

Dr. Susan Gomez Zwiep (00:00):

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Eric Cross (00:10):

Welcome to Science Connections. I'm your host Eric Cross. In this third season, we're exploring the theme of science as the underdog. And last time around, we delved into the data showing that compared to other subjects, science is often put on the back burner. Now it's time to explore why it's so important to change that and how to do it effectively. So over the course of these coming episodes, we're gonna make the case for science and equip you with data and strategies for advancing science in your own home, school, or community. To kick things off, we're going to spend a few episodes going in depth on the integration of science and English instruction. We know we need to dramatically improve literacy rates in this country, and as we'll show in the coming episodes, science can be a key ally in that goal. We'll also show how language development and literacy instruction can support science. Yes, it can be a win-win, folks. To start out, I'm joined by someone who has been studying science and language development for more than a decade. Dr. Susan Gomez Zwiep is a senior science educator and staff advocate for BSCS Science Learning. On this episode, she talks about her own experience as a middle school science teacher and share some key insights and strategies from the research on integrating science and English language development. Please enjoy this conversation with Dr. Susan Gomez Zwiep.

Eric Cross (01:36):

Welcome to the podcast. Thank you for being here and having this really important conversation. So I'm so glad you can make it, Susan.

Dr. Susan Gomez Zwiep (01:43):

Yeah, I'm excited to be here.

Eric Cross (01:44):

We're gonna talk all about language development and science. But first I was hoping that you can just kind of set the stage and tell the listeners about yourself and how you came about to studying this specific subject.

Dr. Susan Gomez Zwiep (01:57):

Sure. So I am a California native. I grew up in the San Gabriel Valley and that's where I started teaching. I have an undergraduate degree in integrated biology from UC Berkeley. And I thought I was gonna go be a field scientist. And while I was waiting for grad school applications to run their course, I took a substitute job in Montebello to kind of bide my time. And because I had a science degree, they asked if I would take a permanent placement, well, a temporary permanent placement. And I said sure. And found myself teaching seventh and eighth grade general science to a population that at the time was about 68% English language learners, in a school that you would consider urban, under-resourced with a community that was large percentage immigrants from Mexico, Central and South America. And I never looked back. I kept that job.

Dr. Susan Gomez Zwiep (03:04):

I loved it. I love the middle school classroom. I love teaching science to my middle school students and truly, truly just found a really good home for my love of science, but also my love for talking about science and helping other people understand science. So at some point I was entertained with the idea of going to graduate school. So while I was still teaching, I actually did a Ph.D. At the University of Southern California in the science education field. And once there, realized that I actually had a unique experience in higher ed, that experience of teaching with populations that are learning English or have home languages other than English, was actually not common in higher ed circles. And being from that community was also not common. And so I pretty quickly leveraged that experience to combat what I think is universally agreed as an equity issue that in my school where I taught, the district had advocated for ELs to get an extra hour of language development in order to promote their English language proficiency.

Dr. Susan Gomez Zwiap (04:28):

And, our principal wisely said, there are not enough English-only students in this school to do that without losing all of our science teachers because there's not enough kids left to actually fill a day, a teacher's day. And she said, these kids learn more language in their science courses than they do anywhere else, so I don't wanna remove that. But the reality is, is that at that time--this was in the late nineties, early two thousands--if you were not proficient in English, you went to more time with language development. And that makes a lot of sense in some ways. But when you look at the big picture, you realize, well, that means those kids aren't going to science and they're not having opportunities to have consistent quality science learning opportunities simply because they spoke a language other than English at home. And so that's really how I fell into this work.

Eric Cross (05:28):

And that has a downstream effect. I mean, once you start pulling students from a course, that automatically sets the trajectory for later outcomes, which we ultimately see in STEM fields where we, we don't see the population of our students represented in the STEM fields. Now, I know this goes back a few years, but you were doing research for your Ph.D. What did you start to follow?

