



# Science Modeling Talks

## Episode 56 - "Training and Equipping Teachers for STEM"

Guest: Amanda Whitehurst

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Mark Royce (02:09)

Well, hello, Amanda. How are you doing?

Amanda Whitehurst (02:12)

I'm doing very well.

Mark Royce (02:13)

Awesome. That's great. So, you're in Arizona and the weather is heating up there? We imagine.

Amanda Whitehurst (02:22)

It is. It's starting to get warm.

Mark Royce (02:24)

It will do that where you live. I know you are working out of Arizona State University right now. Is that true? And we're gonna talk a lot about what you're involved with and what you guys are doing there. But first I wanted to just find out, how did you first get introduced to the idea of modeling instruction and, perhaps, find a workshop that you went to. Tell me the beginning of that story for you.

Amanda Whitehurst (02:55)

It is so fascinating how your life can change with one sort of decision. I was walking into the district office where I was teaching at the time, and I had finally decided that I was going to start a regular old curriculum and instruction master's degree. I had a check in my hand. I was ready to hand it to the district office. I put it on the woman's desk. And then someone who knew that I was a science person, someone that I had worked with that was at the district office said, oh, are you here to listen to the presentation for the STEM Masters? And I literally grabbed my check back off the desk <laugh> at the district office, and I walked down the hall and Colleen McGowan was talking about the STEM Masters for middle school, that they were starting at ASU that year.

Amanda Whitehurst (03:53)

And I was in the first group of teachers that started that program. And it's where I met so many of the colleagues that I still work with today. There were so much of the leadership that is currently in Arizona. Teachers of the Year, workshop leaders, are people that I met either in that first year of that master's program or who participated over the course of the three years that it existed. So it was just pure luck. And I am so grateful, because I had never heard of modeling. I had never taken a workshop and I was like, well, this sounds more interesting to me than curriculum instruction. We'll just give this a shot. And so I spent the next two or so years neck deep into modeling and everything that kind of goes along with that.

**Mark Royce** (04:53)

So the STEM Master's program at ASU introduced you to modeling, the idea of modeling? Through that program? Interesting. Yeah. Okay. And what year was that?

**Amanda Whitehurst** (05:04)

That's a great question. It's been a while now. I wanna say that was 2009.

**Mark Royce** (05:15)

Okay.

**Amanda Whitehurst** (05:16)

I could look it up, but sometime around there.

**Mark Royce** (05:19)

And the workshop you went to, you ended up going to a workshop after finding out about modeling?

**Amanda Whitehurst** (05:25)

So I actually have never attended a regular modeling workshop.

**Mark Royce** (05:30)

Oh, really?

**Amanda Whitehurst** (05:31)

I have been to modeling leadership workshops hosted by STEM teachers, NYC. But the entire master's program that was developed because ASU is the academic home of modeling. That's where it was invented. And so they have for a long time had a high school level physics modeling master's degree. But they had never done it for anything in the middle school area. And so that's what they were doing, so all of our math classes were taught, for example, thermodynamics of calculus for middle school, or the calculus of thermodynamics for middle school. I said it the wrong order. Or that kind of thing. Many of our classes were taught from a modeling standpoint or a modeling bent. Some of our teachers were modeling instructors, that kind of thing.

**Mark Royce** (06:32)

So in the, in the master's program, they taught you modeling techniques and methods?

**Amanda Whitehurst** (06:38)

That was the whole pedagogy of the program. Yeah.

**Mark Royce** (06:41)

I didn't realize that. That's very neat. Now, you had been teaching before that for several years before you went into that program. Did you continue to teach in the classroom or what happened then?

**Amanda Whitehurst** (06:55)

I did. When I started my master's program, I had been teaching sixth grade for six years. I had taught third grade and fourth grade before that, and then ended up in Phoenix. I had been in Tucson, and then I ended up in Phoenix, teaching sixth grade. And that was a lot of fun. But I decided I could no longer work at the school that I was working at. And I talked to one of the people in my master's program who is a middle school teacher, and she said, well, my

school is hiring for seventh grade science. And so then that's where I have most of my modeling experience is with those seventh and eighth graders when I taught there for the next couple of years.

**Mark Royce** (07:44)

Now, I'm curious, I haven't talked to a lot of middle school teachers employing modeling, but how would you characterize working in a middle school with modeling techniques as opposed to a high school setting? I don't know if that's something you can make a comparison to, but you've been doing this a while.

