Chris Orban: [00:00:00] My little dream is to try to create a curriculum that would even compete with the code.org. And so, maybe parents or administrators would opt for our curriculum, which, again, emphasizes the science and math learning objectives that they're not going to get if they just do it the CS-only approach.

Annalies Corbin: [00:00:21] Welcome to Learning Unboxed, a conversation about teaching, learning, and the future of work. This is Annalies Corbin, Chief Goddess of the PAST Foundation and your host. We hear frequently that the global education system is broken. In fact, we spend billions of dollars trying to fix something that's actually not broken at all, but rather irrelevant. It's obsolete. A hundred years ago, it functioned fine. So, let's talk about how we reimagine, rethink, and redesign our educational system.

Annalies Corbin: [00:00:56] Welcome to Learning Unboxed. This is your host, Annalies Corbin. And I'm very excited today, as always, to welcome two guests, so that we can talk about something called STEM coding. I am very pleased to introduce to all of you Chris Orban, who is an Assistant Professor of Physics at Ohio State University, specializing in a very complex stuff called Computational Physics and Computer Science Education. And we're really thrilled to have him here to talk about his work, and his program, and experiences in the K12 sector as it relates to moving kids up the STEM pipeline.

Annalies Corbin: [00:01:35] Joining Chris is Richelle Teeling-Smith, who is an Assistant Professor of Physics and Astronomy at the University of Mount Union in Ohio. It turns out Dr. Teeling-Smith was, at one time, in one of Dr. Orban's courses along the way. So, we may have a chance to talk about that. And together, they're going to talk with us about the project STEM coding they've been working on. So, welcome to both of you.

Chris Orban: [00:02:04] Happy to be here. Thanks.

Richelle Teeling-Smith: [00:02:05] Yeah. Thanks for having us.

Annalies Corbin: [00:02:07] So, I want to start, Chris, with you and just give us the hundred-thousand-foot overview, first and foremost, about the STEMcoding Project. What is it? And where did it come from? You're the originator, as I understand it. So, give us a little bit of the background piece, so that we can then jump into the nuts and bolts for folks who are contemplating similar paths.

Chris Orban: [00:02:33] Sure. There's kind of my motivations in starting this STEMcoding Project. And then, there's sort of the wider needs. It started not necessarily intending to go towards the high school route, but I had a number of undergraduate students who want to do research with me -

computational physics research, laser physics research, computational astrophysics research. And I would say, "Well, great. What's your programming skills?" And I would just meet student after student who got 4.0s from high school, and no one had ever showed them how to use a computer to solve a physics or a math problem before. And finally, I got so fed up with it that. It was like, "Okay, fine. I'm going to create activities that, sort of, gently introduce students on how to use a computer to solve those kinds of problems." And that initial effort kind of snowballed eventually into the STEMcoding Project.

Annalies Corbin: [00:03:31] And so, as you step back and think about the disconnect then between a high school, a traditional high school experience, and the lack of skill and knowledge as it relates to applying in a lab setting. And that was definitely my own experience in my field. That was the origin of PAST in many ways is that we saw that same kind of disconnect. Different field, same problem, universal issue that I hear faculty around the globe talking about some of these fundamental disconnects. In this case, in the computer science and basic programming skills. So, Richelle, how do you get involved in all of this? What does that look like for you?

Richelle Teeling-Smith: [00:04:18] So, I mean, I can start out by echoing, well, what you were just saying. I think, I was also -- I was that student who made it all the way through. I actually made it to graduate school before somebody asked me to do any sort of a computational project. And I was a little dazed and confused. And so, I was in that same position of not having had this sort of foundational piece of my education, and I

was in -- this is talking about having a Bachelor of Science in Physics, at this point in time. So, it was kind of just missing from the curriculum.

Richelle Teeling-Smith: [00:04:49] In 2015, after I graduated, I started teaching at Marian Technical College, which that shares a campus with OSU Marian. And that's where Chris and I, that's where our paths crossed again. And so, I was teaching these introductory physics courses - Physics 101, 102, that type of content. And I had some conversations with Chris. And he was telling me about these modules that he had developed for his own courses. And I knew, like I said, from my own personal experience and also from what I saw in the classroom that that was a big hole that needed to be filled for my students.

Richelle Teeling-Smith: [00:05:26] So, I started to just work with Chris at that time to continue to develop the modules and to use them in my courses, also, from the perspective as a researcher, but also from the perspective as a teacher in the classroom. And that's really where we connected and how we started working on this project together.

