

Student Project (00:00):

Are you tired of trying skincare products? We offer miracle gummy bears that clears acne, rashes, and other skin problems.

Eric Cross (00:07):

Welcome to Science Connections. I'm your host Eric Cross, and that was a sound from a real student project advertising a fake skincare product. You may remember in our last episode, we talked with Melanie Trecek-King, all about using science to teach critical thinking skills. Melanie talked about preparing students to identify misinformation in the real world through creative assignments like creating ads for fake pseudoscience products. On today's episode, we're going to talk to a middle school science teacher who adapted that assignment for her own students. Her name is Bertha Vasquez. She's from Miami-Dade County, and she just retired from the classroom after 30+ years. Bertha's now stepping into a full-time role as education director for the Center for Inquiry. And in this conversation we talk all about developing critical thinking skills in younger students. She also discusses her hope to expand this work beyond the classroom. I know you'll enjoy this conversation with Bertha Vasquez. Well, Bertha, welcome to the show. Thanks for coming on.

Bertha Vasquez (01:09):

I'm very excited to be here.

Eric Cross (01:11):

I'm really excited for you to be here. When I heard about you and what you've done, and we are ... you're my people. Former seventh grade teacher.

Bertha Vasquez (01:18):

Yes.

Eric Cross (01:18):

And can I just start off by saying—

Bertha Vasquez (01:19):

Yay!

Eric Cross (01:19):

I know, right? Can I start off by saying congratulations? Thirty-three years in the game!

Bertha Vasquez (01:25):

Thirty-five! Thirty-three years at the same school.

Eric Cross (01:27):

Thirty-three at the same site.

Bertha Vasquez (01:29):

Yeah. Actually, the same classroom. I loved my classroom. One year in high school and 34 in middle school.

Eric Cross (01:36):

That's amazing. I don't know if we'd be able to distill down 33 years or 35 years into a sentence, but your secret? What do you tell new teachers who are just getting into education?

Bertha Vasquez (01:46):

God, you gotta love. You gotta have passion for this subject. And you have to know what you wanna do, which is to promote science appreciation, to teach science for the awe and wonder that it engenders in people. That it makes people feel awe and wonder about the natural world around them if you teach it that way. You last longer. I think.

Eric Cross (02:12):

I agree with you. I just finished nine years and—

Bertha Vasquez (02:15):

Seventh grade?

Eric Cross (02:17):

Seventh grade the whole time.

Bertha Vasquez (02:19):

Oh, man. That's the toughest year.

Eric Cross (02:21):

You know what's funny is I originally wanted to do high school, because I had worked with high school students in the past, and when I started student teaching, they put us in middle school first, and then they kinda put you in high school. But I realized that when I was teaching middle school, I was getting them earlier in their science experience.

Bertha Vasquez (02:40):

For sure.

Eric Cross (02:42):

And I was able to craft and shape what that experience was like.

Bertha Vasquez (02:46):

For sure.

Eric Cross (02:47):

Hopefully to give them kind of like a trajectory or momentum going into a positive direction. Because I found that when they were in high school, many of the students already had experiences and they've kind of like had this schema, this mindset, already developed.

Bertha Vasquez (03:00):

Yes. And plus I have a silly side, and when I did move to high school and I put on a cape and explained that science was a superpower, that we were gonna use our data to make predictions and things like that, they kind of looked at me like I was out my mind. While seventh graders — I taught sixth grade for 25 years, mixed in with seventh and eighth, and in the last eight years of my career, I taught seventh and eighth graders — they love it. They love it when you try to run through the door because, gee, I'm mainly empty space, right? I'm made of atoms. And atoms are mainly empty space. And the door is made of atoms. Therefore the door is mainly empty space. I should therefore be able to run through the door.

And they love it when you crash into the door. In high school, they thought I was stupid, to be honest with you.<Laugh>

Eric Cross (03:53):

Right. When they're in that middle school age, they're just enough like little kid of like, that wonder that awe and that silliness. You said you've taught multiple grade levels. Can we just maybe go back and briefly talk about your background a little bit? Like how you started and then kind of where you went through your career?

Bertha Vasquez (04:08):

I didn't know what I wanted to do when I finished college. And I had a minor in French, in French history, French literature. And the opportunity came up to teach in France for a year in a French high school. As a matter of fact, in the South of France is where I went. And it was the very first day. It was super early in the morning, the students rolled in and I just said, this is where I belong. I didn't know I wanted to be a teacher until that point. I was a biology major with a chemistry minor and a French minor. And I said, this is where I belong. I loved it. Immediately. I went back home, I told my parents, and my first year, I spent only half a year. I was what you call a permanent sub.

Bertha Vasquez (04:51):

I covered for somebody who had to take some time off. It was at a very, very difficult school. I was what I would call baptism by fire. You know? I was picked up by the school. I spent the 33 years in, which is George Washington Carver Middle School in Coconut Grove, Miami-Dade County. It is a language school where students learn their math in Spanish, French. They take their humanities in Spanish, French, German, or Italian. It's a school full of foreigners, multilingualism, very interested, excellent parents, wonderful colleagues. And that's why I stayed there for 33 years. Along the way, I worked for National Board for Professional Teaching Standards for a long time. I don't know if you know about the National Board certification.. I was running their scoring sites. And then eight years ago I started working part-time for the Richard Dawkins Foundation for Reason and Science. And that is why I retired from the classroom last month, and I am now working full-time for them. They're now part of a larger nonprofit called The Center for Inquiry. That ran it through, right? I ran through the whole 33 years.