Dr. Susan Gomez Zwiap (05:50):

Yeah, so I eventually took a position at Cal State Long Beach, which was not by chance, it's a Hispanic-serving institution, and that's where I wanted to do my academic work. And once I was there, sought funding with a district to support elementary science learning. So it had a teacher professional learning component that was both summer and in-class, sort of like PD in the classroom component. And the district came back and said, the only way you are gonna get time to even talk about science in elementary school is if it's attached to language development. And so that's what we did. It was a three-year grant, there was a sister grant that followed--so all told, it was about a five-year program where we basically said, what if instead of following the traditional ELD, English Language Development curriculum, we modified and put science as the context for language development in the K2 bands.

Dr. Susan Gomez Zwiap (07:01):

Teachers at the district traditionally had not been excited about their language development curriculum until we said, we're gonna take that and we're gonna do some science instead. And then they were like, no, no, no! We love our ELD curriculum. But they hung in there with us. The project was successful enough that it actually became a K4 and then a K5 project. The district ended up having to put in a ton of money into this because the grant only paid for so much. But their schools actually wanted "in" 'cause

what they heard is when we put science as a context for language development, kids were talking more. Kids were speaking in English more. Kids were writing more. Kids were engaged. And the ultimate, kids were developing English quickly and in a community where you could actually operate within the community without speaking English. These are Spanish-speaking communities and the schools operated in Spanish outside the classroom. So if you walked into the school's office, the principal secretary, the person who manned the door, spoke Spanish. The field supervisors that the lunch supervisors spoke Spanish.

Eric Cross (08:17):

The non-teaching staff that are supporting the rest of the students outside of the classroom.

Dr. Susan Gomez Zwiap (08:23):

Yeah. Everybody spoke Spanish and they spoke Spanish at school. And even the principals came back and said, from being in this project, that the kids were coming into the office and had transitioned to communicating in English, especially when they wanted to talk about science, and they really wanted to talk about science 'cause they were super excited about the stuff that they were learning. So we started to see this trend of students communicating more in English because they were excited about the science that they had been learning. And yeah, that sold itself and we had schools jumping in.

Eric Cross (09:01):

So you started off in a situation where you were told that you had to, if you wanna get science and you had to merge it into English, basically. And is it fair to say that that's because of testing requirements that schools have on them? Like this is what gets analyzed or what was the purpose behind that?

Dr. Susan Gomez Zwiap (09:15):

It was district policy and it was site policy and those policies were put into place for very good intentions. Students don't get reclassified into English only, and reclassification is how you traditionally got access to all this other programming, electives, AP college prep, all those other things. And the best way to get them reclassified was to learn English, and to learn it sooner rather than later. So it was in an attempt to get kids reclassified from English learner to English proficient.

Eric Cross (09:55):

And then during that process it was able to be expanded to K4. And then with these open-minded teachers, you gave them the content, they used science as the context for learning. And then your students who were mostly emerging bilinguals and multilingual students, you found that they started speaking English more frequently. What did you make of that result? Like what did you come to after seeing all that happen?

Dr. Susan Gomez Zwiap (10:20):

So I do wanna say that there's a couple of reasons why we think this works so well. But I have to really acknowledge that there were linguistics, second language acquisition experts that were part of this team. And we wouldn't have been able to make any of this work if it was purely science educators leading this cause. There's a lot we didn't understand about language development, and they really helped us. But one of the things that we think is unique about science, there's a few really important aspects--one is that we all have experiences in the natural world, since we can process outside information, right? We all have observations, things we've observed with our eyes, we've heard, we've

felt, and all of those experiences build some pretty good science ideas before we enter formal schooling. You know, kids already have ideas about this.

Dr. Susan Gomez Zwiap (11:20):

We don't have to give them language for it. They already have these concepts and experiences. The other thing is that we are inherently interested in the natural world we occupy. And so we're curious, science is often considered cool, there are science channels and science fiction movies and science fiction books and magazines--and this is just ... it's just cool. And that tended to be the trigger, you know, when we gave kids something interesting to observe. A Ziploc bag with water that we added an Alka-Seltzer to, and strange things starts happening in the baggie. That curiosity, that excitement allowed kids to leap over any concerns they had about the language they were supposed to use in the classroom. One of the most difficult things about learning a language is using a language that is imperfect. So saying things and communicating in a language that you are not a hundred percent confident about, that you're not sure you're using the right words or the right tenses. But when kids were excited about this thing in a Ziploc bag, they didn't care. They communicated however they could, sometimes in their primary language or their home language, sometimes in imperfect English, but by and large they just communicated. They did it in oral language, like listening and speaking, but they also did it in writing. And that was easy. Like we didn't have to do anything other than provide interesting science experiences. And that's, that's pretty common.