Annalies Corbin: [00:05:45] So, where do -- if you sort of step back from a little bit, and before we get into the nuts and bolts of the STEMcoding Project itself and the program that you're actually running, Chris, I want to talk a little bit, because this comes up over and over again, states are scrambling across the nation to deal with issues tied to very generically label computer science and computer science education trying to get at some of these very things that the two of you were talking about. Why the giant disconnect?

Annalies Corbin: [00:06:20] I mean, based on your own work and your experience. And before, again, we get into the nuts and bolts of the program, I really kind of want to dig in a little bit based on your experience and your watching in and around the Ohio State universe, let's put it that way, right. Broadly Ohio as Ohio State, not the Ohio State. We'll be really clear here. So why do we have this giant gap? Why this disconnect fundamentally? What do you think's happening here?

Chris Orban: [00:06:50] So, Richelle and I were talking about this the other day because it's interesting, the trajectory that computer science education in the United States has had because there was actually some amount of Coding and Computer Science in classes in the '80s and the '90s, the Apple IIs, and things like that. Yeah, I mean, I'm 36 years old. So, I'm part of the generation that kind of had those things. Organ Trail and those sorts of stuff.

Chris Orban: [00:07:17] And what happened is that in the mid to late '90s, early 2000s, there was this push towards, "No, no, no, no, no. Let's focus on math and reading because if the kids can't do math, and they can't do reading, that's foundational for everything else." And it was around that time, I don't know the exact date, but it was around that time that Computer Science was the status of a change that was no longer a core subject in K12, in spite of the fact that it had been in core subject in K12 since the Elementary and Secondary Education Act of 1968.

Chris Orban: [00:07:55] But us in our infinite wisdom in the 2000s decided to change that. And it wasn't until probably 2014-2015 that code.org, with its advocacies. Code.org, if you don't know about it, is this organization that a lot of the tech billionaire helped to found to do more coding in the schools. And one of their big efforts was lobbying and legislative. And so, they managed to change that. So, we're back on a good trajectory now, but unlike some things with the schools, actually, we're on an okay trajectory before, and it's just trying to get back on track.

Annalies Corbin: [00:08:32] And it's perplexing, I'll be honest, and I will fully admit, I'm a bit older than Chris. And so, I was one of those kids in the mid '80s in those first schools where it really became foundational, right. And I vividly, vividly remember, we had the Commodore. That's what we were working on in the very first computer science class that had ever come to my high school, and it was going to be an elective course. I remember that vividly.

Annalies Corbin: [00:09:04] And I also remember, we had the we had a lottery in because there was going to be one, maybe two, sections in a pretty big high school. At the time, I was, of all places, in Cheyenne, Wyoming. So, a million miles from where we

are right now. but it was a big deal for it to come. The kids were really, really interested in it. I remember getting into it.

Annalies Corbin: [00:09:26] Also, at the time, I remember, I think I might have been one of maybe two or three girls in the whole school that even put their name in the lottery. I have to admit it was almost all boys in the course. And then, over the course of my high school career, I think I took a Computer Programming or Computer Science course, at least -- I think I had one a year for all four years, getting all the way through with the old C language. That's how old I am at this point.

Chris Orban: [00:09:54] Cs an okay language.

Annalies Corbin: [00:09:54] So, there you go.

Chris Orban: [00:09:54] Don't diss C for me.

Annalies Corbin: [00:09:54] But it's intriguing to me, right. It's intriguing to me that it disappeared the way it did, and the timing is curious because the other thing that was happening about the time that Computer Science is going away in schools, we also got rid of shop classes, and we got rid of those very applied courses that is, now, very uncool to Call Home Ec. A lot of things like that, those foundational fundamental things went away in exchange for things like CAD labs. And so, there's an irony here in my mind that we took out the foundational piece that allowed you to understand what

was happening inside a CAD lab, right. So, that went away. So, that's a curious thing to me. Do you have any rational understanding, either one of you, of how that dichotomy came to play?

Chris Orban: [00:10:52] I don't think either of us are experts on the policy decisions ad how we got -- I mean, I think that it was a matter of people seeing kind of test scores declining. I mean, the '90s was a time of decline in the public schools for a variety of reasons. But neither Richelle and I are experts on. So, I think it was probably seeing that decline and wanting to do something about it was maybe the motives behind it.

Chris Orban: [00:11:21] What's interesting to me is that a lot of the movers and shakers now in the Computer Science education world are the kind of folks like you and me that did have some Computer Science when they were in elementary school. And it's a matter of putting that back where it belongs.

Annalies Corbin: [00:11:37] And I think it's intriguing, the students love it broadly. We get all kinds of calls at PAST Foundation for a variety of different program opportunities, which is part of why I think that student coding program, in particular -- And just to be clear for our listeners, so you started this as an opportunity to help with your own student, your intercollegiate students, both of you utilizing it in that category. But, now, you're utilizing it in the K12 space. And so, I want to talk a little bit about that.

