Science Modeling Talks

Episode 73 - "Modeling in the University, The State of Modeling and Teacher P.D."

Guest: Matt Oney

Mark Royce (01:00):

Hi, Matt. How are you doing today?

Matt Oney (01:03):

I'm great. It's good to be here with you.

Mark Royce (01:05):

Yeah, I'm really happy that you're able to meet with me today and chat about all things modeling. It's gonna be a fun conversation, I think. I'm looking forward to it very much. So, let's just jump right in, and I'm gonna ask you, how did you first get introduced to the modeling instruction?

Matt Oney (01:26):

Yeah, so my original training was in plant molecular biology, and when I was finishing up my graduate research, I was looking for new opportunities and got my teaching certification. And one of the things in Michigan was that you could get these certifications that were integrated science and they're kind of a blessing and a curse. The blessing at the time was that it allowed me to apply for positions that were outside of the biology content area. The other side of that is that if I got a position that was outside of that content area, I needed to be able to teach it as well. And getting into teaching later in life, it had been more than 10 years since I had taken a physics course. And so when I got this position as a physics and chemistry teacher, my first year teaching physics was a nightmare. And it was mostly due to my lack of preparation in understanding what developing a physics curriculum looked like. And I just so happened to go to a conference with my district and the Michigan Teacher of the Year at the time, I can't remember their name, but Gary Abud actually was his name.

Mark Royce (02:44):

Oh, yeah. Yeah.

Matt Oney (02:45):

... was into modeling, and he was promoting modeling workshops as part of his acceptance speech of being the Michigan Teacher of the Year. And it just so happened that there was gonna be a physics workshop near where I was living at the time, and I knew nothing about modeling. And actually, I want to go back just a little bit. During that year when I was really, really struggling to teach physics, I was watching an episode of Myth Busters. And I thought to myself, I was like, what the myth busters are currently doing of just like taking these general curiosities that they have about the world and identifying ways that they can answer those curiosities. I was like, that's what I want my students to do. But I had no idea how to do that related to physics. And so, I saw this physics workshop as kind of a lifeline for me. If I was gonna continue teaching physics, and within minutes, like during the first lab that we were doing as part of that workshop, I could see right away that this is what I was really hoping for in terms of what I was

gonna be as a teacher.

Mark Royce (03:58):

That's really cool. When did that happen? What year?

Matt Oney (04:03):

That workshop was in 2015.

Mark Royce (04:06):

Okay.

Matt Oney (04:07):

Yeah. So it was my second year teaching. My first year of teaching was at a different school, and I taught biology, which I was very comfortable with doing, and had great mentors in terms of helping me come up with good inquiry-based methods of teaching that. But when I got to this new school, I was the physics teacher. There was nobody else. And so I didn't have that type of mentorship to help me in developing a real good curriculum. So going to that modeling workshop changed my life completely.

Mark Royce (04:45):

So that was 10 years ago. When did you move from high school teaching to the Michigan State University?

Matt Oney (04:55):

I got both of my master's degrees from here at MSU and always maintained relationships with many of the people that I had worked with, both in natural science where I got my master's in plant biology and also in the college of education. And I would periodically, like right after I got into modeling, I thought to myself, I need to share this with as many people as I can, <laugh>. And so there were a lot of alternative certification programs similar to the one that I had gone through at MSU, and I just would continuously reach out to them and say, Hey, I've got this idea for a workshop with your alternative education students. Is there, you know, is there a time that I can come down? So what I really started to get involved with was learning how to deliver professional development. And when there was a position opening here at MSU, a faculty position in training science teachers. And that was in 2020. And so I applied for that position. And yeah, I've been here since 2020.

Mark Royce (06:09):

You mentioned professional development, that you love to see that kind of be increased and, and evolve. What other focus do you have at the university there? What are your primary?

Matt Oney (06:21):

Yeah. So my primary focus, it's changed over the years. When I was first hired, I was hired as a teaching professor, and I taught mostly courses related to preparing future science educators and also some non-science majors courses. As time has gone on, I'm still teaching courses related to science education students. So my primary teaching focus is related to preparing future middle and high school students. And everything that I do iis based in modeling instruction. And I have a small little focus. We offer a certification in college teaching program here for graduate students. And I am the college coordinator for that. And then also teach the course related to that. And then we're very fortunate here at MSU that we have an endowment that charges us with providing professional development for Michigan science teachers.