**Amanda Whitehurst** (08:03)

Sure. It's a little bit hard for me to say for sure since I haven't taught at the high school level. But I would say that there's a lot more scaffolding that has to go on in terms of getting kids to do that discourse and that dialogue. But there are fewer bad habits that you have to break from them from as well. So there's just a little bit more...There's still a little bit of joy left at being in the classroom. They're ready to give you the benefit of the doubt. Like when you come in and say, Hey, we're doing a cool thing today. And they're like, okay, maybe we will do something fun. I think that it's a real, I really love middle school. I think it's just a beautiful sort of perfect combination. They're old enough to really be independent, to really ask good questions and to have dialogue with each other, but they're still really open to, and excited about what you're doing. And everything's still kind of new for them. So, yeah.

**Mark Royce** (09:14)

That's really cool. My wife has mentioned to me several times that she wishes that all middle schools used modeling because when they come into high school, they've learned some, in a lot of situations, have learned some bad habits as you were mentioning. And she wishes they had been introduced to the modeling approach to teaching, you know, inquiry and all the, the Socratic kind of stuff. And, you know, those kinds of things is sometimes it takes kids in coming into high school a little bit to transition, where they can really hear what a teacher's saying that way. So, how would you characterize that modeling has influenced you and impacted you as a teacher since you started modeling?

**Amanda Whitehurst** (10:06)

I would say that modeling really gave me the tools to teach in the way that I'd always wanted to teach, but couldn't figure out how to implement effectively. I knew that I wanted to be doing all hands-on things. I knew that I wanted to have this dialogue between students. Deep down I had these goals for myself and for my classroom, but I could never really figure out how to get there. And I think what I realized after engaging with modeling was that one is that I didn't have a sense of the overarching storyline, you know, where we know where it is that we're going over the whole arc of an idea, of a concept, and so I think that's one of the things that modeling really introduced me to is like, these are the skills.

**Amanda Whitehurst** (11:04)

Because as an elementary and even into a middle school teacher, we are not supposed to be the experts in everything. Our information, our knowledge is supposed to be an inch deep and a mile wide. I have to know about everything, and that's what I enjoy. I really love doing that. But it also made it really difficult for me to know in detail the concepts that were all connected in the storylines for every single topic, you know, to really have the depth of knowledge to be able to put that together. I just didn't have it. And so I think that's one really big thing that modeling did for me. And then the other thing was seeing what it could look like. I didn't really have a picture of what I wanted that discourse to look like. I knew that I wanted it to be happening, but the steps to get there, and I think that pedagogy was really important in helping me say, you know what, I can modify for my students, or if it's a rough group, you know, we can do these things. But, but basically saying, you know, these are the basic skills that your kids have to have. And scaffolding them till they get to that point. Once, once they reach that point, then we can start really digging into topics.

Mark Royce (12:28)

I'm going to jump subjects a little bit here. I noticed in your bio that you helped found a thing called Arizona Cactus Caucus. I'd never heard of that. And it just was a curious name and I thought it would be cool for you to tell us a little bit about what that is.

Amanda Whitehurst (12:49)

Sure. Absolutely. So, a bunch of years ago at this point, while I was part of STEM Teachers Phoenix, Kelly Warble came to me and said, Hey, I am part of this program through AIP and AAPT, and we are funding STEM teacher leaders. We wanna help support people who are interested in developing their skills around policy and solving problems within their state that maybe need to have a policy level view. And so, from that fellowship that we did, me and five or six other teachers from Arizona, we did this policy fellowship. And through that we created this entity, this organization that was advocating at the Arizona legislature for funding for teachers. And what we did was we got a little over a million dollars for teachers to recertify in high-needs areas. And this was so needed in Arizona because Dr. Jane Jackson had been doing her own research, literally just having student workers call schools around Arizona and saying, do you have a physics teacher? And what she came up with at the time was that there were 159 left in the state.

Mark Royce (14:37)

Teachers?

Amanda Whitehurst (14:37)

A hundred fifty nine fifty nine physics teachers left for the entire state. And that is a shockingly low number. There are millions of students in Arizona, and that just basically means that students didn't have access to a physics teacher. And so what we were advocating for was saying, look, we have people who are in the profession. We know that we have a teacher shortage in Arizona, but maybe there are people who would be interested or excited about taking on something new, learning how to teach physics and re-certifying in this high-need area. And that kind of bloomed into kind of all of the high-needs areas. So there were like only 600 high school chemistry teachers left in the state at the time. So we basically expanded this program to be any high-needs area. So math, I think it even included CTE and special ed just basically are you interested in certifying in something else. And so we supported people with \$2,000 scholarships so that they could take college classes or whatever it is that they needed for that. And it was a program that lasted a couple of years, and it did end up changing our physics teacher numbers by about 20%, which we're very proud of.