Annalies Corbin: [00:12:13] So, Richelle, you mentioned that you saw students utilizing those first modules that were coming out that they were filling a gap for them. What do you think was the broadest appeal for those modules at the post-secondary? So, for those collegiate students, what was the need that it was filling?

Richelle Teeling-Smith: [00:12:34] With the students -- I'll use my courses just kind of as a case study here to talk about, but the students that I'm seeing in my courses, at this point, they're usually very late teens and early 20s, and they're preparing to go out. They're very career-focused. I see a lot of students who are majoring in the field of Engineering or majoring in another STEM field. And so, a lot of them are very much interested in kind of that. They do see it as a skill set that they haven't had that they think they will need in their career or that the people who will hire them one day very soon would be very interested in them having some experience and knowing just how to get around, how to do some basic programming, and having an understanding of what's going on behind the scenes.

Richelle Teeling-Smith: [00:13:29] And I can think of examples with engineering students just because they they use so many different pieces of software to do different types of analysis - stress analysis, et cetera - and to have an understanding of what is going on to know that they can validate the results that they get out of the piece of software, to trust the results, et cetera. And so, those students, it's nice because they do

have that. They are sort of self-motivated in that sense because they really can see that it's valuable, and they think of it as something valuable for the future that they've chosen for themselves.

Richelle Teeling-Smith: [00:14:06] Other students who don't have that same motivation. So, there are other students, of course, they say, "I don't see myself using this in my career," they happen to be much less excited about participating in that aspect of the course because they don't see it the way I see it, which is very much about almost having a different type of fluency, and an understanding of how things just work in our technological society, and that everybody should be equipped with some basic understanding or that fluency in this algorithmic or computational way of thinking. And they're not as they're not as sold on that concept because that's not built into the way that they have been taught for their entire lives. It's not inside the box. It's not what they're used to. And so, some of them do struggle with that.

Annalies Corbin: [00:15:03] And we see that in students across a number of different opportunities when you think about shifting the way that they get access to applied opportunity or the applied component of what they're learning. Maybe that's a better way to think about it. So, Chris, how does that need at the undergraduate level and the experience of both you and Richelle were having in your classes, and then the success that you were having with these modules you started to create, how does that then translate and become what is, at this moment, the STEMcoding Project, and the way you're applying it into the K12 space?

Chris Orban: [00:15:38] Sure. So, I should say before we get too much further that Richelle was really key to working with more teachers, particularly the Physics teachers because, at the time that we started collaborating, she was running a college graduate plus courses through Marian Technical College. And so, she knew a heck of a lot more Physics teachers than I did at that point. And so, she really helped us to find kind of some of the early adopters to try some of this out in our classrooms and things like that.

Chris Orban: [00:16:07] And those were the stepping stones for us to put one foot in front the other as the project grew. But around 2016, I started sharing some of the

coding activities we had with the Physics teachers that we knew and that Richelle knew. And so, for example, we had this Astros game. So, if you're an '80s kid, I know you appreciated the Astros game. And the Astros has a bunch of great physics on it. In fact, the laws of physics are simplest for a rocket moving in free space, thrusting and accelerating around. And so, it's a great opportunity to illustrate how physics and coding can go together.

Chris Orban: [00:16:51] And so, we started sharing that with Physics teachers. We started getting feedback from Physics teachers on, "Oh, that's great, but could you do this? Could you do that?" And so, we built more and more activities. And then, we won some nice grants in 2017. And that was really the launch of the STEMcoding Project was grants we won from Ohio State and from the American Institute of Physics.

Annalies Corbin: [00:17:11] And so, as you took and translate this need back into these original courses with high school Physics teachers -- and just for our listeners, in addition to the resources that are available at the website, we've talked a little bit in previous episodes about the college credit plus and the way that that works. It's an Ohio opportunity for early collegiate credit into the high school arena that, quite frankly, many states from around the country are looking to replicate. So, we'll make sure we have links for that as well. So, for anybody who has questions or doesn't understand exactly what Richelle is referring to.

Annalies Corbin: [00:17:48] The work specifically with teachers, Richelle, I want to touch on that just a little bit because one of the questions that I get frequently, especially as it relates to innovative programs like this, is teachers can often love them on first experience, but getting them to sustain use of that is always another conversation and piece of the journey. So, are teachers actively engaged in helping you create the activities, or is it the ask around a particular module or set of standards that's driving it, and then you're doing it internally? Can one of you talk a little bit about how the actual modules currently in this iteration are now being created?