Matt Oney (07:29):

And I've, over the years kind of became in charge of that endowment as well in developing professional development workshops for teachers. So in the summer of 2024, we did a modeling physics workshop here. We've also, I, uh, developed these nifty little paper airplane launchers that we invite teachers at all levels, so K-12, to come in and be introduced to our paper airplane launchers that we've developed, and then also the curriculum that we've developed with them. And then we've done some data analysis and interpretation workshops as well, bringing Michigan math and science teachers in for those workshops.

Mark Royce (08:19):

Wow. So modeling instruction is really at the core of what you're doing, even at the university. That's kind of, I was surprised when I read your bio and your focus at the university, I didn't realize how much modeling instruction was infused in what you're doing there.

Matt Oney (08:37):

Yeah. I mean, you can take, I guess maybe the modeler out of the high school classroom, but you can, or you can take the, you know, that whole thing. But modeling, anything that I ever teach again, will be absolutely rooted in modeling. I mentioned earlier that sometimes I teach these, there are non-science majors courses. So like, if you're a business student here at MSU, you still have science courses that you're required to take as part of your degree, or if you're any kind of a non-science major student. And, sometimes these courses can have upwards of 200 students in them. And everything that I do is based in modeling with those students as well. And sometimes my colleagues are like, how can you do this? And I don't think it's anything special necessarily about me, it's just, it's special about the training I received as a modeling instructor. And it's it's something that I try and share with my future teachers and also my future college science professors as well that I work with.

Mark Royce (09:47):

You know, my wife comes from the high school focus, you know, and so I kind of get how modeling instruction works in a high school setting. Give us some examples of how you use modeling methodology in the university setting.

Matt Oney (10:06):

So, for large classes, like the ones I was describing earlier, I, still will...I'm always the kind that will ask for forgiveness instead of for permission. And so I've had no problem bringing things into my classroom where my students can authentically ask questions and develop methods to answer those questions. So one example I have previously taught an organismal biology type of course. And basically, and again, it's for non-science majors. And my focus for that course when I developed it was on antibiotic resistance. And one of the questions that my students asked was, where can we find bacteria or microbes in our environment? And so I said, well, I can't answer that question for you. We need to figure this out.

Matt Oney (11:04):

So we learned about different techniques of how we can collect bacteria, and I brought Petri dishes into the classroom and asked students to go and swab various different surfaces that they were interested in, to find out where we can collect bacteria from. And, you know, the interesting thing, after all the years of doing that, I haven't taught that course in a couple of years, but in all the years that I did that, I mean, I had thousands of students swabbing across campus, and there was only one place that we ever got a clean Petri dish that nothing grew on it. And, and that was the ceiling of one of the rooms, didn't --When they swabbed it, there was nothing that grew on the Petri dish. So yeah, I mean, for the non-science majors courses, those are the types of things that, -- I think what modeling has really ingrained into me is the removal of me as a, as a speaker of knowledge. And more so, a facilitator of figuring out ways to learn about the questions that my students have. As a preparer of future science teachers, I mean, really what I am is I'm just a workshop leader as my full-time job throughout the year. You know all of my

courses are in preparing students to develop curriculum, and deliver instruction for students in a way that is engaging. And everything that I've done is the things that I've learned in modeling workshops.

Mark Royce (12:49):

That's wild. I have, this just popped into my head, this thought. A lot of modelers use whiteboards in the classroom. Is that anything that you've ever used in the university setting?

Matt Oney (13:02):

I don't go anywhere without my whiteboards. So, you know, when I've talked about these large lecture courses that sometimes I have to teach, I'm toting whiteboards across campus and, you know, my back hurts afterwards but I don't go anywhere without whiteboards. I was invited to speak. We have a packaging engineering program here at MSU and a couple of my graduate students that are in that college had invited me to speak to their faculty. And I showed up with my whiteboards to that. And, immediately after just a couple of minutes, the director of that program was motioning to their expert builder or whatever. And was already saying, okay, we're gonna have all of our classrooms outfitted with whiteboards. Now, some of the newer buildings that we have on campus are really nice. The tables are whiteboards, and they can be flipped vertical. The rooms are completely lined in whiteboards. And so I didn't have to carry my whiteboards there.

Mark Royce (14:08):

Wow.

Matt Oney (14:09):

But yeah, if I'm not teaching in my building, 'cause my building I have all of my made whiteboards that I always have used. But if I'm not teaching in my building, I'm carrying whiteboards across campus with me.

Mark Royce (14:24):

That'd be a big stack with the size of your classes, I'm sure. Wow. That is really cool, man. So I assume that when you're teaching future teachers, students who are on a education path, you encourage them to learn about modeling instruction, take a workshop. Is that the kind of thing?

