

# READING WRITING IN THE DISCIPLINES

## Learning Vocabulary in Biology Video Transcript

### **Mary Murphy:**

I want you to take out your diagrams that you drew yesterday.

We are in the middle of a unit talking about protein synthesis, so today's class focused on looking at the two processes within that larger process, transcription and translation.

You may have walked in and noticed something is very different about our board today. Right? There's some ribonucleotides all over the board.

I want to make the classroom a place where they look forward to coming, and so they walk in the room, they see those cards, and they say, "Ooh, that's different. We don't have that every day. Something fun is maybe going on today."

If their nucleotides are specific to DNA, they're called deoxyribonucleotides...

By the end of the class today, if you successfully crack the code, you will have one version of the story of what happened to Martin Meselson.

So two weeks ago, we did a mock crime scene. So they came in on a Monday and I said, "Did you read 'The Chronicle' this morning? You didn't see the article about the famous missing geneticist?" They don't know, "Should I believe her?" There's a whole fake article and we read it. The premise is, Martin Meselson, famous geneticist, is missing and there's a crime scene in his office.

So we will hopefully have one version of the resolution to the kidnapping case.

### **Griffin:**

I've been waiting so long to hear what happened to Dr. Martin Meselson because we turned in our lab reports a week ago.

### **Murphy:**

The goal of it is a fun way to teach forensic science. So we look at blood typing and karyotyping and DNA fingerprinting. And at the end of it, they write what's

called an officer's report where they say, "Here's all the evidence. Now I'm going to make sense of it."

We're going to start with transcription. So how could you tell the story of transcription? I want you to narrate it. What do all these words mean, how do they work together, what's the story of transcription? Let's do that first. Go.

And so the warm-up today was to pair off and to just look at the diagram with an emphasis on, what are these vocabulary words? It gave them a chance to explore their questions just sort of with each other, which may be not as high stakes as asking a question in front of the whole class.

**Griffin:**

The transcript of the DNA or the RNA, that is created by the RNA polymerase and that is then sent through two sections of a ribosome and then...

**Student:**

Into the cytoplasm. Yeah, okay, cool.

**Griffin:**

I feel more like a scientist when I'm in this classroom just because Mary explains the kind of challenging vocabulary in a really clear way. She uses other, like, smaller, less scary vocabulary words to explain this greater one.

Oh, okay, yeah.

**Murphy:**

In science, I think literacy has many components. I think especially in biology, there's a huge vocabulary aspect. And what I say to my students is, they're actually learning a new language.

Let's see if we can give a specific definition to a transcription factor. Why is a transcription factor important? Yeah, Maya.

**Maya:**

It, like, allows the transcription to occur. Like, it allows it to start.

**Murphy:**

Good. If it's not there, is the gene going to be transcribed? No. And this we refer to as gene regulation, right? How can we characterize what gene regulation is?

I think when they're talking as a scientist, one of the things that they're learning to do is when to use the vocabulary. Oftentimes, they'll talk around the

vocabulary because they can't use the word, which is fine, and then I'll usually interject and have them use that. I think also a huge part is being able to explain something to a peer.

**Abbey:**

When a protein is made out of the amino acids, the amino acids are attached to specific tRNA that have the anticodons.

**Student:**

Yeah.

**Abbey:**

For the codons in the mRNA.

**Student:**

Okay, so the codons are just each, like... they're in the mRNA.

**Abbey:**

Yeah. Okay.

**Murphy:**

Let's talk about, how is translation used in general everyday conversation and then how is the word translation used in the context of biology?

One of the points that we try to make in this particular process, transcription and translation are both words they've heard before. Okay, well, what do they mean in everyday conversation? You can use prior knowledge to figure things out.

Melissa, go!

**Melissa:**

So, translation in general terms, like when you'd usually use it in a conversation, is the same meaning but in another language.

**Murphy:**

Okay.

**Melissa:**

So, like, if you're translating from English to Spanish, it has the same meaning, but it's in a different language.

**Murphy:**

Okay, and then in biology.

**Melissa:**

In biology, in this case, it's changing RNA to amino acids.

**Murphy:**

Perfect.

The classic way you practice transcription and translation is just to do worksheets over and over and over and I got really bored of doing that, and the kids were bored.

For this next activity, I'm going to put you guys into five groups.

And they weren't actually thinking about what it meant. And so the idea behind the activity was, I think, one, fun, right? There's some investment in terms of why they want to complete it because at the end of it, there's an answer to this question that we were dealing with two weeks ago.

Here's how this works. Each of you has three envelopes. Within these envelopes are some index cards. The index cards that are in these envelopes have sets of DNA three at a time. You're going to take the information on the index card and you're going to transcribe it. What will you have after you transcribe it? Maya.

**Maya:**

RNA.

**Murphy:**

RNA, good. Then you're going to figure out which amino acid corresponds to the RNA, to the codon, and lastly, you're going to figure out which tRNA will carry that amino acid. Once you have the tRNA, you're going to physically get up, come to the board... Notice, these are the tRNAs. If you did it right, it'll tell you that you have the right amino acid -- yes, isoleucine -- and it'll give you a word in English. You go back to your table, you write down that word in English. If it works, after each envelope, you'll have either a sentence or part of a sentence. You'll come up to the board, you'll write down the English words that you figured out, and at the end we should have a paragraph, and that paragraph should tell us something about Dr. Martin Meselson and his kidnapping. Are you up to the challenge?

**Students:**

Yeah.

**Murphy:**

Okay, let's do it. Go!

I think, also, the kinesthetic part. They're up, they're moving. They're working together as a team rather than by themselves on a worksheet.

**Student:**

U-A-U.

**Murphy:**

Because they invest in the activity, they realize to communicate their understanding, they have to know the words. And so it sort of just... that goes hand in hand.

**Student:**

I think it's A-G-G.

**Student:**

I think it's A-G-T.

**Abbey:**

So you have to take the codon, you have to transcribe it, and then translate it. And so once you find the translation, that's when you go up to the board and, like, get the card with the sequence of three letters that matches yours, and then you can get the word.

**Murphy:**

What I've realized in science is that they're grappling so much with what the data actually means that that's where our focus has to be. So the phrase I probably write more than anything on a lab report is, "Justify your claims." That's like the kidnapping mystery we're trying to solve. Here's this huge body of evidence. Which parts are important? What's extraneous and what is important in terms of proving what you think happened?

**Student:**

Then the next one is T-C-G, which becomes A-G-C.

**Murphy:**

The idea is to link it to the crime scene -- so we're spiraling activities -- and to say, "If you figure this out, you're going to have one of many possible answers to the mystery."

We have our first sentence!

I think there was a little bit of a (gasps) in the room. You know, when certain sentences went up, like, "Are you my father?" there were kids I heard say, "I knew it, I put that!"

**Student:**

Did we finish this?

**Murphy:**

Dramatic reading!

**Student:**

All right. Doctor Meselson has been found! He was hungry and scared, but unharmed...

**Murphy:**

Participation is more than raising your hand and answering. It's listening to somebody else, it's coming up with your own idea, it's coming prepared for class, and then maybe it's taking the chance to, you know, say something in front of everybody.

**Student:**

The sample belonged to our mother. Case closed.

**Murphy:**

Yes! Good job, you guys. You did it, you did it.

I try to really bring myself into the room. This is what I'm passionate about. These are the questions I think are really cool. What are the questions you think are really cool and let's see if we can figure them out.