

Mark Royce (00:00):

Hi, Frank. How's it going?

Frank Novakowski (00:01):

Hey, great to be here. How are you doing?

Mark Royce (00:04):

I'm well. I'm doing well. So I'm excited to talk to you about the things that you're doing in the modeling realm in your classroom, in the extracurricular things that you're doing that support modeling and encourage science teachers. So let's start by you just telling us a little bit about you and where you are teaching and what you're teaching and how you're approaching it.

Frank Novakowski (00:36):

I live in Illinois, in a suburb of Chicago. Roselle is the town that I teach in high school is Lake Park. Took a position of, it's kind of like a department chair, but we call it something different. It's curriculum leader at Lake Park and previously taught at Wheaton Warrenville South for 21 years. And that was kind of where I got my start in modeling, taught with Jim Stankevitz for several years. And I know Phil Culcasi has been on your program before here and he's really been instrumental in getting a lot of teachers in Illinois trained with modeling instruction. And and so that was where I started. I took a physics workshop, I believe in 2003, was the first one, and then I took a second one, and then the biology materials got released.

Frank Novakowski (01:50):

As soon as I found out those were released, we were able to get a workshop. And then I started using the biology materials the following year. I had already taught physics for a couple of years, and so was familiar with using modeling instruction in physics, but was very excited about the biology materials and how we could take those strong student-centered approaches that were developed and apply them in biology. And so that's where I'm at now. I am teaching biology to freshmen and providing training and resources to teachers at the school I teach at now. I've also been very fortunate to participate in a lot of modeling workshops, lead a lot of modeling workshops. Florida - FIU has a strong modeling program there. And I've been to individual high schools that just want workshops for their own school. I've been to universities like FIU and Cal Poly. So it's been a lot of fun. It's been great meeting just so many teachers that really care about science education, and that's why they're there. They wanna promote science education and develop their curriculum in the most student-centered way possible.

Mark Royce (03:39):

Tell me how, when you got introduced to modeling instruction, how did it inform your teaching and how did it change your approaches, or did it, you know, and then I also want to hear about, maybe there's a second question that about how the biology materials have impacted your teaching in the classroom. So first, just how modeling has informed you, and then biology.

Frank Novakowski (04:08):

So I went to the University of Iowa, and my degree is in science education, so it was specifically a science teaching degree, and the program there was highly inquiry-based, I mean, every methods course, all centered around inquiry-based instruction. And so modeling was not, you know, a stretch for me at all.

In evaluating my own teaching, the biggest weakness I felt like I had was connecting topics to each other. And also in the sense that I thought that that was, you know, part of my job. Well, I have to show students how these things are related and how they're connected, right? And so, taking that first modeling workshop, really, you know, as the phrase goes, opened my eyes to a couple of things where, number one, the connections are really important, right? How are these things related?

Frank Novakowski (05:28):

But also, guiding students through the process of making the connections, right? The onus is on the student. Okay, how does this connect for me based on my prior knowledge as a student, right? Not as the teacher. Well, I have to prove to them how these things are related. So those were kind of the two key things that I picked up. And that changed for me. And then, when the biology modeling materials came out, you know, I mentioned, I jumped in on those right away. And so one of the things that we've talked about in workshops is, hey, if you're going to, if you're gonna do modeling don't dabble, and like, okay, well, I'll try it for a little bit, or maybe I'll do it with this unit, right? It's, it's to dive in and do, do the whole approach, take the binder and just go through it.

Mark Royce (06:41):

Hmm.

Frank Novakowski (06:41):

And then as you do that, you start to understand how the materials were put together, right? How the units are aligned to progress, right? What kinds of connections your students are gonna make

Mark Royce (07:01):

Mm-hmm. <affirmative>.

Frank Novakowski (07:03):

And then you can start to tweak to make it work for your specific situation or your group of students and make it fit their needs and, you know, make it fit a little bit of your own personal teaching style as well. Yeah. And, and so that's what I did. I, I just, we did the binder straight through, and then started kind of exploring the ideas of, okay, well, why does unit two come after unit one? And is there, is there another activity that we could do that would help students make the connection between unit two and unit three, or whatever the case may be.