Eric Cross (06:05):

That was, well, that was great. And I know that there's all kinds of sub things. I know there's some honors that you had received and some accolades that you had earned. Very humble, but like, well I'll talk about that and maybe the intro. But you did some amazing things and you served so many students. And as a teacher, I look at teachers like yourself who have spent a career in education, and I kind of feel like a little kid and go, how did you do it? Like, what did you do? What, what kept you there? Because that's where I want to be later on in my career, is to be able to say the same thing. Because your impact on the students at Miami-Dade County is huge. I'm sure you've seen kids that you've taught over the years and --

Bertha Vasquez (06:42):

Oh yeah. I keep in touch with a lot of kids and it's wonderful to hear what they have to say. It actually brings tears to my eyes.

Eric Cross (06:51):

And that's the kind of the good tears that we want, not the other ones.

Bertha Vasquez (06:55):

Yeah. I'll miss that part a lot.

Eric Cross (06:57):

Yeah. Well, so last time around, Melanie and I were talking about what she's doing at her college with her students to develop critical thinking skills. And so I was really interested in talking to you because she had mentioned you as being someone who helped develop these skills with middle school students. And so, I kind of wanna start off by asking, why do you think it's important to try to teach these skills at a middle school level, these critical thinking skills?

Bertha Vasquez (07:23):

Well I would say at the elementary school level, not even at the middle school level.

Eric Cross (07:26):

Oh. So we're gonna go back. We're gonna go back there.

Bertha Vasquez (07:28):

Well, it's so important to be able to do that. And I think I wanna shout out to Melanie's work. If you look at the NGSS standards, which so many states have adopted, and even in states like Florida, Pennsylvania, Texas, where they haven't been adopted, those skills are there, you know, I think the NGSS, they call them science and engineering practices. And you're talking about skills like communicating, you're talking about skills and engaging in argumentation, asking questions, planning investigations, analyzing data. Those skills are there. And I think teachers get training in those skills. What makes Melanie's work so important and the critical thinking skills that you're talking about to introduce in middle school, is that she is specifically targeting how to address the barrage of pseudoscience that we are now faced with on a daily basis on the internet, on social media.

Bertha Vasquez (08:27):

And she's specifically targeting that information and how to train students to think, to discern the difference between misinformation and information. And she has, I'm sure, as she covered with you, a really good way of doing that, you know? But you have to teach it embedded in the content, for sure. They have to have some content, right? And I think not just those skills, I think what we have to teach when we do process in science is we have to teach how science works. And by that I mean teach humility, how scientists don't try to prove themselves, right. Scientists approach every question with, how do I prove myself wrong? And if we, as a society, I mean -- I just wanna be right, you know? No, Eric, you're wrong. I'm gonna dig my heels in and I'm gonna say that I'm right, especially if I'm emotionally attached to whatever it is I'm arguing about.

Bertha Vasquez (09:20):

And I think if we could train students to be humble and try to prove themselves wrong, that that would make, I don't know, all societal dialogue better. And along with that process, like I said earlier, to promote the idea that that science is not some cold calculating way of seeing the world, but it's a way of seeing the world with this wonder and this awe that I think scientists carry within. I think that's the atmosphere you wanna have in your classroom to teach those science and engineering practices that the NGSS espouses, etc. Does that make sense?

Eric Cross (10:00):

It does make sense, Bertha, I appreciate that. And there's two things that you said that really stood out, and I want to talk about both of those. When I said middle school, you responded with elementary. So I wanna back up. Can you talk more about that? Why did you say that?

Bertha Vasquez (10:14):

Well, because the scientific method and thinking critically is not in our nature. Our nature is to believe our parents, right? Because the kids who listen to their parents did not fall over the edge or get eaten by the predator. And the person who sat there, well, that ancient, ancient person, maybe even before humans, who stood there and saw rustling in the grass and actually pulled out an ancient clipboard and said, hmm, let's see, what is that rustling in the grass? Is it the wind? Is it a predator? Is it a friend trying to sneak up and scare -- that person got eaten by the predator that little kid. So we don't have their genes. We have the genes of the people who had a knee-jerk fear reaction and said, I better run. So we're fighting, I think, the human tendency to draw quick conclusions and knee-jerk reactions and to be tribal. So if we start in elementary school to teach them to ask questions, to make decisions based on evidence to feel okay with being wrong, kids hate losing at games, right? They get all grumpy

Eric Cross (11:31):

<laugh> Not just, not just kids. <Laugh>

Bertha Vasquez (11:33):

Right. Yeah. If we can start this at the earliest age possible to make them think about things with non-triggering subjects, I think the earlier the better.

Eric Cross (11:45):

That makes a lot of sense. Especially identifying how biologically these are adaptations that we have for survival. However, when they're applied in situations that are not survival situations, they can ultimately cause harm or cause consequences that are not positive. I wanted to pause and kind of zoom out a little bit to this 30,000 foot view, because I think this is really, really important. Can you speak a little bit about why it's important to teach this big picture? For instance, one of the things I think about with pseudoscience, for me, something that's near and dear to my heart that's personal, is when I think about some of my elderly family members that grew up watching television during an age when you trusted the person on TV implicitly. They had journalistic integrity, all of those things. They still watch television

with that same mindset. But the content is different. And I've watched them lose money and buy things that are ineffective. That's one of the things I think about. But maybe, can you talk a little bit about big picture and why this is so important for this to be taught from elementary all the way through college?

Bertha Vasquez (12:59):

First of all, I never thought of it that way. That's a great way to think about it, that generation. But also, what you're saying is we teach these skills in a science class, but hopefully they use those skills when they encounter pseudoscience. So definitely what we do on a day-to-day basis is really important for society.

Eric Cross (13:22):

Absolutely. And I think the idea of teaching students how to think is often, at least in what I've seen in the standards, it's, so much information and so many skills, but this "how to" tends to get overlooked. And that's why when I talked to Melanie the first time, I said, this is something that should be everywhere, in all of our classrooms. But yet it's, it's not. And where can we put this? Because there isn't exactly, like, I didn't see a clear, this standard tells you to teach it, but I am bound to standards. There's standards that I have to teach in addition to all the other things. Where do we put this?