Eric Cross (13:06):

Yeah. I feel like, to co-sign on the science is cool, it is objectively, if a matter of fact, even just looking at the Oscars, like we have multiverse, you know, we have sci-fi you know, the costume designer of Wakanda Forever. We have all of these different movies that are all founded in some kind of these scientific principles. And so the idea that science is cool and organic, naturally engaging is something I think we, we all can connect to and it resonates with all of us. So I feel like is sort of your origin story too.

Dr. Susan Gomez Zwiap (13:33):

That's the origin story.

Eric Cross (13:34):

That's the origin story right there, to continue with this like movie theme. Now if we fast forward to today, based on all the research that you've seen since then, and your experience, why would you advocate merging English language development and science?

Dr. Susan Gomez Zwiap (13:49):

Well, for one, the research that we conducted actually provided some really nice evidence that showed, even though we had essentially stole minutes from language development time and inserted science. And on state mandated tests and on their students' language proficiency measures, the kids in the program with the blended, did significantly better than students who were getting ELD instruction alone. Traditional ELD instruction. And that kind of blew our mind. We would've been happy if they had done just fine. Like we could put science into a student's day and do no harm. They could get their language development; they could get science. But in fact, what we found was that they did better. That they actually gained English more quickly and it showed up in multiple measures, including the state English language arts assessment, which again, kind of blew our mind.

Eric Cross (14:55):

So just to be clear about the study that you did, you looked at two groups and one was the blended science and English language development, and then the other one was a control group. And the blended group ended up showing more improvement.

Dr. Susan Gomez Zwiap (15:09):

Yes. So there's quite a bit of research now, this research was done in the early two thousands, and the research has built around it to really suggest that this does seem to be a more efficient way to promote language development while still maintaining students' access to a core content area. But in recent years, the standards have shifted and that has been just a remarkable, wonderful change. And both standards have shifted. So when we did our research, we did it under the old California Science standards that were fairly heavy in technical terms. They were heavy in science concepts rather than kids doing things. And they were a much narrower focus.

Eric Cross (16:04):

And these are the standards that most of us grew up on, right? Those of us who are pretty much teachers in the classroom today pretty much grew up on what you're talking about. Is that fair to say?

Dr. Susan Gomez Zwiap (16:12):

That's fair to say, yes. So the new standards that we have now, the California NGSS Standards emphasize not just ideas, but they also emphasize students doing things in science. And we didn't have to build-in language portions to the standards. They now exist. The NGSS is a very, very rich linguistic opportunity for students. And at the same time, the way we've thought about language development has also shifted. We used to talk about language and science... we used to think about science as a lot of words, and you had to know the words, you had to have this technical language. And we've sort of shifted that to really thinking about, language is no longer a prerequisite for science learning. Language is now developed through the science learning or the content learning experiences.

Eric Cross (17:11):

So now there's more chances to integrate English into science. Have you seen success stories or have you seen examples of this? Maybe just anecdotes of teachers kind of doing this since you've been doing this research and kind of watching. If so, would you mind sharing one or two?

Dr. Susan Gomez Zwiap (17:30):

Yeah. And I will just give a nod to Dr. Dr. Okie Lee who's now at NYU who has really led sort of this reconception of language and science. And one of the ways she talks about it is this notion that I enter this learning experience, I enter this observation of this phenomena with fairly naive, simple scientific ideas. And my language about it is equally simple. But as I develop more and more ideas, as my understanding of the phenomenon, what I figured out becomes more sophisticated, I need more sophisticated language. And so what we're starting to see are these spaces where teachers are building science ideas and science and understanding along with the language. And in order to do that, you really need to know what's the storyline arc of my science lesson? What do they figure out in lesson one? What do they figure out in lesson two?

