Science Modeling Talks

Episode 69 - ReCast - "AMTA Past, Present and Future"

Guest: Ray Howanski

Mark Royce (01:20):

Hey, Ray, how are you doing, man?

Ray Howanski (01:22):

I'm doing great, Mark. How are you?

Mark Royce (01:25):

I'm doing well. Enjoying some gentle rains out here in California for the last couple of days.

Ray Howanski (01:33):

We're enjoying some gentle sunshine here in PA.

Mark Royce (01:37):

That's great, man. I love Spring. Of course. So we're gonna talk about the past, the present, and the future in this conversation that you and I are having. And as the CEO of AMTA, I'm excited to hear your perspective on things right now as they sit. It's a significant year in the life of the organization, and I know there are some plans coming up and some things that our listeners should know about the development of AMTA. And I thought this would be a great opportunity for you to be able to share with our listeners some of that stuff. So let's get started with you giving us a brief rundown on the origins of AMTA. You know, why was it originally created? What was the prompt that the organizers had to make it happen? How did it get started?

Ray Howanski (02:40):

So, it started actually because there had been some really intriguing work done by David Hestenes and some other folks, some NSF grants. And there had been some findings that they had come across a method of teaching science that was really super effective. So, David, doing academic work, had really interesting background, right? I mean, backgrounds in psychology, physics, philosophy. And really kind of a thinker, right? Just really, really, deep thinker and, kind of, worked with a gentleman, Malcolm Wells, who had implemented this method of teaching, centered around models and modeling. And interestingly enough, actually, in my mind, it really expanded even just beyond that. But that's the center and the core of it is, you know, it's instruction built around students building a small set of models from which they can use to solve problems, make predictions, and essentially think critically about experiences they have.

Ray Howanski (04:16):

Traditionally, you know science instruction, a lot of times, gets really complicated for kids. It gets noisy, if you will, with lots of verbiage. And they kind of get lost with the complications before they get introduced to the beauty and the simplicity of science, right? I mean, that's the goal. That's where you want to get to. So anyway, they had, and

they actually were able to document the success, right? And actually get data to show, Hey, this is really effective. And then the really cool thing was they found a way to then get money to hold workshops. And then have, you know, they had an idea, maybe we can show other teachers how to do this, and can they get the same results? And it turns out that they were, and it was super effective.

Ray Howanski (05:10):

And that was really, I think, exciting. Firstly, for them. But then I think really exciting for the science education community as a whole, because people like myself were out there and we were struggling with try to find more effective ways of teaching science. And, you know, lo and behold, here it was. And so, needless to say, NSF grants have, they run their course and then the NSF kind of leaves you off, and they say, okay, now, let's see what happens with that idea. They'll carry it so far, they'll fund it so far. And so then that's when a team of folks got together and talked about, let's maybe get an organization going, a nonprofit.

Ray Howanski (06:12):

So sure enough, Colleen Megowan was the one that kind of headed it off. Patrick Daisley was the one that they actually did the work to established the nonprofit status. But Colleen, I think, really dedicated several years, I mean, many years of her life, but several specifically to getting AMTA off the ground. You know, generously donating lots of time and effort to get it off the ground. And sure enough, they did. And now you had an organization that was really of teachers for teachers and by teachers, because, you know, they had found an effective method for teaching science and found a way to show other teachers how to effectively teach science and engage students in doing science.

Mark Royce (07:06):

It was a very grassroots effort then, you're saying?

Ray Howanski (07:10):

Yes, absolutely. And I would contend that that's why modeling instruction has had the longevity that it has had, because of the fact that all the ideas were born in the classroom really early on. David Hestenes made a really wise decision, I think, and certainly had developed everything that you needed, academically in order to make modeling instruction happen. But, and I, obviously, I wasn't there, but, I hear tell that he actually looked around, and early on when they were doing the workshops and realized that the teaching of science to high school students, or middle school or elementary school, or community college, higher ed, each has their own culture, right? There's a very unique culture and learning environment that is dynamic and evolves over time.

Ray Howanski (08:16):

And it really is something that is kind of like its own living organism, if you will. And he realized that he was not in tune with that, and he realized that really the thing that he needed to do was say, okay, here's the guidelines. Here's the structure. I'm gonna step back and let the teachers kind of figure this out, how it will actually be implemented. And then, so there was a series of years where the teachers did that, and that's why one of the models or one of the expressions of modeling instruction or AMTA is that it is of teachers for teachers by teachers, because that is really where it really got its legs in that the communication happens because there's a dialogue. And so, that's what makes it a living, breathing, method of instruction, because it doesn't sit static.

Ray Howanski (09:20):

There's always feedback. There are always revisions and updates to the methodologies based on what teachers are finding, because we know, right? Kids, you know, there's little subtle changes. In society and kids and teachers, we can talk about some of those, some of those changes are big changes, but some of 'em are subtle happening all the time. And I think it's really important that the conversation goes both ways that there's a dialogue of really effective and well thought out core of what modeling instruction is, but then also allowing it to live and breathe and grow

over time based on experience of teachers and their experience with both school systems and their schools, and also students. Just one little example, if I can, I'll throw in there is like whiteboarding. You know, early on, whiteboarding was done a very specific way, where students would draw up their solutions and explain to the class, you know, solutions that they have found.