Mark Royce (16:07)

Yeah. That's great. Wow. Yeah. That, that was a very surprising number. That's just really something. So tell me how you got from your master's program and teaching and now working at ASU with the STEM Acceleration project. Tell me how the journey from the teaching to this now.

Amanda Whitehurst (16:38)

Sure. So, you know, I really credit modeling and all of people that I met through there -- it's a direct line. It's a direct line for modeling to the program that I'm working on at ASU right now. So because I did this master's program, I met a person called Erin Conrardy, she's been on the board for AMTA in the past, and we worked together for several years. And she came to me one day and said, Hey, some people that I know just came back from a modeling workshop. It was Wendy Hehemann and Mina, and somebody else. So some folks had just come back from STEM teachers, NYC, they'd done some leadership training there, and they looked at STEM teachers, NYC, and they said, we need this in Arizona.

Amanda Whitehurst (17:37)

Why don't we have a STEM teacher's organization in Arizona? So they came back and they said, let's found one. And so, because I had been connected to these middle school modeling folks, I joined the board, that first year of STEM teachers, PHX, STEM teachers, Phoenix, and a lot of those folks from the middle school modeling. So, somebody I know that you've interviewed before, Christi Mendoza was a part of that and helped do workshops with us. So STEM Teachers, Phoenix began to grow and develop, and I was part of the board, and I just was sort of sitting and listening and absorbing and trying to figure out how this nonprofit space kind of worked. And I had some time to invest in it at that point because my first son had been born and so I ended up leaving teaching at that time. And so I became very involved in STEM Teachers Phoenix, and it was at our first conference that we did that then Kelly Warble, who has also been president of AMTA, came to me and said, let's go do this leadership policy fellowship in Washington, D.C. And I did that with Melissa Girmscheid, who's also been a president of AMTA and Jeff Hegesbach and Mike Vargas, and just a bunch of different people. And so we went and did that, and we created the Cactus Caucus. And then once the Cactus Caucus had been created, that kind of put us in the realm of some of these policy makers. And so when COVID happened, and we were seeing the impact that covid was having on the professional development organizations like STEM teachers, Phoenix, like the Science Teachers Association. And we found out about the state-allocated ESSER funds, which were from the Covid Relief Bill. And so what we did is we applied for \$10 million of COVID relief funding to the teachers that we saw when we were teaching, but also post-COVID, the needs that people had for training from professional development organizations, connections with each other, and stipends and funds for materials.

**Mark Royce** (20:19)

Tell us more details about the A-S-A-P, I guess it would be called.

**Amanda Whitehurst** (20:27)

Sure. Absolutely. It's very exciting. So, like I said it's a \$10 million grant funded through the Esser funds from the state of Arizona. And basically what we said was that if you don't have a teacher in a classroom, you can't impact students because all of those funds are going to help reduce learning loss from the pandemic. And we said, if you don't have a teacher that understands STEM fields, then you can't make any progress in STEM learning loss. And so we invited teachers to apply, and we worked directly with teachers because we certainly didn't want this to be just one more thing that a district asked teachers to do. So we asked teachers to apply and said, we will pay you a really nice stipend, so we pay people \$5,000 for their participation. And then another \$2,000 on top of that for materials that they can use to buy stuff for their classes.

**Amanda Whitehurst** (21:37)

And for that, we said, we would like you to participate in 30 hours of professional development. We want you to give us four of your best STEM lesson plans. Please make them transdisciplinary. So not just science, not just math, not just engineering, not just technology, but something that has at least two of those letters in STEM, and then do a project or a lesson, or lessons or something in your class. Give us some sort of impact on your students. And the thing that this level of funding has really done for us is it has allowed us to support just a huge number of teachers. So we had about 500 teachers our first year of the program, and now in our second year, we have about 400 teachers. And the impacts across the state have just been insane.

**Amanda Whitehurst** (22:36)

We impacted almost 90,000 students in our first year. We don't have the numbers yet for the second year, but we hear stories of supporting teams that are going to competitions or creating school-wide programs where one person has said, I'm not gonna just impact my class. I'm gonna do this aerospace unit and I'm gonna do it with the whole school, or all kinds of amazing things. So teachers are really the main focus of the Arizona STEM Acceleration Project. But it's not the only focus because we also come from this professional development space. That's what STEM Teachers Phoenix was doing for those years before I started this. And we know that if teachers have connections to each other and they feel supported, that they're more likely to stay in the profession.