Dr. Susan Gomez Zwiap (18:35):

What do they figure out in lesson three? How are the science ideas building over time? So that I can then look at the language that they're using and what language supports do I need in order to allow students to not only engage and figure things out, but communicate their ideas about it. And so we're seeing teachers blow up what we call language, what we call text. It's not just words. It's not just sentences written on a paper, but it's models, it's pictorial representations, it's gestures, it's this wide range. We pretty much said, let's blow language up. Let's like use all of the linguistic registers that we have in order to make meaning of what we're seeing it in together in this classroom. So that's one thing that we're starting to see. The other thing is that teachers are really allowing students opportunities to use what we call social language, non-standard dialects.

Dr. Susan Gomez Zwiap (19:40):

The language I use at home and with my friends. Because earlier I had said, we have all these experiences and those experiences in the world are tied up in my social register. They're tied up in my home language 'cause that's where I experience them. And to let students have access to using that language in the classroom, especially initially in a unit, means we're giving 'em access to those experiences that they have that are related to the phenomena under study. So I totally understand the benefit of promoting academic language and promoting language frames and forms that we use in more academic settings. But it's a sticky wicket. You have to be careful how you tell students about the way you want them to communicate. Because when we tell them that language that you use at home with your friends and family is not welcome here, we can send a message that they're not welcome here. And that those experiences that they have outside of classroom about how things fall, the way sunlight heats up different surfaces, where you'll find plants and what plants you will find based on conditions. All of those experiences, we're sending a message that those are not welcome in the classroom. And so this expansion of language, including non-standard dialects and even home language, is really important for letting students bring their whole selves into the classroom.

Eric Cross (21:23):

I love what you just said. It legitimizes the funds of knowledge, the language, the cultures that our students are bringing to the table. I remember when I first learned the word code-switching in college and you know, I'm biracial, I grew up in my home community and my school community were two different communities and I ethnically, culturally belonged to both. And I had to code-switch in order to kind of survive and be accepted into different communities. And not until I was in college did I actually understand what I was doing. Now there were all kinds of teasing and jokes that went on to how I would talk if I code-switched improperly. And in my classroom, I would see students who would explain concepts in a way that was maybe like a casual register. They just were explaining it the best way they could.

Eric Cross (22:10):

And the way they were speaking was kind of denigrated or it was seen as negative even though they were communicating their concept. And when I became a middle school teacher, one of my, I don't know, it's like sometimes when you teach, you get to, you change how you were taught or what you experience and legitimizing my students' language, and they would tell these beautiful stories and in their most common like, casual language, but they're explaining the concept brilliantly. And it was phenomenal to see this barrier be removed of saying, you have to talk like this in order to be a scientist or you have to say these right words. And, and that's what I feel like I'm hearing that in how you're describing kind of how science has been done and what language can do to certain groups of students.

Dr. Susan Gomez Zwiep (22:58):

Yeah, very much so. And you know, back to the origin story, you know, I grew up in a multi-generational household. My mom, my aunt, my grandmother, Spanish was their first language, but they lost it because my mom was raised in Riverside and she, you know, went to school in the, the fifties and sixties and back then you weren't allowed to speak Spanish at school. And so they lost the language.

Eric Cross (23:27):

They weren't allowed to speak it at all.

Dr. Susan Gomez Zwiep (23:29):

At all. I didn't directly observe it, but that is the story that my family tells, that there was no English spoken anywhere on school grounds. And that was a different issue. Right? That was very much for people unfamiliar with some of the history in Southern California. Their segregated schools, severe racism, linguistic racism, racial racism against Mexicans was a real thing. But yet I grew up in this household where the sort of way of speaking, like I think many Mexican households, the context is everything. So you can't get to the facts until you've told the whole context of everything happening around it. So we used to joke that we couldn't send my grandmother to the doctor by herself 'cause he had 15 minutes, and she was gonna take 20 just to tell him how she got there before she got to why she was there. But this telling of the context, the telling of the story around the idea is part of the linguistic, this sort of linguistic way of my household. When I got to school, I had to learn to drop it because teachers found me off topic. You know, I still have to be careful how I express things and sometimes I'm not a fast storyteller <laugh>, and I monitor that for myself. So I can only imagine what it's like to be a kid in a classroom.