Bertha Vasquez (13:59):

That is an excellent question, <laugh>. Actually, I think I have a chat in -- Melanie and I are gonna speak next week because, to back up a little bit, the first program that I started for the Richard Dawkins Foundation for Reason and Science was promoting evolution education. Boy, that was easy because you have to teach it, right? So I would look at the state standards and I'd see what is natural selection, what is the evidence revolution, what is a theory? All those things. I said, oh, I am giving teachers a great deal here. I'm saying, here's an entire unit of evolution with fun games, with active learning ideas, with your assessment, and it's gonna be tested at the end of the year. And boom, boy, size just exploded. That's Teacher Institute for Revolutionary Science. We have over, you know, 300 workshops across all 50 U.S. States.

Bertha Vasquez (14:51):

I have 80 presenters. It's been a very easy sell. This stuff, as you said, you are bound to your standards. So how do we get this into the classroom? I don't think it necessarily has to be the science classroom. I have had more success with language arts classrooms. You know, they have to teach media literacy, for

example. So they teach what's a credible source, what's not a credible source. We have lessons on ghost stories and haunted houses. So you could teach it through your storytelling and the stories and writing haunted stories and things like that. So you could teach it even while you're doing literary devices or whatever language arts teachers have to do. So we've had more success with language arts. In terms of science, that's a great question. I don't know if I have the answer. Now that I'm full-time, that's what I'm gonna be working on. Like how do I sell this through the standards? I know there's science and engineering practices. Engaging argument from evidence. There's an NGSS standard. That practice of asking questions, communication, those are NGSS practices. So that's probably the way to go.

Eric Cross (16:09):

Analyzing data, representing data, all of these different things.

Bertha Vasquez (16:12):

Right. And drawing conclusions, changing your mind. I always talk about the humility of sciences and the need to change their minds.

Eric Cross (16:21):

So, I wanna ask you, how do you do it? Nuts and bolts. Teachers listening to this, they're driving to work or they're enjoying their summer vacation as they should be, and they're like, you know, I am pragmatic. Like how do I actually execute it? So can you take us through how you adapted Melanie's pseudoscience lesson for your classroom when you did that? Maybe start there?

Bertha Vasquez (16:43):

Sure. I also have another lesson on climate change that is really tried and true.

Eric Cross (16:48):

Yeah. We can start with either one or talk about both.

Bertha Vasquez (16:51):

Okay. And this is the reason I was in the New York Times, like, I don't know, six months ago, because of the climate change lesson that I did. So first of all, it's not really even in the standards, climate change in Florida, ironically, or tragically I should say. Miami-Dade does have it in their scope and sequence for the

year, because there are places you can place it, right? So energy transfer or how humans impact their environment. I think the Miami-Dade standards have it under how humans impact their environment. I put it under energy transfer. So then it's, okay, let's identify how do we make electricity. So you do the whole copper, wire, magnet thing and you know, how we burn gas to boil water, to produce steam. There's all your transfers of energy, right? To get electricity, solar's a little different. And wind, obviously you're not boiling any water.

Bertha Vasquez (17:46):

But then they have to tell me what climate change is, 'cause a lot of kids don't even know what that is. If I had a dollar for every time they told me it has to do with the ozone layer, I'd be retiring in The Bahamas. And then I say, this is how you get the pseudoscience science in there. Find me an article, find me a website that says climate change is not happening or it's not caused by humans. They do. And now I say, let's follow the money trail. Who wrote this? What organization is it? And of course, inevitably it's gonna be the Heartland Institute. It's gonna be the Cato or the Marshall Institute. Now who's funding this institute? And inevitably it's the Koch brothers, it's Exxon, etcetera. And they see the amount of money that these industries give these front groups.

Bertha Vasquez (18:42):

That's how I get it into the climate change, and that's how I get it into the energy unit. And I've been doing that forever. Good news. It's getting harder and harder to find articles that say climate change is not caused by humans. And they do a lot of cost comparisons between solar, wind, nuclear, etcetera, and the traditional fossil fuel forms of energy, and it's getting cheaper and cheaper to produce energy that way. And so you can really promote the idea that it is the economy of the future. And so it's not just about saving the birds, it's about promoting the U.S. economy in a new century.

Eric Cross (19:23):

And I'm imagining that we get a lot more traction when it promotes the economy versus when we're trying to save the birds.

Bertha Vasquez (19:30):

Yeah, I do both. I say, yeah, this is a win-win for everybody. So I get the parents who don't care about the birds, but their kid makes some save electricity by making 'em change out their air conditionings for Energy Star, you know, devices and stuff. And they're happy too, 'cause it's a win-win.

Eric Cross (19:46):

There's an interesting soft skill woven into that where you're trying to accomplish the same goal, but you're meeting different audiences in different ways that they would respond to. And I don't know if that was intentionally designed in that, but, I see that like, hey, we're trying to save, you know, this ecosystem or for whatever reason. And then another group says, hey, by saving this ecosystem, it'll lower your bills. And at the end of the day, the end result is gonna be the same. But both groups are motivated by different factors, and you're kind of pivoting to whatever one motivates them.

Bertha Vasquez (20:20):

Right. I think we are by nature, teachers are by nature, non-confrontational. So I really don't wanna hear from the parents telling me I'm brainwashing their kid. Now Melanie's is so, so important. It is a little harder to weave in. There are some simple inquiry skills that usually I embed into the units themselves. But what I'll do, you know, when I do Melanie's stuff? I'll be honest with you, I did it the last week of school. The kids already had taken their state tests, they were checking out mentally, I go, this is a perfect time to do this. And they had a ball, or, you know, a day that half the kids are gone because there's a field trip. A day where they're leaving early, so you don't have that much time in the class. So I sneak it in there, here and there, and I do have to figure out how we can make it part of what a teacher has to teach. Like the evolution stuff that I promote.