Chris Orban: [00:18:37] Richelle, maybe you can talk about the feedback we got last summer and things like that.

Richelle Teeling-Smith: [00:18:43] Yeah. So, I mean, Chris is the one who is creating the modules. The modules are his babies. But what we're doing is we're utilizing. So, last summer or, actually, the last couple of summers, we've done a lot of online professional development for teachers, and we've

been doing this both for graduate credit and for continuing education units. But the teachers -- So, we kind of have them go through the entire set of activities. And then, we collect a lot of feedback from them at the end.

Richelle Teeling-Smith: [00:19:18] And their commentary and their thoughts about just everything from small details to, "Why as the vector for force is this color, and why is the vector acceleration this color? Does that match my textbook? Does that make sense to my students?" or to much larger, much more, I guess, broader conversations about, "Well, should we be introducing the topic A before topic B?" or about the order in which students should be doing the modules. And so, we take all that feedback from the teachers. And Chris is the one who kind of gets in there, and turns the keys, and makes those changes based on what the teachers want to see in the classroom.

Richelle Teeling-Smith: [00:20:02] And, also, that's also led to a lot of different variations and versions of the same activities. So, we've now developed where we do an online training course that's really focused more for Physical Science teachers. So, usually, we're at the middle school level or early high school level. And then, we have a course that is focused on Physics teachers. And we've actually separated those out and developed different activities for them based on the feedback that they've given us in previous online training experiences.

Annalies Corbin: [00:20:34] Perfect. And so, teachers broadly have the ability to get access to this program and the professional development. Talk a little bit, Chris, about that because you're working right now through the grants that you're applying for, and the various pieces. You're really, at this point, talking about some scale, right? So, what does that look like for you?

ChrisOrban:[00:20:55]Idon'thavetotellyouthatTeacherTwitterisamazing,right. So, gosh, Richelle, do you remember when we started Twitter? It was maybe a year and a half ago or something like that. We should have done that at the very beginning because there's over a thousand Physics teachers on Twitter, there's thousands of other kinds of teachers on Twitter, and that's been a great way to get in touch with people, to advertise these online, the professional development opportunities that we're offering.

Annalies Corbin: [00:21:23] And you are very active on the Teacher Twitter and social media. I mean, I see your postings multiple times a day. Yeah. So, it's working.

Chris Orban: [00:21:33] Good. I have a silly story about my daughter asking me if I knew everything about science yesterday. The answer is no. So, that's definitely been one of the tools. So, Richelle and I, we regularly present at the SECO meetings, the Science Education Council of Ohio. That's another place for you, folks. And yeah, it's just kind of been a slow kind of effort where more and more people find the resources. So, our YouTube channel has 4000 subscribers. So, some people find us on YouTube. Some people find us on Twitter. Other people find us through the American Association of Physics Teachers and things like that.

Chris Orban: [00:22:12] I'm hoping that in the future that more people would be able to find us through, say, the Ohio K12 Computer Science standards. So, I was on the advisory board for that. I didn't play a huge role. I don't want to overstate my role in that, but it is something I'm very excited about for the state because this fall is going to be the first term that it's actually supposed to be implemented.

Annalies Corbin: [00:22:34] Yeah. And like many other states, our Computer Science standards within the state structure has been a point of great debate and, to some extent, contention. But at the end of the day, PAST, we're moving forward with it. And there are a variety of different resources and groups that are bringing resources available for teachers to get confidence and access to that.

Annalies Corbin: [00:23:01] So, I want to talk a little bit about the pilot program, I guess, if you will, as you moved this into an after-school setting, utilizing the students. They're an active part of your feedback loop. I hear the kids as they move from Metro school where after-school program and club that you've been utilizing some coding in. And then, those kids turn out for other things across the street at the Innovation Lab. So, I hear the kids chatter about the experience. So, tell me a little bit about sort of utilizing and working in that space with that program.

Annalies Corbin: [00:23:42] One of the things that lots of our listeners for this program do, we're trying to figure out, how do we do either something similar, or how do get access to programming that already exists and incorporate into what I'm doing? And these are folks from around the world and, certainly, outside of Ohio. So, let's talk a little bit about that experience because you're utilizing the program now even in middle school, correct?

Chris Orban: [00:24:05] Yes. So, I'm the faculty advisor for the Coding Club at Metro High School. And Richelle's has been talking to more schools in her area about starting coding clubs, and library workshop, and things like them. And the YouTube channel is a really great resource for that because you, yourself, don't have to be the world's expert on coding to sort of sit them in front of the YouTube channel.

