SCIENCE VIGNETTE: CELL-BY-CELL

In this unit, the teacher has had each student become an expert on a specific type of cell and then make a model of the cell type. Then students shared this knowledge and used it to make generalizations about the characteristics of cells.

In this lesson, the teacher posted four T-charts around the room and asked students to get together with the others in the class who studied the same type of cell. They walked from chart to chart and wrote their cell type in the correct spot on each T-chart.

A single-celled organism	A cell of a multicellula organism
Euglena	Red blood cell
Diatom	Lung cancer cell
Botulism bacteria	White blood cell
O. tauri	Muscle cell
Amoeba	Skin cell
T. gondii	Osteoblastz
Anthrax bacteria	Stem cell
E. coli	Leaf cell

Completes all functions of an organism	Completes SOME functions of an organism
E. coli	Osteoblast
T. gondii	Leaf cell
Anthrax bacteria	Stem cell
Amoeba	Red blood cell
Euglena	Muscle cell
Botulism bacteria	White blood cell
O. tauri	Lung cancer cell
Diatom	Skin cell

Does NOT have a nucleus	Has a nucleus
E. coli	Muscle cell
Anthrax bacteria	Osteoblast
Botulism bacteria	Leaf cell
Red blood cell	Stem cell
	Lung cancer cell
	White blood cell
	Skin cell
	T. gondii
	Amoeba
	Euglena
	O. tauri
	Diatom

Has DNA	Does NOT have DNA
Skin cell	Red blood cells (when old)
Muscle cell	
Osteoblast	
Leaf cell	
Stem cell	
Lung cancer cell	
White blood cell	
E. coli	
T. gondii	
Anthrax bacteria	
Amoeba	
Euglena	
Botulism bacteria	
O. tauri	
Diatom	
Red blood cell (when young)	

ANALYZING DATA

"Now that we've collected our data. Let's spend some time analyzing and interpreting it. We'll do this collaboratively in our planet groups."

My students have three different group assignments — a planet group, an ecosystem group, and an element group. Each group has four students and a labeled set of four desks pushed together in my room.

Having the various groups set up before hand helps make the process of transitioning into small groups fast and smooth and enables students to take action without always needing to rely on detailed directions from the teacher.

"You'll work in planet groups to talk about what you notice as you look at the data across the charts. Then your group will write some summary statements on sentence strips that describe what you noticed. We don't need to read sentence strips that say simple things like, 'There are eight single-celled organisms.' We can just count those ourselves. What you want to do is come up with something interesting or surprising or complex that you notice about our data. Look for patterns. Look for anomalies. Talk and write about those. When you get to your planet table, you'll find a resource envelope with some data analysis tips. Remember you can use the sentence starters on the tip sheet to jumpstart your thinking. Try to find at least three things worth sharing."

The sentence stems directly support student engagement in the discourse process and the anchor charts, info sheets, and data analysis tips provide additional support to further students' development of discipline-specific skills and knowledge.

Analyzing Data Sounds Like...

- I see a pattern. The pattern I'm noticing is...
- I see an anomaly. The anomaly I'm noticing is...
- Based on the patterns I see, I predict that...
- This is the highest/lowest...
- I have an idea about...
- Based on the data, I think...
- What do you think explains...
- I'm surprised by...
- I wonder if there is an error...
- I notice there are differences...
- I notice there are similarities...
- I wonder if...
- I wonder why...
- I wonder how...

I usually busy myself as groups work and listen covertly to their conversations. If a group is stuck, off-task, or going in a nonproductive direction, I stop by and try to offer some tidbit to improve things. Otherwise, I let them do their own work.

The teacher gathers, interprets, and responds to evidence of student learning while students are engaged in discourse.

For the purposes of reflecting on this lesson, I videotaped the entirety of the conversation among Juan, Coral, Brian, and Chantell. Here is what they said in 10 minutes.

Coral: Marco's going to get in trouble for wearing that hat.

Brian: It's a sweet hat.

Juan: Do you have your phone?

Brian: Nah, my mom took it away, for a whole week, for nothing.

Teacher: I notice your group hasn't started talking about the data yet.

The teacher redirects students to work toward understanding the intended learning of the lesson.

Coral: Do you see Marco's hat?

Teacher: Yes, I do, and right now, I'm trying to get you all to talk about the data.

Brian: Okay, okay. Let's do this thing!

Teacher walks away.

Chantell: Who's got something to say?

21-second pause. All four kids are staring at the charts.

Juan: There aren't any cells that don't have DNA sometime at least.

In this exchange, students build off of other's comments by expressing agreement and asking questions. When Coral asks her second question, she references the sentence starter resource to support her participation.

Chantell: Yeah, that's right.

Coral: Does that mean all cells have DNA or did we just not pick any that don't have DNA?

Brian: Man, all cells got DNA. I read it when I was doing my cell.

Coral: [Looking at the sentence starters] I wonder why all cells got DNA. Everything else is different. I mean not everything else, but they've got a lot of different shapes and stuff inside, so how come they all got DNA?

Brian: Write that down. Write down, "How come all cells got DNA?"

Chantell: Yeah, write that down, but say "have" instead.

Coral writes on a sentence strip.

Chantell: Okay, what's next?

Juan: You see all those single-cell ones. Those are all the same ones that do all the functions. Both lists are exactly the same.

Brian: Yeah, they got to do it all. They are the only cell they got! Those other cells are the ones with the teams. Remember in the Info Sheet, it said it's like they got a goalie, defenders, forwards, probably a coach too.