Eric Cross (24:59):

Right. And there are so many constraints in the school day, you know, especially if you're multi-subject and you're elementary and you're teaching multiple subjects and someone's trying to tell a story and you're just like, land the plane! And they've, you know, gotta tell 'em the story, but realizing that when you look at it through a lens of like, culturally, this is how we communicate, then it reframes what the student is trying to do. They're communicating to you based on how they've learned to communicate and they're including essential parts of the story. And so how do you both honor that while also, you know, certain things like brevity and being concise and things like that that they'll have to learn. But also honoring that and making sure that there's space for that in your classroom. Even me, I'm thinking about this where I had students record this video and it was one minute to two-and-a-half minutes explaining three concepts. And I had students coming up to me afterwards saying, Mr. Cross, I need to record two videos because two-and-a-half minutes is not long enough. And I was like, how? I even extended it. But I'm realizing and listening to you and going, they're probably not just getting to the point. They're probably including more context into this because that's how they story tell and that was actually part of the lesson.

Eric Cross (26:12):

So now I need to go back and extend their time that I've given them for <laugh> that project. I wanna come back to kind of, since we're on this topic about why this is also an equity issue. Mm-hmm. <affirmative>. So we were talking about language, you touched on this a bit, and we were talking about integrating into science, but can we go a little bit further into how this integrated approach maybe can

benefit English language learners in particular? And maybe anything else that's related to equity that comes to mind.

Dr. Susan Gomez Zwiap (26:40):

So there's a couple of layers of the equity issue. The most tangible and clear is student access. If we wait until students develop English proficiency to allow them access to quality science learning, we lose a tremendous number of students that could not only could they benefit from science, we could benefit from their entering this science conversation. And I was at a university and I was in a college of natural sciences and we were dedicated to increasing the diversity of the faculty. And it was a struggle 'cause the number of Ph.D. science ed or biology or chemistry academics that come from marginalized populations is very, very small. And it's not by accident. You know, the number of students that make it into the next level, that make it into college prep courses, that make it into STEM majors, that complete STEM majors and go on to either careers or advanced degrees narrows at every possible step.

Dr. Susan Gomez Zwiap (28:01):

And so the equity issue is really one of access. And as basic as that is, it's the easiest to solve. So that's the first layer of equity. But the second issue around equity is how we engage these students once they're in this space. Do we make it possible for them to see themselves as a scientist or an engineer? Are we creating learning experiences that not only allow them to use all the sense-making resources that they have, but do we make them feel like they're valuable and useful in that space? Because there's a lot of people that will say, I could be successful as a scientist, but I'm not willing to give up who I am in order to do that. And that's a real thing. There's a lot of research about like, why are they leaving? Like why, you know, is it because they're not able?

Dr. Susan Gomez Zwiap (29:05):

Is it because they don't see themselves as being capable? And now I think we're looking at this as a different issue. It's not that students don't see themselves as capable and not that they're not achieving. They see the cost that it will take to enter these fields and essentially not be able to be their full selves. So that's the second equity issue. And in both cases we lose. As a society, we lose. We lose access to the full range of human resources that we have, and we lose access to their unique perspectives that they would bring to real problems facing us. It's like all hands-on deck. We need to stop making it too difficult to participate in the conversation and we need to be more inclusive about how we invite these other perspectives and how we respect and utilize their ways of sense-making. That may not be Western science ways that we have in our books now, but hopefully those science materials are gonna change and we're gonna start to see other ways of sense-making and other people involved in the stories that we tell around science concepts.

Eric Cross (30:29):

And just to be clear, this practice in integration, while it lifts up equity for marginalized or underrepresented groups or students who are emerging bilinguals or students who typically we don't see representation of, this approach also benefits native speakers as well. Correct?

Dr. Susan Gomez Zwiap (30:47):

Yeah. And there's actually a group of native speakers that come from text poor homes. It's typical in underserved communities. Poor people living in poverty that may be native English speakers. They may not be marginalized populations. But they don't have access to like text. And so that's another group



altogether that needs linguistic support. And then once you have all voices in the room contributing, everybody benefits because now the conversation, the building understanding conversation we're having or the sense-making conversation that we're having has everybody involved. And we all benefit from that.