Matt Oney (14:46):

Yeah, I mean, essentially what we're doing in a semester is modeling workshops. They're basically going through modeling workshops. The only unfortunate thing is I just don't have the amount of time to do what you can actually do in a full workshop. So what my students will do is all the paradigm activities that are included in the physics mechanics curriculum, the chemistry one curriculum, and the biology curriculum from modeling. But what I'm not able to do is all of the deployment activities that are included in, in those modeling instruction curricula. So, I miss that about being a high school teacher, is being able to go through the full thing and seeing everything. And sometimes it feels a little bit rushed, but, yes, absolutely, everything that we do is modeling based. I don't know any other way to do it. And everything I do is encourage my teachers as well to continue investigating modeling instruction and come back and do workshops with us once they get into the classroom.

Mark Royce (16:11):

Do you have a sense of how many of those students actually pursue modeling after they leave your courses?

Matt Oney (16:17):

So when I did my physics workshop two years ago, I had two of my former students that attended that workshop. So I can say that much, you know? As an early career teacher, I remember that you're having so many things thrown at you. And so, you know, I'm able to keep in contact with a small number of the teachers that I've worked with,

but unfortunately it's just, they're so busy and, and, I always make myself available to them. But I'm not able to get that immediate feedback on how many of them are using modeling instruction. But one thing that I often will get is emails from my former students saying, Hey, I wish I would've downloaded more of the materials when I was in your course from our online site.

Matt Oney (17:09):

Would you mind opening that back up for a couple days so I can get access to some of the, the materials that we did in your course? And, and so I will get those types of questions sometimes. And, and I have built a course pack for my course, a physical and a digital course pack that-- I'll see if I can grab one real quick. But, you know, in the course pack, it's a laboratory manual sort of, I guess in, in the vein of modeling instruction. So I've got like my white-board templates that are, you know, that I want whiteboarded for them when they're doing my personal activity, but I put it into the course pack as well, so that when they are going out and teaching in a couple of years, they've got that example from when they did my course to be able to use when they're in their classroom teaching

Mark Royce (18:04):

In Michigan, how prevalent is modeling instruction across the state in high schools and other, you know, middle school, universities, and do you have connection there as well?

Matt Oney (18:17):

So I would say that, five years ago or just before the pandemic, so the state of Michigan had a grant to do modeling instruction workshops across the state, and we were doing 10 or so workshops, at least across the state of Michi-gan every single year. And once that grant ran out, then workshops in Michigan kind of died essentially. I think that my workshop might've been, when I did it in 2024, might've been one of the first workshops in Michigan in many years. I think that, there's a couple of things, little intricate things with that. And, one of the things with modeling is that I think a lot of times we sometimes think, I've gotten my training in modeling, I never need to go back. Right? And so when we did this massive push all across the state, I mean, from south to east to west to north, there were workshops all over the state of Michigan.

Matt Oney (19:24):

And, you know, the workshop that I went to was in, in the upper peninsula of Michigan. And so they were, they were far and wide across the state. And so we did kind of saturate the state of Michigan, which is an amazing thing because there are so many teachers in the state of Michigan. I attended a workshop at our science teachers confer-ence in 2018, and it was just modeling, you know, teachers that had attended modeling, and there were probably 500 teachers in this room. And so there were a lot of teachers that got trained in modeling in Michigan, through that grant. And then that grant ran out and the heads that were kind of administering the grant and big parts of that didn't have the funding to continue to support it. It was great. I mean, it paid for mileage, it paid for hotel rooms for attendees. It paid stipends and things like that. Which is a huge, huge cost as I know now as I've been doing professional development here at MSU. And I have a massive passion in modeling instruction, but one of the things that I've also found over the past couple of years is that teachers are less willing to give up their time during the summer as they once were to attend three-week workshops.

Mark Royce (20:50):

Right.

Matt Oney (20:51):

We had enough money to host 24 teachers last summer when I did it, and I think we had 12. And so I'm finding it harder to get teachers to attend. I think that one of the things that could, you know, now that we've had a little bit of a lull of workshops in the state of Michigan, that if we do pick it up here again in the next couple of years, that we'll get full workshops again. So we'll see if I am able to continue doing workshops here at MSU, I would love to.

Mark Royce (21:29):

I think the loss of grant money is an issue that goes beyond Michigan. I think it's countrywide. The financial and time demand to do the workshops on teachers, especially since the pandemic, it seems it's really hard to get people to want to go somewhere for two or three weeks. But do you have insights that you could share that you think would help us to better, you know, get people involved in the workshops to get 'em there?