Ray Howanski (10:38):

And it really was a great breakthrough in terms of getting the dialogue to be more student centered and get the instruction in the classroom more focused on where the understanding of the students actually were and helping the students actually develop their models, and get engaged in modeling process. But that modeling, that whiteboarding process has really blossomed over the years. We now have multiple ways of doing whiteboards and presenting whiteboards and having students share the whiteboards, probably more than I could get into right now. But that's just one example of how it's a really good core idea. It really is something that is really fundamentally gonna change instruction in the classroom and just give that tool to teachers, and they'll develop it, right? I mean, teachers are just by nature, really thoughtful, inquisitive, curious people that will try anything to help students learn and just give them some of the tools. And I think that's really what modeling does. It gives teachers that really foundational piece of resources that they can then go and blossom in each of their teaching environments.

Mark Royce (12:13):

Tell us a little bit more about the evolution over time that has been experienced in the modeling community. I know you mentioned the whiteboard and how it has grown and developed. Tell us a little bit more about some of the other ways that the modeling instruction approach has impacted science teaching over the last several years. I mean it's been like around 20 years since all this got going.

Ray Howanski (12:43):

Sure. So, you know, let's take another example I think that lots of folks would be familiar with, and that would be the science and engineering practices. You know, like when the next Generation Science Standards came out. I have to say, like very much aligned with modeling instruction, not totally by accident, because there certainly were some modelers and folks that were very familiar with modeling instruction as part of that conversation, when they were developing the next Generation Science Standards. But, I think it even goes beyond that. Like when you, when we look at the standards and we look at, like I said, the science and engineering practices. So even in terms of the cross cutting concepts or the DCIs, like any of these, are very much aligned with modeling instruction, or modeling instruction is aligned with those standards, whichever way you wanna look at it.

Ray Howanski (13:45):

But the one thing I will say that what modeling instruction does not do, they don't, we don't chase the check boxes of the discipline core ideas. So like, you could have a list of content that you want to cover in class, and you can check all those boxes, but the question is, are the students really learning it? And are they learning the process of science? Right? And then it comes down to that fundamental question. Is science a list? Is it a list of facts that we wanna know? Or is it a process of how we come to know things? And that's where I think the beauty of modeling instruction is that we really focus on that process of knowing, right?

Ray Howanski (14:37):

That's that science and engineering practices, right? So when you look at what's happening in a science classroom, you come into a modeling classroom and you recognize it right away, right? Because the focus is about what those students are doing and the process and the thinking of those students. That's the focus, right? The teacher is clearly the person that is facilitating that, encouraging, listening to all that thinking. That that dynamic, and whichever part of the modeling cycle you come into the classroom and, that's what's happening. That has evolved so much over the years, Mark, like, when you look at, just say, discourse in the classroom, right? Several, articles have been written about discourse in the classroom, based on people being inspired by what's happening in modeling class-

rooms.

Ray Howanski (15:40):

And they kind of realized pretty early on and still consistently, that, that's really the core. The core of that learning dynamic is, you have this expert in the room, right? This teacher that, that knows, you know, a lot about that content and know a lot about instruction, but none of it works unless you connect with where that student is, what that student understanding is, what are they coming in with? So, like, however you wanna look at it, that's the only place that learning starts, right? So we need to make that connection as teachers, to those students. And what they're thinking is, and their background is, so that is facilitated by whiteboards, by giving them ways to represent their thinking and diagrams so that the teachers start to get a peek into what their thinking is on the part of the students, and how we can mold that, how we can help them come to what is acceptable in terms of the thinking of how we explain those systems and those models in science today.

Ray Howanski (16:58):

And the other thing, and I don't wanna get sidetracked by this, but, I am sometimes concerned personally that we rush things too quickly in schools in general, and instruction in general. And that there's often a disconnect that I think the students are left kind of trying to give the impression of understanding, and they want to show themselves as good students. What I think often what we need to do is just slow down and really listen. And give them a chance to really process things and really come to foundational understandings of key concepts, and in their lives. And I've seen this with my own kids. I've seen it with my kids' friends in their lives. I think many people have. We're amazed over time what our children do, what the next generation does.

Ray Howanski (18:08):

If we just give them some good core foundational principles to build on. They really go in and out and figure a lot of stuff out if we just give them the practice of thinking critically and understanding some fundamental truths about the world. That's something that I think that is a strength of modeling, because it really does focus on not trying to fill the student with every factoid that we know as teachers or a textbook has, but rather give them the the chance to really uncover for themselves the most fundamental and key aspects of the world, right? And really get a deep understanding of that. And I think that the resources that are available through AMTA and through modeling instruction, does a good job of capturing those most critical and foundational pieces of the content, the main content areas that then we let students grow from there.