Chris Orban: [00:24:24] I mean, I have a 12-year-old daughter, and she's not hugely invested in coding, but she knows enough that she can skip towards the end of the video. She can skip towards the end of the video, and kind of see what the code that's on the screen, and get her code working. And many, if not most, of the videos on the YouTube channel are these physics video games activities. So, we have the pong game, which I'm sure you'll appreciate. Asteroids game. Do you remember the Lunar Lander?

Annalies Corbin: [00:24:54] I do, yes, yes.

Chris Orban: [00:24:55] Lunar Lander, rocket on the moon without crashing, things like that. We have an Angry Birds clone. And the unique thing about it is that if a Computer

Science person - God love them - if they were going to make that activity like that, they would not emphasize the physics and the science behind it in the way that we do. They probably wouldn't show the velocity, and the acceleration, and the force vectors.

Chris Orban: [00:25:17] And so, what we're doing is we're using coding as a venue to reinforce those learning objectives, the science learning objectives, and math learning objectives that we're already kind of supposed to be reinforcing in the schools. And that's kind of what we don't see when we get -- so, for example, when we go to ourcode.com, so the world's most popular Computer Science education site, we have four activities now in ourcode.com, and we're very proud of that because they are designed to reinforce science and math learning objectives. And a lot of the stuff we see there is fun and interesting. And Katy Perry's on it. But it's not necessarily a good fit for putting this in a science or math class.

Annalies Corbin: [00:25:58] So, Richelle, when you work with teachers that are utilizing the modules in a variety of different ways, do you find that they are successfully utilizing the STEMcoding Project modules and to replace what they were doing before? Are they still kind of doing what they always did and using this as an added component? This is a big huge debate in the problem and project-based instruction world. So, what's been your experience as you help teachers figure out how to utilize this day to day?

Richelle Teeling-Smith: [00:26:38] Well, I feel like the answer to that is yes and yes. I mean, because it's always kind of mixed, but I think it depends on how the individual classroom happens to be structured. And in my classroom at the collegiate level, what we have done since these are all -- Chris has designed all of these to be -- they're very modular, which is wonderful. They're 45 minutes to maybe an hour to complete the whole activity. And that means that they fit really well into one class period like in a high school or middle school.

Richelle Teeling-Smith: [00:27:11] At the collegiate level, we have a different structure, but I use them for lab activities. So, what I had done is taken out some hands-on activities and just slotted these programming modules directly into those spots. And I

think it's really just a mixed bag. And teachers reported back that they use them in different ways.

Richelle Teeling-Smith: [00:27:33] We try not to think about it as like taking out or replacing existing content because that's a big problem for teachers because they have so many benchmarks that they have to be meeting. There's so much to do, and there's so much to teach, and they have so little time to cram it in. So, when it's viewed through that lens of like, "Oh, I have to cut something out to put this in there," it's not going to work, and teachers have the tendency to be really kind of turned off by that because they already have so many things on their plate that they need to accomplish with their students.

Richelle Teeling-Smith: [00:28:07] But what Chris was saying about the programming activities, like really just using the coding to reinforce the concepts that you're already trying to teach the classroom, that's really the approach that we're taking here because we're really trying -- it's not replacing or cutting anything out.

Richelle Teeling-Smith: [00:28:27] So, the idea is if you, "Hey, this week we're going to be talking about position, and acceleration, and velocity, and all those concepts," we're really trying to build those coding activities in a way that they are constantly reinforcing those basic concepts and kind of assessing them or introducing them to students in the same way that you would do in the classroom, but you're just using a different -- through a different avenue, right. So, using the code as or using the programming as a different language to teach the same concepts.

Annalies Corbin: [00:28:59] Is it enough content to fill a Physics course? Because I'll be honest with you, Richelle, in our work, we truly advocate to replace, right. That we're out there looking for the best stuff that's available to really help classes, schools transition from very traditional instruction to this very inquiry applied opportunity. And Physics, by nature, is applied, right? Great physics teachers are really, really good at that component of it, right? And so, to be able to supplement and add.

Annalies Corbin: [00:29:37] But the reality of it is there's an awful lot of just ho-hum physics, if it's even being taught. And there's still a lot of places where it's not really fully -- to your point earlier, the reason you had all these students showing up to some extent without some of these skills is because they didn't necessarily get the access that they needed. So, is there enough content yet to be the curriculum or the course?

Chris Orban: [00:30:05] Yeah. Well, it's something I've thought about, and something that there's actually a teacher in Los Angeles who found our stuff and just fell in love with it, he's actually submitting our whole curriculum to his district in Los Angeles to see if it fulfills the requirements for Computer Science from the State of California.

Annalies Corbin: [00:30:26] Wow.