Eric Cross (21:21):

For someone who may not have listened to Melanie's episode or seen that lesson, can you walk us through step by step what, for the brand new person, what is it that you're actually teaching? And then what do you do? What, what's the learning process maybe through your lesson plan? What are your students doing? What are you teaching?

Bertha Vasquez (21:38):

Okay, so Melanie had a beautiful article called "How to Sell Pseudoscience." And she gives you the seven tips that someone uses to sell you a product that really doesn't work. For example, they may use a lot of

scientific babble words, like, "it promotes the metabolism of the cellular detoxification in the electron transport chain of the mitochondria." I just totally made that up. It doesn't mean anything, right? Have an expert. If it's a hair growth thing, maybe you can have a hair growth expert from the Cat Hairball Institute of San Diego. Make the person buy into it. So you make it a money-back guarantee or you give 'em half price on their first purchase. So they've bought it, and once they've bought it, they're gonna be more loyal to your product. Make 'em suspicious of anybody who questions the product. So, "oh, big pharma doesn't want you to know this. This has been a cure, but they don't want you to know because they're making money."

Bertha Vasquez (22:37):

That's another one. And then appeal to ancient wisdom. It's called logical fallacy. Like, "based on ancient plant wisdom" or "used for thousands of years." All these are, she breaks 'em into nine things that are used to sell pseudoscience. The lesson is on young skeptics right now. I show those nine tips to my class. They, love it. You have a class paying attention, I can guarantee you that. And then I say, now you guys are going to create an ad, either a 2D ad or a video to sell a pseudoscientific product. And immediately they're running into their groups and they're saying, we're gonna sell nail growth or a height, or, you know, sometimes they push the envelope a little bit and they wanna do butt enhancement and other types of enhancement where I've said no. But <laugh>, I guess Melanie could do that in college. I'm not gonna do that in middle school.

Eric Cross (23:40):

Wise choice. Wise choice.

Bertha Vasquez (23:41):

Yeah, I don't wanna get in trouble. Plus it's not appropriate. But anyway, then they create these ads and they send them to me and we show them all in the classroom. I guarantee you that those students, when they walked into a store with their parents and they saw the product that has money-back guarantee and cures way too many things, and it's based on ancient plant wisdom and the scientific language on the box, they may go, "Mom, you know, I think these people are trying to sell you some pseudoscience." They're ready to react in an evidence-based manner before running into the product.

Eric Cross (24:22):

So if I was mentoring a new teacher and helping 'em write the lesson objective, remember like, I don't know, did you ever have to do like lesson objectives and put 'em on your wall so that students could see? And everybody who walks by can see.

Bertha Vasquez (24:35):

I love how you, you're bringing me back to if you're a new teacher, if you're a teacher, how do you put this into your lesson plans?

Eric Cross (24:44):

Well, can I come up with a lesson objective, and you let me know, and let's maybe do this together. So, I'm just gonna use the framework: Given this students can. So like, given a creative commercial idea or given instruction on pseudoscience, students can demonstrate their ability to do critical thinking by creating a pseudoscience ad or maybe can demonstrate the nine elements of -- how would we finish that?

Bertha Vasquez (25:12):

Identifying pseudoscience.

Eric Cross (25:16):

So given a lesson on pseudoscience, students can demonstrate the nine tactics companies use to sell pseudoscientific products.

Bertha Vasquez (25:26):

Right. And then what we'd have to do, I think a teacher would have to do, and so many state standards, they might be slightly different, but the idea is the same. Find what standard are you actually covering with that? And there are standards that talk about scientific literacy, and we need scientifically literate citizens, you know, for society today. It can fit, it can fit

Eric Cross (25:56):

Well. I wanna go back to what you said about English language arts being a big part of this because the first thing that popped up in my head was interdisciplinary, transdisciplinary, this getting out of silos and going back and forth and giving--

Bertha Vasquez (26:10):

Oh yeah.

Eric Cross (26:10):

Oftentimes, and of course I'm biased and you'll likely agree with me on this, but I think our content is exciting intrinsically. I think it's just the way the world works and everyone's interested in different elements to different degrees.

Bertha Vasquez (26:24):

I think it's much easier yes. To teach science sometimes than the past tense and French.

Eric Cross (26:30):

And we need the skills from other content areas to help students be able to communicate their ideas in science or access their ideas in science. And when we're able to share those things across back and forth, students love it because it's like these similar concepts, but we look at it from different angles. So I'm wondering if an English teacher partnered with a science teacher and did this, the thing I wrote down when you were talking was ... the activity was called upset your science teacher. And, I imagine English teachers taking this lesson because it's totally media literacy, right? Critical thinking. It's all there.

Bertha Vasquez (27:03):

Yeah. It's totally media literacy.

Eric Cross (27:05):

Absolutely. And then the science teacher, the science class, or students evaluate it for claim evidence reasoning. They evaluate the effectiveness of it or whether it's true or whether there are pseudoscience aspects of it. And students are looking at each other's work, but through two different lenses.

Bertha Vasquez (27:21):

Right. I love it. And I loved it when, early on in my career we did interdisciplinary stuff. And to sit with other teachers and develop lessons, that's one of the most exciting things about teaching. We're always so stuck in our own classrooms. And it's really hard nowadays with all of the responsibilities and the testing to do stuff like that. But that's effective teaching right there.

Eric Cross (27:45):

How did your students receive it? So you did this with your kids, you said they love, like, what was the response?

