -- one, two, three. And then the third dimension was salinity. So it's really a three-dimensional box and when you pull it all together, sort of like a Rubik's cube, you have all possible combinations. And then the second objective was, have them set up the experiment. The best kind of lab group for scientists is a group where people work together well. They have to be able to offer constructive criticism, they have to be able to help other people with their experiments when they have time, and they have to be able to think about other people's experiments. To me, that's part of being a scientist. That's what I really value about them as a group, is they do all of those things for each other.

John:
Let's start to Google some of these.

Student:
Okay, let's...

Student:
Molar mass, which would be 22.9...