Chris Orban: [00:30:26] I mean, we have enough activities now that you really could do an entire course based on our stuff. And the interesting reason to do that is because if you look at - and this is true of Ohio - Computer Science now counts as Algebra 2 in Ohio.

Annalies Corbin: [00:30:42] Right, correct.

Chris Orban: [00:30:43] There's kind of a grumpy letter that gets sent home to the parents saying, "Just so you know, your kids haven't taken Algebra 2. We're going to graduate them anyway, but they might not be prepared for college." Well, our attitude is to say, "Well, if Computer Science is counting his Algebra 2, you better put math on that class."

Annalies Corbin: [00:31:02] Absolutely, right, yeah.

Chris Orban: [00:31:03] And not to throw snowballs, but if you look at the code at our curriculum, it's not necessarily what it emphasizes. And in some states, I've heard -- I think this is true of Texas. I'm not totally sure. Some states, Computer Science classes can count forwards Physical Science and things like that.

Annalies Corbin: [00:31:19] Yeah. The different states have taken a wide array of approaches of bringing Computer Science back again. It's a fascinating quandary, yeah.

Chris Orban: [00:31:29] Yeah. So, my little dream is to try to create a curriculum that would even compete with the code.org. And so, maybe parents or administrators would opt for our curriculum, which, again, emphasizes the science and math learning objectives that they're not going to get if they just do it a CS-only approach.

Annalies Corbin: [00:31:49] And within the State of Ohio, the modules have all been crosswalks to the state standard application. Yes or no?

Chris Orban: [00:31:58] Some of the -- this is just news last week. So, the model curriculum in Ohio was just recently revised and improved just a few weeks ago. A handful of the STEM coding activities are included in that model revision explicitly. Not all. Anyway, not all the -- we have too many activities, and I made too many activities after we did these committee meetings to include in there. But, certainly, it'll be in alignment with -- it was already in alignment with the State Science Standards. And, now, it's going to be explicitly mentioned in the model curriculum.

Annalies Corbin: [00:32:35] Yes, but cross walking it broadly across a variety of different content areas would be sort of an added bonus. We can certainly have that conversation. It's not a hard thing to do. So, as you then think about it, so you've got this teacher who's going to the State of California and saying, "Hey, can we use this?" that'll be an intriguing thing to see as it structures out. Are you seeing the same types of requests or wants? Either one of you, from your teachers in Ohio? And how many teachers, Richelle, would you say are currently actively engaged in using the programming? And there'll be more, obviously, because this is being explicitly mentioned but just anecdotally, how many do you think in the state?

Richelle Teeling-Smith: [00:33:27] Well, let's see. So, Chris might actually have a better grasp on the numbers of people who are actively using it. In terms of like the teachers that we have attending the training, a good -- so, we have probably close to -- what's the number for this number, Chris?

Chris Orban: [00:33:44] We had, I think-

Richelle Teeling-Smith: [00:33:47] 25?

Chris Orban: [00:33:47] ... 25 last summer.

Richelle Teeling-Smith: [00:33:48] Yeah.

Chris Orban: [00:33:49] And we had -- we'll probably have another 25, or so, or maybe-

Richelle Teeling-Smith: [00:33:53] Another 25 this summer.

Chris Orban: [00:33:56] Yeah.

Richelle Teeling-Smith: [00:33:56] And then, we also have -- we do these workshops at American Association of Physics Teachers. Now, at different conferences and stuff like that. We'll usually get a 24 or 25 in each of those as well. And not everybody goes on to use the [inaudible]. So, it's kind of hard to estimate. Chris might have a better idea on the number than I do, but it's kind of hard to estimate exactly how many people continue to use the activities. But we're working with those kinds of numbers at this time.

Annalies Corbin: [00:34:31] Yeah. And so, as folks, as more people want to use the programming, what are your thoughts on how and if - which is fair, how and if - it's able to be used across other disciplines? So, let's say, I'm the Social Studies teacher, are there components of this that I could pull out and utilize in other places, right? That's always the mark of a really amazing program is because it has so many different applications. And that's something that happens to programs as they evolve. So, the folks that are coming right now, are they all Physics and Math teachers? Are you starting to see folks in other disciplines kind of creep in around the edges?

Chris Orban: [00:35:24] So, we had a few folks at the SECO convention that came to our session. I think, Richelle, I can't remember. Did we specifically advertise it for the Biology and Math folks?

Richelle Teeling-Smith: [00:35:38] Yeah. So, yeah, we had a Biology session.