Chantell: Coral, write that down.

Coral: Write what down?

Chantell: Um…

Juan: Just say, um…

Brian: Never mind.

Chantell: No, it's good. It's good. Maybe we could say, "The cells in people play on teams." We know what we mean.

Juan: It's not just our cells. All them that are inside things go like that — even plant ones and fungus ones.

Coral: How about, "Some cells play on teams, like in people, plants, and fungus."

Coral writes on a sentence strip.

Brian: Yeah. That's right. Okay, that's two. How many do we have to do?

Chantell: Three. Timer says we got 5 minutes left.

Brian: Bam! More than halfway done. Who's got something else?

11-second pause.

Coral: Look at the nucleus one and the DNA one. Isn't it whacked that some of them got DNA…

Juan: [interrupting] They all got DNA!

Coral: That they all got DNA, but some of them don't have a place to put it? My cell said that the nucleus stores the DNA. So where do those other ones put it?

Students are building their collective understanding by utilizing the anchor charts and info sheets that support them to ground their conversation in evidence.

In this exchange, Chantell and Coral validate Brian's idea by persisting in thinking about how it can be worded on a sentence strip. Chantell also states, "No, it's good" after Brian tries to withdraw his comment. Student identity and agency are both developed through these types of exchanges, as all participants begin to see how their views are important and that they each have an important role in supporting one another.

Students could benefit from having access to discourse norms that address practices such as how to hold space for others by not interrupting.

Students work together to figure out how to express their ideas to the larger group by asking questions of one another and clarifying expectations.

Brian: Did anybody's cell be one of them with no nucleus?

Coral, Juan, and Chantell shake their heads.

Brian: We can't say that then. We could ask somebody else or get the Internet pass.

Chantell: We don't have to answer. We just have to write it down. Like say, "Where does DNA go besides the nucleus?" Teacher said it just had to be worth sharing.

Coral: It's worth it. I want to know.

Coral writes, "Where does DNA go without a nucleus?"

Then there was what seemed to me a long pause. Juan was staring at the charts. Brian was bouncing his pencil. Chantell was doodling. Coral was writing, then fiddling with her marker. (Upon listening to the recording, I saw the pause was 36 seconds long).

Based on noticing and sensemaking during the lesson, the teacher decides it's time to provide a suggestion for this group on how they can move forward in their thinking. Because she's already provided students with resources to use independently, she can direct them there instead of having to spend more time describing the types of comments and questions students can be asking.

Teacher: Sounds like you are slowing down. Maybe try looking at the sentence starters and seeing if any of those trigger a thought about the data or another way for you to look at it.

Teacher walks away. 13-second pause.

Juan: I'm pretty sure the blood cell experts got their nucleus side wrong.

Students work together to make sense of an anomaly in the data. They use available resources to support sensemaking through discourse. In this process they ask one another questions to elicit elaboration and alternate perspectives.

Brian: What do you mean? Why are you saying that?

Juan: All the ones that are in the multicelled organisms, all those have a nucleus. Except the blood cells say they don't. That's wrong, right?

Coral, Juan, and Chantell laugh.

Juan: I mean it's like the ones with a nucleus should only be the same ones that are multicelled. Like it's almost the same list.

Brian: The blood cells should have nucleus in them just like the other cells from people. That's what you mean?

Coral: Maybe they're just weird.

Juan: Or maybe the blood cell kids are just wrong.

Brian: Maybe!

Coral: Maybe what? Maybe they are wrong or maybe they are weird?

Brian: I don't know.

Chantell: Just write it down. Say… um… um… look at the list.

All four look at the list of analyzing data sentence starters.

Chantell: How about, "I wonder if there is an error…."

Coral: Yeah, okay, what should it say?

Juan: No, man, what if it isn't. I don't want to go saying "you're wrong" and they're right.

Chantell: Oh, yeah. Okay. Um… um… um... how about the "I see an anomaly" one? That's nicer. They could be right.

Brian: I think they're wrong. Yep, they're wrong.

Chantell: We can still be nicer. Write something like, "Are blood cells an anomaly?"

Juan: Put in "on the nucleus chart" or people won't get it. Write, "On the nucleus chart, are blood cells an anomaly?"

Coral writes on a sentence strip.

Brian: That's four. That's more than done.

The kids talk about other stuff for the remaining 23 seconds.

Students leverage the sentence stems to support both respectful engagement and use of discipline-specific language.

After the timer goes off, I asked each group to post their sentence strips on the front board. I grouped like with like as much as possible, and we spent the rest of the class period asking each other clarifying questions, making predictions, and explaining our ideas.

I say "our" because I usually take on the just-another-learner role when we have these discussions. I try to abide by our class norms and take on the role of listener and speaker during each discussion. I also honestly share what interests me, what surprises me, and what I don't (or didn't until recently) understand. I find when I participate as I want my students to do, our whole-class discussions are much more fruitful.

The teacher shifts from authority figure to fellow meaning maker. This models for students how to engage in discourse as meaning making participants. It also elevates students' position as holders of important disciplinary knowledge.

My goal for this discussion was to have students get answers to their questions, to expand their ways of thinking about cells, and to hear how other people analyzed the data. It was also a time for me to explain why all cells must have DNA.

While this goal is for the whole group discussion student behavior during the small group instruction make it possible to deduce that the goal for the small group discussion relates to honing data analysis skills, asking questions of the data, and extending how students think about cells. Sharing this goal with students would have supported them in being better able to meet it.