Bertha Vasquez (27:51):

Oh, I could have walked out of the room, gone across the street to the coffee shop, ordered some coffee, sat down for a while, come back and they would not have noticed I was gone. Except, because they were so excited to show me what they were doing as they were doing the assignment. I have never had such buy-in in my life. <laugh>. They loved it. And I have some samples of that, which I think you can show as well.

Eric Cross (28:20):

We actually have a sample of one of your real student projects that we can play.

Student Project (28:28):

Are you tired of trying skincare products? We offer miracle gummy bears that clears acne, rashes, and other skin problems for only \$9 99. You only need to eat one every two weeks. And in about two months, your skin will look and feel great as new. When you eat one, it goes into your skin pores and clears all the glycerol and creates monosaccharides that phosphates your skin. This product ...

Bertha Vasquez (28:52):

So that was a group of girls, and I can see them in my mind. One of them, the main person was, her name was Carolina. So they're hitting the, the science babble, you know about the phosphorylation, monosaccharides, you could tell that's a biology class. 'cause they had some of that terminology. Make it not expensive, make it cure things right away, you don't use anecdotal evidence, don't use actual data. So they're hitting some of the points. The rubric showed they had to hit five out of the nine to get an A.

Eric Cross (29:23):

When I listened to that video, it felt real. It felt like it could be a real one. And I like I knew what it was, but it was so close to real things that I've seen and heard.

Bertha Vasquez (29:39):

Yeah. I have some gems. I really have some really, really funny ones where you're crying and they're really real. Exactly. Yeah. That was a good one. There was another one on improving the quality of your hair that was really, really funny. And then some of them opted to do the 2D you know, they just did a PowerPoint and then saved it as a jpeg. And if you go online, it looks like the real thing. You know, they actually, and I'm not gonna mention the products here 'cause I don't wanna get sued, but they found products, they came back to me with products that are definitely pseudoscience, that were using the exact same things that the kids were using. And this is the type of, you know, modern literacy that our kids need to have when they walk out of our classrooms.

Eric Cross (30:24):

These activities are so close to home. I feel like when I look at this, this isn't something that's some kind of abstract thing. This is something they could have done and then went home and their parents are watching that or they're watching it. Do you remember, did you ever have experiences where students were, where you watched this connection between what they were creating and the fact that they've actually seen this like recently? I can imagine a scenario where a student's making this and they go, wait a second, we just bought something based on this. Did that ever happen? Or did you ever see these kind of moments?

Bertha Vasquez (30:53):

Yes. Actually the parents have. So my school has a pretty wealthy demographic. Most of the parents have college degrees. They're professionals. So they have the money to buy stuff at Whole Foods. And they have great products at Whole Foods, but they also promote the whole non-GMO thing. And some of the students said they went home and the parents weren't thrilled. Because the kids are like, that's baloney that no GMO thing. There's nothing wrong with GMOs and things like that. And so I got a little pushback about some of that, but hey, you know, that's the only way we grow right? By disagreeing with each other and finding out that we're wrong. It's one of the problems we have today is that everybody's in their little echo chamber and there's no growth taking place.

Eric Cross (31:42):

Right. And when you're teaching people to critically think and ask questions, which is what we do as teachers, is teach our students how to think, yeah, you are gonna create friction. There's gonna be heat that's generated. But like you said, it's really important that we teach our students how to analyze

information and disagree without being disagreeable. So I think it's on one of the shirts, like being humble or like you had said, staying humble. Being curious, being skeptical, but being humble as well as being the key point of it.

Bertha Vasquez (32:12):

Absolutely.

Eric Cross (32:12):

And then going back to what you said earlier about defending turf, not going in like scientists. Like you were saying that when you're teaching your students, where I am looking to be wrong, I wanna prove myself wrong. And that's not how they're raised to think I want to be right. And when I'm wrong, I'm gonna dig my heels in and defend turf because I am my beliefs or I am my viewpoint, my identity is attached to what I think. And it's not movable. And that is a huge problem that we see. But it's reinforced in our kids all the time from what they see in the world.

Bertha Vasquez (32:52):

Yes. And I think the best way to preface a lesson where they might realize some of the stuff they believe isn't true. That is the motto for our program. Don't believe everything you believe, by the way. The best way to begin a lesson is saying, I tried these products or I purchased this online. I've been stung on Instagram. You know, I've bought a couple of things and then I get them in the mail and it's not what I expected. Use yourself. We've all been stung, right? I think about what I believed 20, 30 years ago and some of it was wrong. Right? And that's okay. So use yourself because that's a perfect model for humility as well.

Eric Cross (33:37):

I think it's incredibly powerful to be able to be surrounded by a community of people who are asking questions and genuinely curious, but also maintain that humility about things. I mean, there's a lot of power in that. And that quote, "Don't believe everything you believe." Now, I'm gonna order that shirt. I'm sure now you'll go on a website sometime soon.

Bertha Vasquez (33:56):

Yeah. We are launching, it was called Young Skeptics, the program, but for a number of reasons, we're changing the name and we're launching it in August under Generation Skeptics. And that's the motto. Don't believe everything you believe. And it'll be generationskeptics.org. And these lessons are there. And not only do you have the slide presentation, you have the lesson plan, you have the student worksheet, you have the teacher notes and the rubrics. And I make sure that everything's in a word form, a modifiable form. Because if there's something that might work for you that's not in there, or you don't like something that I wrote, you can change it. Or the lesson plans, it's a Word document, so if your state has specific lesson plans, 'cause mine are a little generic 'cause I'm trying to meet the standards of the whole country, you could cut and paste your standards in there.

Eric Cross (34:47):

Those are words spoken by a veteran teacher who knows how to differentiate for her audience. So --

Bertha Vasquez (34:53):

Yeah. Modify,

Eric Cross (34:54):

Well done. And thank you for doing that. So we talked about the pseudoscience lesson, and we talked about your lesson for evaluating articles about climate change. Overall, what are your takeaways from these experiences as far as students developing critical thinking skills, like with your kids? Were they effective? What were your main takeaways that you noticed after implementing them?