Chris Orban: [00:35:42] Yeah. And so, our strategy as we expand is that -- so, for one, Math is very much on my mind because there's so much opportunities there. And, again, there's this issue with Computer Science taking the place of Algebra 2. And so, as I try to decide what's worth spending our time on for Math, a lot of the times, I'm trying to find activities for Math that have sort of a Biology and Environmental Science component to it.

Chris Orban: [00:36:11] So, one of my favorite activities is our Earth Day Coding activity, where we take the cosine function to model the average temperature through the course of the year. And then, we sort of shift that function by a small amount to approximate climate change. So, in Columbus, apparently, the climate is warmed by about 2.5 degrees Fahrenheit, which if you set your home air conditioning unit 2.5 degrees Fahrenheit higher, maybe you'd notice, maybe my wife noticed and I won't, but you might not notice that subtle a change. And so, the question my mind was, what effect does that have on the number of sub-32 Fahrenheit days, the number of days you're going to have frost? And it turns out to be something like two weeks.

Annalies Corbin: [00:36:56] Wow.

Chris Orban: [00:36:57] Yeah.

Annalies Corbin: [00:36:58] That's substantial.

Chris Orban: [00:36:58] Yeah, 26 days is actually what we-

Annalies Corbin: [00:37:00] Wow.

Chris Orban: [00:37:01] ... we came up. That's not two days. It's four weeks. And so, you can do that calculation with a code. And so, it's sort of a Math, but it's also kind of Environmental Science. And I can rattle off three or four other ideas that are kind of in that same spirit.

Annalies Corbin: [00:37:17] Well, so, here's my prediction for you guys because the reality is -- and for folks listening, please take a few minutes, even if you're not interested specifically in Math and Science, or even if you're an elementary teacher, I really, really do encourage you to go and take a look at the program. The YouTube stuff, quite frankly, is awesome. It's fun to watch. You get a little bit absorbed in it. Whether you're really truly at the push of the play button, you wanted to go there or not, it does actually suck you in.

Annalies Corbin: [00:37:52] And so, I'll give you guys kudos for that because that's kind of an awesome thing. And my prediction is that as you build more, and people get more comfortable, that you will find other content folks looking to find very meaningful, tangible ways to incorporate not just the lessons but the way of thinking that is instilled.

Annalies Corbin: [00:38:15] Because that's the other thing that happens is we didn't spend any time really today talking about it, but going through the modules really does help foster that very high-level computational, cognitive thinking and problem solving skills that we collectively are trying to have more and more students exposed to and certainly earlier on.

Annalies Corbin: [00:38:34] And so, I suspect that as you have more folks exposed to the program, you were going to have more requests for folks coming outside of what you originally thought you would see. But that's just my prediction on what's going to happen with it because you guys have done a really wonderful job with that.

Annalies Corbin: [00:38:55] One of the questions that we get, or we want to talk about all the time through this programming is, what is your high lob, right? As we sort of wrap here in our conversation today, folks are sitting there thinking about what they've heard. I'm in a community in the middle of Utah. I'm in a community in Maine. I really, really love what I'm hearing, and I want to either try this for myself or get access to it. What do I need to know before I start down this journey with you or with other organizations that are doing similar types of things? So, Richelle, I want to start with you. What's your big lob to teachers sitting back, listening to this, saying, "Hey, I think I want to go on this journey"?

Richelle Teeling-Smith: [00:39:35] Well, I would tell them to do it. So, I think a lot of the conversations that I've had with teachers, both with those who are specifically trained to try to use this in their classroom, also with teachers that I've had conversations with in other settings of a different context -- so, Chris and I attended this computational thinking workshop in DC that was kind of bringing people together to really talk about how that's evolving in education across the country.

Richelle Teeling-Smith: [00:40:07] But what teachers are telling me is that there's this big intimidation barrier. And it comes back from the same thing. You talked about how -- so, Chris talked about how he had some coding experience when he was in school. And then, you had some as well saying that you were slightly younger than Chris, And I fell into that hole where there was none. I never had a single Computer Programming course offered to me at all at any point in time, K through 12. And a lot of other teachers are in that same spot.

Richelle Teeling-Smith: [00:40:38] And so, when you're asking teachers to look at this new thing that they need to bring into their classroom, it can be really overwhelming. It's almost like saying, "I need you to teach your same lesson, but I really need you to teach it in Chinese." And they're saying, "I'm not fluent in Chinese. I can't do that. That's too much."

Richelle Teeling-Smith: [00:40:57] But I think I would encourage teachers that even if they kind of have that hesitancy, they, kind of, are feeling intimidated and overwhelmed to know that it's so much easier than it looks. And it really is. And I can say that pretty confidently because I kind of hopped in at this level much later, I wasn't trained to do this, and it's really a very natural thing to pick up. It really is.