**Amanda Whitehurst** (23:42)

And so our PD organizations are really imperative for that. We didn't wanna create a bunch of new PD because there's so many great organizations and people who are already doing it. So we partnered with, I think now we're up to 26 organizations. AMTA is one of them, STEM teachers, Phoenix is one of them. But we're also partnering with like Maricopa County, which is where Phoenix is located. The air quality department where our fellows are writing lessons for them. We have another rural group that is partnering with our national and state parks, and they're rewriting the curriculum for some of our state parks, stuff that hasn't been updated since 1998. They're redoing stuff for them. So we've partnered with all of these organizations and it's really given us the ability to connect our teachers. All of these teachers who, many of them had no idea the amazing work that goes on in our state with professional development. They'd never connected with the science or the math or the technology teachers associations or, they just didn't have a community of people to support them. So we're really creating this ecosystem that allows teachers to find a home that they connect with. And it allowed our nonprofit PD organizations to really find a new group of teachers that maybe they hadn't been able to reach out to before.

**Mark Royce** (25:14)

Let me ask a quick question. The teachers that you guys are influencing that are coming into the project, are these teachers that are already STEM teachers? Are they coming from other backgrounds? Or who are you influencing here?

**Amanda Whitehurst** (25:30)

That's a great question. So we did not require that the people who joined our program were specifically STEM teachers or taught in a siloed STEM classroom. We have a few very intrepid art teachers, social studies teachers, language arts teachers who said, I wanna be able to bring STEM into my subject area. Although I will say that most of our teachers are science, math, technology teachers, who just wanted access. And it's so interesting because so many people talk to us about how they have never had professional development like this before. Like, this is amazing. And that makes me so sad because there's so much great stuff that's out there. You know, every single time I talk to teachers, I'm like AMTA changed my life. You need to understand the power that professional development has on your entire teaching philosophy. And if you've only ever experienced that kind of PD from your school, which is, hit or miss at best.

**Mark Royce** (26:47)

Yeah. Well, the schools don't know either.

**Amanda Whitehurst** (26:52)

They don't know. Absolutely.

**Mark Royce** (26:53)

Yeah. So, the key, it seems, is getting people to be aware of what is available. How are you guys marketing, if you will, if I can use that term, "marketing," getting people aware of what you are offering?

**Amanda Whitehurst** (27:15)

So we have a website, but really one of the things that we tried to do is we just tried to reach out to the existing networks that we were aware of already in the state. So we reached out to the four main universities in Arizona, which is a huge deal. We like to say that this is the only project that we know of that all four of the universities are working together, that they're playing nicely together on. So, we reached out to folks in different parts of the state. We reached out to the teachers organizations. We reached out to these existing networks. And then we reached out to some of the county schools offices. And some counties were very excited with what we were proposing to do. And they said we have a list of teachers, we'll send it out for you.

**Amanda Whitehurst** (28:14)

And so they helped to promote it as well. They said, we'll just send an email blast to all of our teachers. And so we just tried to utilize some of the networks. And then at the end of the day, we really just started cold emailing school districts. And saying like, Hey, can you share this with teachers? And so often, schools and school districts and principals will act as gatekeepers in an attempt to filter out stuff that's not quality, but it ends up filtering out just so much. And so I don't know how much of that made it through, but we certainly did it to the point where in rural areas, because this is a statewide project. So we have fellows in every county of the state, and fairly proportionally as well.

**Amanda Whitehurst** (29:09)

So at a certain point, we just would go to a school district's website and look up anybody who taught one of those STEM letters. And we just started emailing them as well, saying, look, this is an opportunity for you. Join us. And so we had, I don't remember the first year, but I think the second year we had 900 applicants. For 400 spaces, which is painful, but really encouraging because it says that there's a desire, there's a hunger for this connection, for this support, and for this type of program.

**Mark Royce** (29:48)

So you had 400 slots available. What would make a difference to have more, to be able to accommodate more? What would be the thing needed?

**Amanda Whitehurst** (29:59)

Funding. Funding is really the thing when you're talking about 400 fellows or 500 fellows, you're talking about just an incredible amount of logistics in terms of payments on the backend, in terms of tax information. And we ran into a very interesting problem, an unknown unknown, that a very significant percentage of the teachers teaching STEM subjects in rural areas in Arizona are not US citizens. They're here on visas and they're here for five years or less. And you can't pay them directly. That's illegal. But we also knew that those students needed the support. They needed their teachers to have this training. They needed these materials in front of them. So figuring out how to provide that in a way that could still reach those students and those teachers at those schools that have such a need, that was really difficult.

**Amanda Whitehurst** (31:10)

I would say, it takes people and it takes funding in order to pay teachers these stipends because, one of the values of this project is that so much that teachers do, and so much the professional development organizations do is for the love of students. But that always ends up to mean they're doing it for free. And one of the values was that your time is worthwhile and you deserve to be paid for your time.