Eric Cross (31:33):

And we see, I think one of the benefits about a country like the U.S., is we have such a heterogeneous group of people. And when we're moving in the same direction, we're all coming to the same problem, but from different perspectives and we're able to come up with more innovative and novel solutions to them. And that's kind of what I'm hearing is like as we generate scientists that are all coming from different backgrounds, we're gonna be able to solve future problems, current problems a lot more effectively because nobody has a monopoly on perspective. Nobody has a monopoly on knowledge or the fastest way to do something or the best way to do something.

Dr. Susan Gomez Zwiap (32:11):

Right. Right. And traditionally we really have privileged particular experiences, particular ways of sense-making particular linguistic registers. And if we could just kind of put that privileged ways aside and open up space for everybody to feel like they have a voice, I think the next generation could change the world. I think they could solve some real problems. I'm truly hopeful that they would see themselves not just as capable, but as necessary in these pursuits.

Eric Cross (32:50):

So what does it actually look like today to do this work in instruction well? So to integrate the science, to integrate literacy, to take the benefits of the things that we've been talking about. What are some practical things that educators could do to get started, whether it's in early, you know, K5 or middle school or even high school.

Dr. Susan Gomez Zwiap (33:13):

So I will say, I'm gonna kind of separate 'cause in the elementary space, students are primarily developing literacy in multiple languages. The language of the classroom, typically English, home language, languages, they may be multilingual. In the secondary setting where students tend to have developed social language in some language, it's a little different. So I'm gonna kind of separate those two. So for elementary spaces where teachers tend to teach multiple things, I recommend that you get a partner. Don't do this work alone. You cannot do this work alone. I mean you can, but it's very frustrating and not nearly as much fun. So you really wanna take a look at what is the science that kids are going to be engaged in. Because when we look at science first and build language development around it, the experience tends to be more authentic and organic.

Dr. Susan Gomez Zwiap (34:18):

And what we used to do is we used to, like when we were talking about the science, we'd monitor the language we were using and then use that to say these are the registers. This is the language that we use when we were thinking about this. So if students are gonna use this, these are the scaffolds they're gonna need. 'Cause to do it, well, to do it efficiently, the scaffolds need to be specific to the science learning. So if we're doing cause and effect, those are specific linguistic scaffolds that are different than if, say we're doing model and systems and systems models, those are a whole other slew of scaffolds.

And so you wanna be really tending to, what is the science being discussed and what is the language that kids are going to use and build scaffolds around it.

Dr. Susan Gomez Zwiap (35:10):

And then you also wanna think about what is the social language? What are the experience that kids will have either in words or pictures that I can leverage in this space. And then you wanna do that for the arc of the unit and slowly increase sophistication around those linguistic supports, as well as the science learning. But if kids have social language and they're now in, there's a group we call long-term English learners who have not been reclassified way beyond what the typical reclassification is. And that actually is important to think about because if you think about the kinder group, the group of kindergartners that enter a school when they're five or six, those kids are going to go from grade to grade to grade. And as students develop proficiency, will get reclassified and they move out of this group that we're still calling English learners.

Dr. Susan Gomez Zwiap (36:10):

So by the time you get to like seventh, eighth, ninth grade, if they're still students in that category, they have very different needs on average than the group we started with. Often when we talk about secondary or these long-term English learners, we can leverage social language a lot more, but have to build the scaffolds more carefully around, for lack of a better word, the more academic content transferring that those social nonverbal language into more sophisticated forms. I think in any setting, you wanna utilize your resources. If I'm in a secondary space and I have a language development teacher and I'm not talking to her or him or they, that's a problem. You need to go talk to the other people that have these same kids and talk to them about, how are you engaging in language, what are you doing?

Dr. Susan Gomez Zwiap (37:07):

Because you know, you could actually have a lesson, maybe this is a lesson about energy and you're using a model and the kids are creating an initial model. And over in ELD land, they're doing some linguistic supports. They're working on some forms and functions of language. You could talk about the catapult, you could talk about the solar heater. You could use the context of the science conversation, which has a whole bunch of tangible experiences. You know, there's the solar heater in front of you. I don't need to keep it all in my head 'cause it's in front of me and we can point to things and talk about things by manipulating the materials. And then I can take all of that and my ELD partner can use that as context when available. But it takes collaboration, but it's collaboration well spent. And it's more challenging in the initial phases of the collaboration. Once you kind of the get into the groove, it becomes a lot easier.