Richelle Teeling-Smith: [00:41:21] So, the modules are designed -- I'm using ours as an example, but this is more broadly across the board. The modules are really easy to use, they're designed for beginners, and you would you be surprised to find that the type of thinking that you need to kind of complete these activities is actually very natural for us. My students find this, and Chris has reported back that his students find this, and teachers tell us their students said like, "Oh, wow, that was actually -- not only was it fun, but it was really easy." It turned out that you don't have to be afraid and say, "Well, I'm not a programmer." It's actually really -- it's really fun and easy for everybody to do.

Richelle Teeling-Smith: [00:42:00] And also to know that there are a lot of opportunities to get training. And then, we're always here for continued support for all of our teachers if you have questions or concerns. And then, I think, the YouTube videos are a phenomenal resource. That, actually, is one of my absolute favorite aspects of this project are all the videos that Chris, and his students, and some of my students have gone through and recorded these videos because you're never alone. You're never by yourself. You always have some resource right there that can say, "Okay, I'm stuck on this. How do I get around whatever big I'm -- something I'm missing in my code. I have something out of place. It's not working." And there's always a resource area to kind of help you get past that. And then, you're not going to run into that same bug the second time.

Richelle Teeling-Smith: [00:42:46] So, definitely, I would encourage teachers to jump in, and just kind of go for it, and don't be nervous that you don't have the experience doing it because you're going to find that it's very natural, and it's a fun thing to do in your classroom.

Annalies Corbin: [00:43:02] Thank you. That's very helpful because folks are always just kind of, "Should I? Should I? Should I?" So, Chris, should I?

Chris Orban: [00:43:10] Yeah. So, one of the things that -- if you don't mind me answering the question for an administrator because Richelle did a great job for the teachers.

Annalies Corbin: [00:43:18] Absolutely.

Chris Orban: [00:43:19] And one of the realities that we have to deal with and one of the realities that code.org is doing a great job with, actually, is the fact that only something like 35%-37% of Ohio high schools have a Computer Science course. And in fact, we're just talking with Metro. Metro, their Computer Science teacher is trying to figure out what to do next year. And so, as an administrator, as

a principal, what are you going to do? Well, you can compete for that handful of people that can teach it. And in fact, Ohio State University does not have a program-

Annalies Corbin: [00:43:50] Correct.

Chris Orban: [00:43:50] ... to train Computer Science teachers. **Annalies Corbin:** [00:43:52] Right, right.

Chris Orban: [00:43:53] And so, you can try to do the, "Let's have a standalone Computer Science class route," or you can empower your existing Math and Science teachers and reach that remaining 65% of schools. And so, what we're kind of trying to do is we're trying to bring Computer Science in through the backdoor because not all students have a front door.

Annalies Corbin: [00:44:16] Yeah. No. And what the listeners couldn't see was me cheering Chris on because that is exactly how we think about it at PAST as well is this is an opportunity to take really awesome, amazing teachers that are out there, give them a new or an additional skill. Let them infuse it across the curriculum. Give it a real solid context in the things the students are already learning, and teachers are already teaching, and letting them just run. Truly being facilitators of learning. So, I'm thrilled to hear you say that because that's exactly what I would say as well.

Annalies Corbin: [00:44:52] So, thank you very much to both of you for taking time out of your day and joining us. And for our listeners, there will be resources posted on the website. You can also get a lot of information at stemcoding.org. Is it dot org or dot-

Chris Orban: [00:45:06] Just go to YouTube and search for STEMcoding. **Annalies Corbin:** [00:45:11] Absolutely. And-.

Chris Orban: [00:45:11] And that's a sticker for you.

Annalies Corbin: [00:45:13] That's a sticker for me? I love stickers. Thank you so much. And so, again, I will emphasize the YouTube videos are absolutely fabulous. Go there. If you you want more information, we will provide contact information for both Chris and Richelle as part of the resources. I encourage you to reach out if your school and you want to bring this. I would encourage you, as an administrator, to to ask the question to these guys, "Can you come? And what would that look like?" and to really spread the good word and the good work, not just in Ohio, but around the country. So, thank you to you both for your time and dedication. We appreciate it.

Chris Orban: [00:45:52] My pleasure.

Richelle Teeling-Smith: [00:45:53] Yes. And thank you for having us.

Annalies Corbin: [00:45:57] Thank you for joining us for Learning Unboxed, a conversation about teaching, learning, and the future of work. I want to thank my guests and encourage you all to be part of the conversation. Meet me on social media, @annaliescorbin. And join me next time as we stand up, step back, and lean in to reimagine education.