Mark Royce (07:52):

Yeah. So you've been using modeling for about 20 years now, but at some point you started actually teaching workshops. How long have you been doing that?

Frank Novakowski (08:07):

Uh, I think the first biology workshop that I ran was in 2014. And that was at Wheaton Warrenville South. And then kind of progressed from there as more teachers in Illinois became trained, there were schools who I mentioned previously, requesting, you know, Hey, can, can we get a one-day workshop, like in a single school in Illinois? And then, you know, FIU has their effect program, which is, which is a really great program to try to improve science education, specifically in inner city schools in Miami-Dade County. So I was fortunate enough to get involved there, and so was able to do some workshops there

for about four years. I think in eight years or so, I've done 12 or 13 workshops total so far. And you know, it's good that people are still, you know, it hasn't fallen off, if you will. People are still excited, people still wanna improve their instruction. And so it's great to still have opportunities to be able to connect with teachers and just kinda talk teaching and share what we know and, and see how we can continue to help students grow.

Mark Royce ([09:49](#)):

Modeling got its start and was pretty much, fairly focused in the physics arena. And then they added the chemistry component, I know at some point after that. And then, then the biology curriculum started to evolve. What are the kind of the top tips, I guess, I would say that you've learned, insights that you've learned, especially as it relates to biology curriculum and how modeling, connects with the biology classroom?

Frank Novakowski ([10:28](#)):

Yeah, I think the, you know, the skills, like, if you talk about the skills that we want kids to know and be able to do in modeling, right? They're very similar to the science and engineering practices, through NGSS, right? We want kids to be able to ask good questions. We want them be able to identify problems. We want them to develop and use models, right? And so the representations that you have, are, I don't wanna say they're limited, but, you know, in physics you have mathematical representations that, that drive a lot of what you're doing. But you don't have as many of those in biology. So you have to try to just think about, okay, what kinds of representations can we use here for this, for this core idea? You know, to help students develop their mental model and, and make connections in the content.

Mark Royce ([11:42](#)):

We'll get right back to the interview in a moment, but first, did you know you can support the AMTA by simply shopping online with Amazon? When you, you use Amazon Smile, Amazon will make a donation to the AMTA at no additional cost to you. Setting up Amazon SMILE is easy. Just go to smile.amazon.com and select American Modeling Teachers Association as your preferred charity. Your signing up will really help the modeling cause. Now, back to the interview. What would you say when you're teaching a biology workshop for modeling instructors, what are kind of the top things that you bring to the table there and insights that you've gained through your experiences that you really want to get across in those workshops?

Frank Novakowski ([12:42](#)):

I think there's two main things for me. Number one is there's all these components of modeling that have had different names throughout the course of education, right? Like cooperative learning, for example. Everybody's familiar with that. But modeling relies heavily on cooperative learning, right? You're having students work in groups and work together. And so, it's the classroom environment, if you want modeling to be successful, the classroom environment that you develop is really critical. You want students to be comfortable making mistakes. You want them to learn how to ask good questions. You want them to be able to challenge their peers when necessary. Well, hey, here's what I think, and this is why. So how did you come up with with your response? You know, those kinds of things. And you have to have a good classroom environment, a positive classroom environment to be able to promote that kind of discourse in your classroom.

Mark Royce ([13:59](#)):

Yeah.

Frank Novakowski ([14:00](#)):

So that's the first one. And then the second one is just, I mentioned it before, the connections, right? So before I started using the biology materials, I, I taught biology, but it was, okay, here's a unit on living things. Characteristics of living things. Okay, well, next we're gonna talk about evolution. Well, and yeah, it's part of biology, right? But, but never really thinking about, well, hey, we can take these concepts that students have and we can guide them in a way that they can connect this new thing that we're talking about to what they already know. And so, that's another thing that I really try to focus on and have worked a lot to kind of develop tips, if you will. For Okay.