Matt Oney (22:07):

Yeah, I think it's, it's on kind of some of us that have been involved in various capacities to take on a little bit of that responsibility to share our experiences in as many ways possible. And to encourage our peers, especially those that are coming into teaching at in these moments to attend workshops. I think it's also kind of a big responsibility of us that have done workshops and can do workshops in the future to think of creative ideas. And I understand, two-week workshops and online workshops. And things like that is, is coming up with additional, possibly creative ideas to encourage and to incentivize teachers to attend workshops.

Mark Royce (23:04):

Yeah.

Matt Oney (23:04):

To be completely honest with you, I don't know what those ideas always are but I'm willing to sit down with others to discuss some of those additional ideas. I think a lot of us might say that we can do these online, and distance learning things, but I think that we would prefer to be in person. So how can we develop workshops that are maybe, and I know we've done some hybrid distance learning and in-person workshops. To keep this going.

Mark Royce (23:44):

Yeah. I've heard from many, many workshop leaders that the face-to-face workshops just seem to have more import and impact on the attendees. Yeah. It's definitely a challenge these days and that, you know, we just gotta keep addressing and, and planning. And I love what you said about being creative in how we approach and promote people attending the workshops.

Matt Oney (24:15):

So one of the things that I talk to my students about often is when you get into the classroom, you have a massive, massive responsibility as you're leading a classroom that is intended to be inquiry based science. I mean, I would argue that all subject matters should be inquiry based and that our students should be learning through their own curiosities, because children are naturally curious about all of these subjects. Right. I think that whether it's history or science, they're naturally interested in why things are the way that they are. And what I tell my students frequently is that we have a huge responsibility not to kill that curiosity and to cultivate that curiosity and to facilitate opportunities for our students to maintain that curiosity. And I've worked with amazing, amazing teachers over the years, but I do also know that while I was still in the classroom as a high school teacher, I worked with a lot of people who unfortunately killed their students' curiosity.

Matt Oney (25:33):

And it wasn't necessarily in the sciences, it was in other subject areas as well. This work is, I tell my students all the time, after attending my first modeling workshop, I never really had any classroom management challenges. My students were engaged in the work that we were doing. It doesn't mean that they absolutely loved it or that they thought it was the coolest thing in the world, but they were engaged. And engagement is learning. Learning is not necessarily, fun. It's challenging, but it's engaging. And we have such a huge responsibility to make sure that we are not killing the curiosity of our students. And modeling instruction is an absolute avenue to making sure that that doesn't happen as long as it's implemented with fidelity. And the easiest way to make sure that you're implementing

it with Fidelity is to attend a workshop and to commit to that curiosity yourself as a teacher when you're attending that workshop.

Matt Oney (26:46):

And, so I think that it's of high importance that we continue identifying ways to get teachers engaged in attending modeling workshops. It is by far the best mode of instruction. And then even better than that is the curriculum themselves. The amount of time that those pioneers of modeling have spent in developing these curriculums and modifying where they've identified gaps, along with the pedagogical approach of just teaching in this particular way is the best thing out there. There's a lot of good stuff out there as well that teachers can use. But attending workshops and going through curriculum, flipping back and forth through that student and teacher mode, there's just nothing like it. And I have not seen anything that's as good.

Mark Royce (27:51):

So let me ask you, a lot of teachers, you may not be aware that they are killing curiosity in their approach. How would you caution someone who may be doing that against, what are the things that they're doing they may not be aware of, that is killing their students' curiosity?

Matt Oney (28:15):

Well, I think the biggest thing that most educators do is that they fall back on what is comfortable for them. And it can be uncomfortable to give the thinking over to your students and to allow them to drive the thinking in a classroom. And so I think that a lot of times when it gets difficult for us, we fall back on what's comfortable. And we know that we can make a slide deck that describes the various force laws and we can just deliver that. And so I think that that's what ends up happening, is that we fall back on what's comfortable for us, instead of getting comfortable in the uncomfortable of allowing our students to drive the learning through their curiosity.

Mark Royce (29:17):

Yeah. That's good. You kind of touched on this, but I'm gonna ask you, how do you view the current state of modeling instruction and professional development these days in the US?

Matt Oney (29:32):

So I did some workshops this summer, in the upper peninsula of Michigan. And one of the things that one of the attendees had told me is, this is the first in-person workshop that has been offered to me. And so I think that our accessibility increasing around video and attending professional development in those ways is something that is almost a barrier to networking in an authentic way. So there's a trend definitely that I've seen in terms of just not having professional development be offered face-to-face. And I think sometimes, again, we're comfortable these days just in showing up on our screens and showing up on our computers. And a lot of times I think that we wonder like, why do I actually need to be in person for this? And in some instances, you don't necessarily need to be in person for meaningful discussion to happen.