Eric Cross (38:16):

The meta of this, as we talk about integrating science and literacy is, and this is great advice, but it's basically integrate your science teachers with your English teachers and co-plan and do this work together. It's a force multiplier. One, you're both, you're getting two specialists together. It also, I'm just listening to just the parallels. It also resembles what you actually do in the STEM fields of collaboration working together to problem-solve, and you're modeling for your students what you want to happen. And if I was an administrator listening to this, someone who had control, like master schedules and things like that, there also needs to be space created for these teachers to talk to each other and plan and do all these other things to kind of maybe come up with like interdisciplinary units or even just meet and begin the conversation. It just seems like such great advice.

Dr. Susan Gomez Zwiap (39:07):

Yeah. We're professionals. We have academic degrees and credentials and experience in the classroom and yet more often than not, we leave it to the students in the seats to make the connections between my class and the class they go to next. And that's not fair. We need to be talking to each other. So if we're talking about argumentation, argumentation in science and argumentation in ELA and argumentation in math--we're not even talking about the same thing. I mean, cognitively we're talking about taking some evidence and creating a claim and supporting it, but what we mean by evidence is very different in the different disciplines. What counts as more convincing evidence changes. And yet we assume that because we say evidence in one class, the kids know what we're talking about. And the kids are sitting there going, which one is this? Which evidence are you talking about? Because last period it was something else. And so I think we also need to really consider who's in the best position to clarify the connections and the integration because we leave it to kids more often than not right now.

Eric Cross (40:19):

I agree. Just having those conversations and defining your terms and agreeing on them just to make it easier for students. 'Cause you're right, they are left to make those connections or bridge the gaps. And when you have an education system for many schools, I think most of us, it's still pretty siloed. You're still kind of like, especially when you're in secondary, it's we're doing this or even elementary, different times of the day you do different subjects, versus the way that we experience life itself or even our professions. We're actually integrating science and math and reading and writing throughout the day, and ebbs and flows going back and forth. And without making those explicit connections, we're leaving a lot of things to chance, hoping that the learning's there in such a valuable moment. Before we go, I'm wondering if you have a parting message for listeners about the topic of integrating science and literacy. You've already said so many amazing things, but you have the platform speaking to educators and folks out there. What would you wanna say to them?

Dr. Susan Gomez Zwiap (41:18):

This is not an easy endeavor. The system that we operate in does not make this effort easy, but it is worth it. It is worth it to the kids in our classrooms. It is worth it to the building of a scientific community and a scientifically literate populace. It's important to solving problems in the future. It's important to have kids feel like regardless of how they say things, that they belong in a classroom. If we can relax the sort of linguistic demands on kids and let them enter science learning in a way that allows them to use all their resources and they're curious, they can really leverage both areas in a way that they don't do individually. It's really hard to think about what it is I'm trying to say if I'm worried about how I have to say it. And so we really need to think about, when are those times that we're gonna let kids just tell us what it is that they're excited about and when is it that we're going to help them craft a more formalized language around those ideas. Right now we do a really good job at that second half. We need to do better at the first.

Eric Cross (42:46):

Susan, thank you so much for joining us today and for sharing your expertise and your wisdom and your passion for serving the students and for bringing everybody to the table through language and through science. We really appreciate it and the listeners will too.

Dr. Susan Gomez Zwiap (43:03):

Thank you so much. This is my favorite topic.

Eric Cross (43:06):

Thanks so much for listening to my conversation with Dr. Susan Gomez Zwiap, senior science educator and staff advocate at BSCS Science Learning. And please remember to subscribe to Science Connections so that you don't miss any of the episodes in this exciting third season. And while you're there, we'd really appreciate it if you can leave us a review. It'll help more listeners find the show. Next time on the show, we're going to continue exploring the how and why of integrating science and literacy instruction.

Speaker 3 (43:35):

When we interview scientists, they spend a lot of their time reading the work of other scientists and writing their findings, writing grant proposals, presenting at conferences. A huge part of the work of a scientist is not just at a bench conducting experiments, but even if you're conducting experiments, you're using your literacy processes to think about what you're seeing in your experiment.

Eric Cross (43:57):

That's next time on Science Connections. Thanks so much for listening.