Frank Novakowski ([15:06](#)):

Say this is your sequence, right? Well, we do, we're gonna do evolution, uh, later in the year, and we're gonna do genetics earlier in the year, right? Because, you know, part of part of modeling is, you have this curriculum, right? But the curriculum is not set in stone. You have to make it work for your situation. And, and so it's supposed to be flexible. And so, when you move things around, you need to make sure that you understand how to help kids make connections between what you're exploring now and what their prior knowledge is. But you also have to be able to make sure that you're not creating gaps in their understanding by changing things around. And so really putting some concentrated effort into thinking about what potential gaps or pitfalls there could be for student learning and making sure that you address those within that cycle that you're going through.

Mark Royce ([16:28](#)):

So would you say that in the classroom, as you move through the curriculum, you're kind of helping the students understand a storyline? You're creating a storyline to help them connect, you know, this concept to the next concept, to the next concept. Is that kind of what you're talking about?

Frank Novakowski ([16:50](#)):

Most certainly. And there is a pedagogical, methodology developing right? In biology for the last few years called storylining. If you're familiar with that or not, I'm not sure, but.

Mark Royce ([17:08](#)):

nope.

Frank Novakowski ([17:09](#)):

Um, <laugh> okay.

Mark Royce ([17:10](#)):

I'm not, but I'm not in the classroom either or connected with you guys, you know?

Frank Novakowski ([17:16](#)):

Got you. So, it's a phenomenon-based pedagogy where you're going through these activities in a sequence that's based on a story that's designed to get students' attention, right. Make 'em interested and motivated to learn science. And, and so yeah, I think that, that is important, right? That as you, as

you go through and, you know, know, like in chemistry, they have what's called the story so far. So as they go through and they progress, right? They'll, they'll wrap things up and they'll talk about, okay, what can we add to the story so far? And so we do something similar in bio where we are attempting to generate a storyline that helps make it cohesive and students can continue forming connections, between new ideas and ideas that they've already gone through.

Mark Royce ([18:25](#)):

You mentioned that you teach freshmen students in high school, right? High school. And how do you find that freshman students are engaging with you, at a kinda young age, you know, freshmen, there's a big difference between the years in high school and, how are they engaging with you in the biology classroom?

Frank Novakowski ([18:50](#)):

It's a unique, set of students, right? They don't have a lot of the skillset that you need, because most of them haven't had a class where the teacher has given 'em some freedom to think, and they're not just sitting there listening and writing down everything you're trying to say, right? And so, it is kind of one of the benefits of, I think having a cohesive program at the high school. Where teachers are using biology, chemistry, and physics, and students can kinda learn and develop some of these skills, some of the modeling skills. It actually increases their success in chemistry and physics as sophomores and juniors. And I know that's kind of a side tangent of what you asked. But, but I think it's important because, you talk about trying to, again, make science for students, an experience. It's good to have cohesion in the different core content areas that they're learning about, so that they can take those same skills and, and apply it to a new content area.

Mark Royce ([20:30](#)):

So are you planning to lead any workshops coming up this year? In 2023 or

Frank Novakowski ([20:39](#)):

So, this coming summer, Cal Poly, which ran physics, chemistry and biology last summer, and last summer was the first time that they had ever run biology. Is planning on doing all three workshops again this coming summer. And so they've asked John Anderson, and Brenda Royce and myself to return to run those three workshops this summer.

Mark Royce ([21:14](#)):

Oh, cool. Yeah. I I forgot that you had been at Cal Poly when my wife was there as an instructor. That's cool. So give a pitch to those who are listening, to invite people to join you in your workshop. Why would somebody wanna be there?

Frank Novakowski ([21:37](#)):

Yeah. You know, there aren't that many experiences, I don't think. I mean, when, when I took a modeling workshop, it was different than other workshops that I had been to, right? Not just because it's longer, but the group of people that are there, right. That are so passionate about teaching, and want to learn about modeling and how to improve instruction for their students. It's just been great. And so it's the experience of going through the activities and, you know, putting yourself in the student's position. We have what we call student mode where you, where, which people who are listening, who are familiar with modeling know what that is. But you, you essentially are putting yourself in the role of

a student, and, you're learning so much about what the student experience would be. And, there's no, there's no other, professional development experiences that I've had, that are similar.