Bertha Vasquez (35:16):

You wanna do stuff in your classroom that's gonna translate to real life. I'm always looking for real life connections. You know, if I'm teaching DNA and genes, I'm gonna talk about insurance companies and your private medical information. And now that we can identify genes that might lead, you know, never for sure, but can possibly lead to breast cancer, for example. We talk about, well, who should have this information? What about attorneys? What about insurance companies? What about the government? I think you always wanna have that real life connection and the lessons that we just talked about. Totally have that real life connection. You know, what's gonna happen outside of your classroom. It's not just gonna be in inside.

Eric Cross (36:00):

The relevance is huge. The relevance part of it is making it real life, 'cause what are the things that we hear that students say? Or at least it's almost like a meme now. Like, when am I ever gonna use this? Why does this matter to me?

Bertha Vasquez (36:10):

Oh yeah, yeah. By the way, that reminds me. So I run three programs, three projects for the Center for Inquiry. And we've been talking about generation skeptics. There's another one called Science Saves. And all it does is promote science appreciation. And because I start the year trying to teach kids, you know, science is all about wonder, it's about awe, I ask them to draw me a scientist, and inevitably they draw me, the old guy with the crazy hair, with the lab coat standing in front of the chemicals. Try it. Every child minus two possibly. A group of 30, 28 kids are gonna draw the guy with the lab coat with the crazy hair and the goggles standing in front of a table full of chemicals. And then we talk about that's not what a scientist does. And by the way, on the last day of school, I do it again.

Bertha Vasquez (37:02):

And they draw themselves and they draw themselves scuba diving or they draw themselves climbing a volcano or developing new materials for their skateboards or new candy or whatever. But I follow that, draw me a scientist. Actually, that's what they do while I take role the first day of school. Draw me a scientist. And then I pretend to be very upset because all the pictures are the same stupid old guy with the crazy hair. And then we have a lesson, we have dozens of lessons on science saves, but one of them is called Science Saves Lives. And I feature three examples of how science saves lives or improves lives. One's an artificial heart, one is a portable dialysis, and one is a 3D printed robotic hand for children. And then I say, okay guys, sky's the limit. Sky's the limit. Create something to benefit society or the world.

Bertha Vasquez (37:55):

And they get into teams and they create glasses that help blind people see. Or they create a machine that takes carbon out of the air, or they create an x-ray machine that can diagnose all forms of cancer. Obviously, they don't know the science behind these things. So I had a group of students, just this year, just last year, who created a brain implant that helps victims of paralysis move. I thought, okay, that's super cool, whatever, they did it. And they're just drawing the product with descriptions. It's not that complicated. Well, guess what, about three months after we did this, the kids came back to me and it's

called Brain Spinal Interface. And it's a thing where you implant an implant in someone's brain and they can walk again and they can move their hands again. So what they had made for fun, saying, yay, science saves, let's do something cool. They couldn't believe it. It blew them away that it was actually a thing that scientists had developed.

Eric Cross (38:59):

Even the fact that they came up with the idea without maybe knowing the whole science or engineering behind it, is extremely validating for a young person. A young person! Like everybody! Like that was my idea. And then you see it, that is extremely rewarding. I can only imagine how excited they were.

Bertha Vasquez (39:14):

Right. You get future engineers doing stuff like that. And that's how I start the year after I have them draw me a scientist, which shouldn't take more than, you know, 20 minutes while you're taking role. I start the year with that lesson to make them realize what science is actually about. You know, it's not about blowing stuff up, like the cartoon type scientists, but scientists are actually people trying to improve the world, asking questions and looking for answers in a certain way. Like our scientific method in the process of science.

Eric Cross (39:46):

Right. Let's talk about your current work. So you're at this transition point, at least last year, where you've spent this large segment of time serving students directly in the classroom. And I wanna talk about what you're doing now and why you're focused on finding ways to develop these skills outside of the classroom. So when you're thinking about the programs that you're kind of coming up with and putting together, what are you thinking of? What are you imagining?

Bertha Vasquez (40:11):

Well, like I said, evolution was an easy sell. So I have three programs. I have the Teacher Institute for Evolutionary Science. That's TIES. That's been wildly successful. Then we have Science Saves, which promotes science appreciation. And then we have Generation Skeptics, which is supposed to promote the type of critical thinking that we need in this society of ours with this barrage of misinformation hitting us every day. And it's only gonna get worse, I think with AI, you know, as that starts getting more and more common. When you said out of the classroom, one of my pet peeves, <laugh> is that

everything everybody comes up with, "oh, teachers need to do this." So bicycles safety, oh, it could be in elementary school; helmet safety, elementary school; stranger danger, stick it in there; say no to drugs, stick it in there; promote critical thinking, stick it in there.

Bertha Vasquez (41:06):

It's always the teachers and I especially feel for my elementary school teacher friends because they have so much to cover and they have all these tests looming over their heads, but now they have to do: say no to drugs, stranger danger, bicycle safety, food safety, sexual physical and emotional abuse, all the stuff that we have to do. So I thought, what if I start thinking about ways to take this out of the teacher's hands? So I started with TIES. I created a celebrate Darwin Day entire program where you are a secular group or you are a bookstore, or you are a university, and you're like, well, what the heck do I do? I wanna celebrate Darwin Day. But that seems like too much work. If you download the package that I created, you have your stations, you have your QR codes, you have your hands-on, you have your signs, you just have to print them out.