Matt Oney (30:45):

But I think related to professional development and to thinking about a student-centered classroom, it's a difficult avenue to mimic what's happening inside of a classroom. And so I think that if we really want peer-to-peer communication to happen in an organic way in which it does inside of our classrooms, it needs to be modeled in the professional development that we're delivering and receiving as well. So, I'm committed. With the endowment funding that I have, I am not offering any virtual professional development. Our stuff is all in person and, we either go to different places across the state or we invite individuals here on campus. And we will continue to do that, as we continue developing different workshops. In terms of modeling instruction, yeah. I think we've talked a little bit about this already and the state of modeling instruction.

Matt Oney (31:57):

One of the things that I did early on in my career is, and I don't know if this is still the option, is that AMTA had a lifetime membership and I became a lifetime member, which was a little bit more than doing the one-year membership, but I wanted to make sure that I was always able to access the newest materials. And so I think that, on top of one of the thing, you know, some of the things that we described earlier in terms of membership, is that we need to encourage membership as well. And the other thing that I might also say, and I hadn't thought about this until just now, and I don't know what the visibility is of AMTA at local and national conferences, but I think that there might also be some things that we can do in that space as well in terms of creatively thinking about workshops that we can offer at local and national conferences.

Matt Oney (32:57):

And then also, maybe offering AMTA memberships at discounts for attendees of these different workshops that we might do. And I think that, you know, I'm pretty sure here in Michigan, if we had an AMTA booth at the Michigan Science Teachers Association conference and had somebody run an abbreviated workshop at one of the, for the conference or overview maybe. Enough to get 'em wanting more. And then letting 'em know that, Hey, we've got a full two-week workshop that you can do. And maybe that's something I can come up with here for teachers in Michigan as well.

Mark Royce (33:48):

That'd be great. That's a really good idea.

Matt Oney (33:52):

I guess one other thing is I think that, one thing that we might be able to do, in terms of AMTA is identifying and, coming up with ideas for other partner universities. And researchers that are in the science education space to think about how we can continue offering workshops and evaluating the effectiveness of modeling instruction. I think that that would be... and the other thing is that we could really use some good stuff for elementary schools as well. I mean, my kids are... My, oldest just got into middle school but so I've seen six years worth of elementary education come through. And I think that it's good. And some of my children's teachers have done amazing things.

Matt Oney (34:57):

But I think that it would be an area that we could, if we could develop some really good curriculum and then also modeling workshops around that curriculum for elementary teachers, I think that that's something that would really benefit AMTA, modeling instruction, and also science education, because I know that there's a massive focus in elementary education on math and literacy. And if we can find a way that those things are delivered, that the math and literacy is delivered, with science in mind and thinking more about math and science literacy and developing curriculum related to that with a model modeling pedagogy, I think that that would be amazing. So, and I think that the one way that we could really be able to get that to happen to come full circle on this is by partnering with other higher ed institutions that have graduate students and postdocs that are looking for projects.

Mark Royce (36:12):

Yeah. That's great. Gosh, Matt, it has been a real pleasure to talk with you today. And I really appreciate your insights and I am so glad that you were able to share with us. So I look forward to seeing how your career grows and the influence that you're having. I think it's awesome that we've got you as an ally in the modeling world. It's really cool, man. So I just wanna say thank you very, very much for spending this time with me today.

Matt Oney (36:47):

Well, I really appreciate the invite. I do have to tell a quick story is when you called me, to see if I would be on this, my youngest daughter who's eight overheard the conversation. And when I told her what the conversation was

about and that you, you wanted to have me on the podcast, she said, so you're gonna be famous then, because everybody's gonna be able to hear you talk. And so, there will definitely be an 8-year-old that'll be listening to science modeling talks. I appreciate what you're doing so much. I enjoy listening to all these episodes. I'm obviously a subscriber to it. And just hope that I did it justice, so thanks for your role. I appreciate it.

Mark Royce (37:32):

Oh, thanks Matt. That's cool. I don't know how famous we are with this little podcast, you know, but I think it's important for modelers to share with modelers. 'Cause sometimes, you know, especially some that are in rural areas and something like that, you can feel isolated. And hopefully we're helping to dispel some of that sense. Thanks again, Matt, for joining me. And I just wish you the best in your endeavors at Michigan State. That's awesome that you're there. I love what you're doing there. And so I just really, really wish you all the best.

Matt Oney (38:08):

Thank you so much. I really appreciate it.

Mark Royce (38:11):

Okay. You take care.

Matt Oney (38:12):

You as well.