Mark Royce ([23:12](#)):

Uh,

Frank Novakowski ([23:12](#)):

You know, you're always, okay, well, here's a great activity. Okay, well, I can do this, right? But going through the activities and thinking about, well, what would students say in this situation and how would I respond to that? How can I help them make these connections? It's just a great experience and in every workshop there's new people who have fresh ideas. I've certainly become a better teacher through leading workshops. I learn something new at every workshop, so I love continuing to be able to do them.

Mark Royce ([23:59](#)):

Yeah. Can you give us a little bit of an overview of what your workshop will look like?

Frank Novakowski ([24:07](#)):

Yeah. It's a two-week workshop. And, generally speaking, in a daily schedule, we do some cooperative learning-type activities, you know, talking about that classroom environment, and the importance of developing that positive environment that students feel safe to share and learn and make mistakes in. And then, it's essentially a deep dive into the materials in the binder. At that workshop, we cover the first four units, which is essentially the first semester of biology content. And so, we're doing the activities, we're whiteboarding, we're discussing, we're looking at the exercises, talking about the curriculum as it is. And then I try to also give the people in the workshop, Hey, here's what my population of students is like, and here are ways that I've tweaked the materials to fit the needs of my students.

Frank Novakowski ([25:40](#)):

You know, I mentioned the importance of going through the materials so that you kind of know what the sequence is and how, and why they were developed that way. But it's also important for teachers to know that there's flexibility and they need to, if their students have specific needs, they need to make modifications to best fit their students. And so I try to walk them through, not necessarily the things that I do that are different, but how did I come to making this thing different and why? And then how it fits in the sequence and reinforces what the overarching concepts and ideas are in that unit so that students can continue to build their model.

Mark Royce ([26:47](#)):

That's great. Well, I know that anyone listening can go to the website of modelinginstruction.org, modelinginstruction.org and find out there's all the workshops that are coming up are listed there, and Frank's would be one of them. And, so if you're interested, it would be great for you to go check that out and get signed up for a workshop.

Frank Novakowski ([27:19](#)):

One of the things that I guess we did that was cool this past summer was we had a combined session. So John, Brenda and I, we all brought our workshops together because part of NGSS is cross-cutting concepts. And so we decided to have a joint session on energy.

Mark Royce ([27:45](#)):

Ah,

Frank Novakowski ([27:45](#)):

And that was really neat. That was a good experience.

Mark Royce ([27:49](#)):

So the workshop experience is, it sounds like it's immersive and very instructional, but also inspiring. And I'm really, first of all, I wanna say thank you for the work that you're doing with, uh, helping to get other teachers informed and educated on the methodologies that you're using. And, also I'm always very, very proud and want to thank teachers in general, you know, and the fact that you've decided to give your life to that profession is really, really great. So thanks for that.

Frank Novakowski ([28:34](#)):

I appreciate the opportunity that people want to take these workshops, and learn more about teaching and, how can I do this better?

Mark Royce ([28:46](#)):

Yeah. It's great. Well, Frank, I wanna say thank you for taking the time to spend with me and share your thoughts. And they've been, it's been really great. I've enjoyed talking with you very much, and I guess you're gonna be seeing my wife this summer.

Frank Novakowski ([29:06](#)):

Yeah, I'm definitely looking forward to working with her again. She obviously has a lot of knowledge and, like I said, that joint session, I learned, I think as much as any of the participants in the workshop, just talking about that cross-cutting concept of energy and how it's approached in physics, chemistry, and biology, and what are some of the ways that we can try to work together across those three core content areas so that when students take biology and they take chemistry and they take physics, they're getting a similar treatment of, okay, here is how we talk about energy. And it makes sense in all three of these core content areas.

Mark Royce ([30:00](#)):

Yeah. Cohesion across them. That's awesome. Well, once again, thank you so much for being here this evening, and, uh, I, it's been great talking with you.

Frank Novakowski ([30:13](#)):

You too. Yeah. I really appreciate it.