Bertha Vasquez (41:59):

And it makes it a lot easier for a non-classroom person, you know, a non-teacher to celebrate Darwin Day. I've been doing summer camps. So yesterday we did a lesson on Scooby-Doo and ghosts at a summer camp here in South Florida. It's a Taekwondo summer camp. The kids watched an episode of Scooby-Doo. And boy Scooby was amazing. You know, the guy who's faking the ghosts always has some financial reason to make people think that they're ghosts. Right? Doesn't that sound like Melanie's stuff? Doesn't that sound like the misinformation that we're dealing with? So we watched the episode with the kids, and this is my language arts teacher, friend who came with me. And then we talked about the evidence that they found to prove that the ghost wasn't real. And then the reason why the guy wanted to make you think -- it wasn't a ghost, actually it was a headless monster.

Bertha Vasquez (42:58):

And of course he had treasure and he wanted to keep people away from the treasure. So that's another couple of lessons on the Generation Skeptics page, which is using Scooby-Doo <laugh> to teach ghost stories and things like that. So I'm thinking summer camps. I went last January to a Unitarian church in Naples, and we did the lessons there. I also have a group of experts. I have a ghost hunter, I have a moon landing expert, I have a psychic expert. I have people that are willing to zoom into your classroom and

your summer camp and your library, or whatever, and talk to your audience about ghost hunting or psychics or moon landings. So I'm excited about that.

Eric Cross (43:50):

How long have you been working on this program for?

Bertha Vasquez (43:53):

October 2021.

Eric Cross (43:54):

2021. Got it. Okay.

Bertha Vasquez (43:55):

Yeah, I did some summer camps last year.

Bertha Vasquez (43:59):

I've developed some lessons. My language arts colleague developed some lessons, but now we're ready to launch it for real, under the name Generation Skeptics. The other thing that we're thinking out of the classroom is we're gonna start, we already have one teacher, high school clubs with bylaws and afterschool club for the students where the students run the club and where these experts can Zoom in and talk to the students about all of these different forms of misinformation or pseudoscience. So it's also out of the classroom, because again, coming back to your point, I'm not sure how many actual state standards or NGSS standards we're gonna find where these lessons fit nicely. So I need to put it somewhere else.

Eric Cross (44:46):

And to your point, with science, often taking a backseat to other content areas because of state testing, a lot of science teachers aren't even able to get to all their standards because they're just not given the time. And so the fact that you're building a curriculum that's high quality, but also thinking with the classroom teacher mindset and thinking about us and those of us who are still trying to build up to that, you know, birth of Vasquez legacy, we appreciate that because yes, clubs, afterschool activities, all of those things are, are great avenues for it.

Bertha Vasquez (45:20):

Yeah. Museums also have shown interest to partner with us, like the weekend children's events and things like that, so the parents can take them. I also have a very large home-schooling population that I've done some work with and the parents want these lessons to do with their kids at home. So there's another out-of-the-classroom avenue.

Eric Cross (45:46):

And it sounds like it's very inclusive. Like you had mentioned that the Unitarian church and other groups, and oftentimes what happens in pop culture, or not pop culture, but maybe just like in media in general, is things are very binary. And so skepticism is often closely linked with being areligious, no religious or spiritual beliefs whatsoever. And then the other side, let's say someone had metaphysical beliefs, beliefs that may be are not scientifically verifiable. Can you also exercise this muscle of skepticism in other aspects?

Bertha Vasquez (46:20):

Yes. Yes. I think you can exercise this muscle in other aspects. So for example, I have this book that we published on teaching evolution, and it's teachers around the country telling you, this is my favorite lesson, this is my favorite lab, this is how I address misconceptions, this is my favorite book. If you look at these 16 authors, there's a great diversity. There's urban, there's rural, there's middle school, there's high school, and yes, there's atheists and there's very religious people in the book.

Eric Cross (46:53):

Would it be fair to say that we would be doing a service to society if everyone, regardless of what your beliefs are about, I mean, metaphysics or whatever, if everyone was practicing this, we would see a positive change in society.

Bertha Vasquez (47:07):

I think so. Absolutely. And yeah, just the idea of approaching each other with a little more humility, willing to hear the other side and have a respectful conversation.

Eric Cross (47:17):

And how those conversations are had ... it seems like a big part of this, right? Like being able to not only exercise humility and listening, but also having some humility in how you explain or share things. I think that is also important. Both on the receiver and the listener and yeah, the giver side. I find that it's a two-way street. It needs to, it needs to go both ways.

Bertha Vasquez (47:38):

It's hard when there's an emotional attachment to your belief. For example, I did a radio show, and it's easy to laugh at people who disagree with you. But, I brought up GMOs again. I bring up GMOs and it really turned off the host. So I know what Melanie tries to do in her work and what we're trying to do in ours is to make people practice, use that muscle, as you called it, with a non-triggering topic. I just visited the springs in Central Florida. Central Florida has these beautiful natural springs you could get on an inner tube and float down peacefully as the birds fly by. And people were jokingly talking about the mermaids that live in the springs, AKA the manatees. But we decided, I'm gonna write a lesson on how to figure out that mermaids in the springs don't actually exist and practice all the skills in Melanie's toolkit. And it's such a fun, non-triggering subject, kind of like the ghosts, that that's the way to do it. You don't have to trigger people with the beliefs that they actually hold dear. Does that make sense?

Eric Cross (48:53):

It does. What I'm hearing you say is you can build the skill of critical thinking, but you don't need to step on these kind of landmine topics that people have been deeply vested into, have been socialized for, things that kind of bypass our rational thinking and go straight to the heart, which can actually be a diversion from what you're actually trying to build in the person. It's essentially differentiation. That's what I'm hearing is you're differentiating for your audience and you're picking topics that are kind of, you know, more neutral, but yet the person's still able to, to practice this transferable skill that they might actually on their own, organically transfer over at some point in time. Just not right now. When you and I are talking face to face. It's a little bit too intense.