**Mark Royce** (31:46)

Yeah. Your funding, did you say it was for three years? Originally?

**Amanda Whitehurst** (31:53)

It was originally we had written the grant

**Mark Royce** (31:56)

And is it gonna renew or extend, or do you have any news on that front?

**Amanda Whitehurst** (32:03)

Great question. It was originally for three years. But then because of the grant process, they came back and they



said, actually it's two. So, 'cause we were gonna do 300 fellows a year for three years, because we had the funding to do 900. So then we decided, well, if we've got two years, I guess we'll just, what's another 200 fellows on top of what we were gonna do already? We'll make it happen. We're teachers, this is what we do. But that is all COVID relief funding. And so every single dollar from COVID relief funding has to be spent by September of 2024, or else it heads back to the federal government. It doesn't even go back to the state of Arizona. So, that's a thing that a lot of conversations of people who are kind of in this space have been having is there is a fiscal cliff coming in September, not just here, but all across the country that a lot of organizations that applied for those lesser funds are gonna be running into. But, we did think in terms of sustainability from the beginning. It does take time to write grants and to talk to businesses and explore public-private partnerships and do all of these things. But, those are things that we've been doing from the beginning to try to find a life for ASAP after September of this year. And we have some tentative success. Things are still in motion, still in flux, but we think that there are gonna be a couple of opportunities for grants and for funding from businesses to help continue this program, unfortunately, at a much reduced scale for the time being. But we have all the infrastructure. If someone is ready to pony up, we can ramp right back up. So that's, that's great.

**Mark Royce** (34:13)

It just sounds like the work you're doing is awesome. And it's really, gosh, you said already 90,000 students impacted 900 teachers trained and equipped. I mean, this is really great work. You're pretty much focused on the Arizona State area, so your influence is primarily there, but this sounds like a program that could really be effective and helpful in other places as well. You know, I don't know if you have any words of encouragement or for people living outside of the Arizona area.

**Amanda Whitehurst** (35:00)

I do. One of the things that has kind of been the goal for my partner, Mike Vargas, and myself since we have participated in the Cactus Caucus, was that Arizona needs some form of STEM action center. And all of the other states around us in our region actually already have one. And there are some states that are actually already focused on this kind of thing. Supporting teachers, Idaho, New Mexico, Nevada. I think California has one as well, although I'm not as familiar with theirs. Tennessee, I think Alabama is just about to start their own, or at least look into more ecosystem development. So it's an idea that's out there. There are templates. So if people are interested in the policy space, kind of looking at these big ecosystem-wide changes, there are templates out there if you're looking to start one for your state.

**Amanda Whitehurst** (36:07)

But it also means that some people in other states, if they have a STEM action center or equivalent, they can connect with them and say, this is a professional development that is research-based and proven, and it impacts teachers and students. And I would love to see modeling, partnering with those STEM action centers more to provide some of that professional development. You know, they are providing the funding so that the teachers can be there. But we can reach other teachers. And I think that would be something that I would really love to see happening more across the country.

**Mark Royce** (36:58)

Yeah, that's great. That would be wonderful. Well, time flies and my goodness, I can't believe that our time is up already. It's been awesome talking with you, and, hearing your insights and the work that you're doing. So Amanda, is there anything else you wanna share with us before we go about the STEM Acceleration Project?

**Amanda Whitehurst** (37:25)

Sure. There's three parts of ASAP and I've already talked about the teachers and the professional development partners. But the third bucket is really the research that we're doing. And what we find is that so much of the data that we have about how things are going in our state, in terms of access to STEM teachers or, the number of de-



grees that people have, all of these things, it's all pre-COVID. So 2019 is sort of the most recent data. And so really we're trying to give kind of a snapshot of how things are going in the state so that we can use that as we talk to policy makers and as we talk to funders and say, these are the needs. This is what it looks like on the ground right now, so that we can talk specifically.

**Mark Royce** (38:24)

That's important research. And I'm sure you guys are gonna gather a lot of information that will be very helpful to others as well. Maybe there's some like billionaire that's listening to our podcast and he can help make sure this keeps going for the next few years.

**Amanda Whitehurst** (38:43)

That would be good. We would be excited to speak with anyone who has an idea for a funding opportunity.

**Mark Royce** (38:50)

Yeah. That's great. Well, thanks again and you take care of yourself and hopefully we'll see you around in the whole modeling community.

**Amanda Whitehurst** (39:00)

Oh, I look forward to it. Thanks.