Bertha Vasquez (49:34):

I love that you said it way better than I did. Thank you, <laugh>.

Eric Cross (49:38):

Well it's so clear to me as you're explaining this, the value of it. And for me, I want this to be an idea that regardless of what your background coming into it is, it's something that we can all practice. It doesn't need to be these polarized groups. This is something that can be applied to all situations. And I found in my own personal journey that as I've grown or learned or not believed all of my beliefs or questioned my own beliefs, I've evolved. And if anything, it's kind of got me to a point in life where I have more questions than answers. I started off going and asking 10 questions and now I have 10,000. And I've kind of become comfortable in this tension that I live in so many things.

Eric Cross (50:19):

You know, there's certain things that I'm more passionate about. But there's other things where it's like that muscle of being skeptical and asking questions and being curious and being in a community of people who support that, I think that's really, really important too. Because going back to what you said earlier, it's easy to be in an echo chamber, whether it's on social media or a thought bubble, whatever it is, people who just resonate your own views, whether it's online or in person. And we think that that's the only way, and in reality, we're doing ourselves a disservice and we could end up spending more money buying those power bands with a little holographic thing. Remember that thing? Remember that thing they used to sell at the mall? <Laugh>.

Bertha Vasquez (50:55):

Yeah. Coming back to the classroom, when you find out that what you thought was gonna happen doesn't happen, it's up to the teacher to model that behavior to go, "Oh my God, how cool we were wrong! That's exciting. We're gonna learn something new now!" You know, make the kids realize that being wrong isn't always a bad thing.

Eric Cross (51:17):

Yeah. I think that's critical. You're right. We need to model exactly what we're teaching our kids. Bertha, your passion and your joy is balanced by the gravity and seriousness of how important this is to you.

Bertha Vasquez (51:33):

It is. It is very important to me.

Eric Cross (51:34):

And it's exactly how you started. I asked you in the beginning, what kept you in this for so long? And what I heard essentially is this existential like joy, passion, belief in what you're doing. And that's come out again and again and again, and so much respect for you and appreciation for not only the time that you spent serving our kids, but what you continue to do to serve those of us who are serving kids. And you continue to do it. Thank you for that.

Bertha Vasquez (52:01):

Thank you. I hope to improve the product over time.

Eric Cross (52:04):

I have no doubt. And we are gonna put links to the resources that you have shared. And these are all free for educators, is that right?

Bertha Vasquez (52:14):

All free. And if you have to buy materials, you're looking at under \$5 at a grocery store. That was one of my things that I wanted, was that these materials be accessible to everybody.

Eric Cross (52:24):

Keeping students in mind, keeping teachers in mind, this is gonna impact so many students. And earlier you talked about Science Saves. So you hold a video scholarship contest in which you ask students to submit 20-to-30-second videos about the importance of science. And I'd like to close out just by sharing snippets from a couple of those videos.

Student 1 (52:43):

Science saved my brother Nathan when he was diagnosed with autism at the age of two. Fluoxetine, Prozac and occupational therapy research saved my brother from his tormenting anxiety attacks and OCD by increasing the serotonin levels in his brain.

Student 2 (52:56):

Science has been the way through which I've been able to give back to the world. Whether that be developing a microfinancing platform for the unbanked or helping over 70,000 educationally underserved individuals through STEM workshops. It's been the way that I take my research from bench

to bedside and actually make science actionable in people's lives. One notable way that I've done this is by developing the We Arm, which is a low-cost prosthetic arm for individuals with below the elbow amputations. Hashtag side saves because it's now being piloted in places like Ukraine to help limb loss patients.

Student 3 (53:24):

Imagine living with not one but two autoimmune diseases, Hashimoto's Thyroid and Type one Diabetes. Despite these challenges, my graphic design teacher, Ms. Ashe faced, medical science provided her with the treatments and technologies she needs to manage her health.

Bertha Vasquez (53:39):

That's awesome. The young man with a prosthetic arm won \$10,000 cash. He's going to Stanford University in the fall. So every year we give away \$15,000 to students who make the best 30-second videos on how science has improved their lives or the lives of someone they know. That's on the Science Saves page.

Eric Cross (53:58):

And is that open to just students in Florida?

Bertha Vasquez (54:01):

All high school seniors. All U.S. high school seniors across the country. This year we had over 300 entries. Last year was our first year, we had over 200. I get to watch all those videos, <laugh>, and then I picked the top 30 or 40 of those, and I passed them on to the big judges, I call them. And, we have last year's top 10 and this year's top 10 at sciencesaves.org/scholarship. And yeah, it's great to see kids realizing that.

Eric Cross (54:35):

And it's great to see you carrying that torch for educators and for students and for reminding everybody that science saves and making practical applications and empowering students and rewarding them for being able to do it. Bertha, thank you so much for joining us today.

Bertha Vasquez (54:50):

Yes. This was lots of fun. I felt like we should have just had like a coffee or a beer while we did this conversation.

Eric Cross (54:56):

When I come out to Florida, I'll look you up and we can continue.

Bertha Vasquez (55:00):

Okay. Sounds awesome. We'll go to the Everglades, do some birding.

Eric Cross (55:03):

I'm in, I'm in.

Eric Cross (55:06):

Thanks so much for listening to my conversation with Bertha Vasquez, education director for the Center for Inquiry. Check out the show notes for links to the Center for Inquiry website as well as resources that Bertha and I discussed. And we'd love to know what you thought of the episode in our Facebook discussion group, Science Connections: The Community. And make sure you don't miss any new episodes of Science Connections by subscribing to the show wherever you get podcasts. And while you're there, we'd really appreciate if you can leave us a review 'cause it'll help more listeners to find the show. You can find more information on all of Amplify shows at our podcast hub. Go to amplify.com/hub. That's amplify.com/hub. Thanks again for listening.