Mark Royce (19:26):

Yeah. Wow. You're touching on kind of what my next question is, is what, what do you think the greatest impact that AMTA has had on the educational community at large? I mean, how do you see AMTA really making a change, and what are the greatest ways it has done that?

Ray Howanski (19:49):

Well, first of all, can I answer or come to the answer? But I'm gonna start by saying I am amazed, and I think many people that would be listening to this would be amazed at how many people have been heard about or been exposed to modeling instruction. And know about. AMTA For an organization that, like you say, is really grassroots, that does not have a big sponsorship, or there's not a big donor behind it, you know, we just don't have that. It's really a very much like, repeat again, right? We're kind of run by teachers, help teachers and support teachers. We're always trying to scrape together ways to keep things going, but it's amazing to me how prevalent it is, and how many people know about it and know people that implement it.

Ray Howanski (20:50):

And the other thing I will say that it's so well respected. I think that folks that have had a workshop and have, you know, the minimum of the 60 hours that research pretty clearly shows that you need for implementation of effec-

tive modeling instruction and hopefully beyond, right? Lots of folks have had many hours beyond that, that, there's just no looking back. Like, it's just, it's just like there's, you really see it, and you just say, well, why, you know, you really wonder why would we teach any other way? So, I just see it as it's a beacon of hope. And maybe, that's not such a terrible phrase, but I don't wanna be too overly optimistic.

Mark Royce (21:46):

No, I think that's great.

Ray Howanski (21:47):

But it really is, um, for those that have a life situation that allows them to dedicate the time to learn how to implement modeling instruction, there are very few and far between that regret putting that time in, is what I'll say. And to me, the really overwhelming majority of teachers that come out of modeling workshops and change their teaching practice and never look back is really quite amazing, because when you look at professional development, Mark and I don't think you've ever have the privilege of teaching, right?

Mark Royce (22:44):

No.

Ray Howanski (22:45):

But you know, there's lots of folks in teaching that will groan about professional development and they're making us do this again. Or, you know, most of us figure, we kind of know how to teach.

Ray Howanski (23:00):

You know, why are they, why do I have to listen to somebody else, right? I have my degree, I've been teaching for X number of years. It's really rare that you run into something that teachers say, wow, that was really worth my time. That changed my instruction. That's really going to change how my students are able to learn. And their engagement in the classroom and modeling instruction has done that. Like, it's the one professional development where people come out and they're like, yeah. Like, that's how you do it.

Mark Royce (23:40):

That's why I started this podcast. Because I saw my wife go through that, you know, and that "aha" and change of trajectory in her approach to teaching. It was super impactful. So Yeah. That's amazing. Yeah.

Ray Howanski (23:58):

And I had the experience and many of us, like I said, I'd say the overwhelming majority of folks that have been able to dedicate that time and anybody listening to this, that is a science teacher that can find a way to get to a workshop, I just can't recommend it enough. And like I said, for multiple reasons, if I can, I will say, like, so there's, so that's the fundamental piece that I think is just amazing to me. Like after having personally, and I searched for over 20 years for a better way to teach until I found modeling instruction. But it's, it's not... While it is centered around models and modeling, and that is the core of it, and that's fantastic. And it really is what makes it work, right?

Ray Howanski (24:57):

That's the engine that makes it run. But Mark, there's so many other parts to it, right? Like I said, like the discourse, the gathering, like starting with the phenomenon, right? And students having experiences in the classroom that they have a shared experience, all the students. So you can have dialogue that everyone is united about. Everyone has seen the same thing happen, and they can kind of unravel that together. Like how you do that, is not self-evident. Like you need colleagues around you so that you can talk through this in a workshop to say, well, what happens if this, or what if this happens? Or how do I lead into this situation? And that is another really important -- and

I that makes it work.

Ray Howanski (25:58):

That's part of the magic. And then how the representations go along with that experience. Energy bar charts is another one. Like, it's a secret sauce of helping students of all different disciplines understand energy in a way that they can't without those representations. It allows a dialogue in a classroom that you can't have otherwise. So there's all these little pieces and tools that make it work. And these are the things that teachers go into this workshop that are like, like you say, they have those aha moments. Those are the things that happen over and over again. It's not like a mystical, magical thing. It's, there's all these very specifically chosen tools that are provided to teachers. And, a conversation, I will say that has been happening for generations about this, that leaders of workshops are able to become part of, and they can then perpetuate that, right? Like, this didn't happen overnight. This happened over many, many years. Really well thought out. Develop the tools. How do you use the tools? Listen to teachers how it implements, what are the problems. That's the dynamic. That is the magic that that makes going to a modeling workshop, learning modeling instruction, career changing.

Mark Royce (27:45):

Yeah. You said over many years, am I right? This is the 20th anniversary this year of AMTA,

Ray Howanski (27:54):

It is the 20th anniversary of AMTA, remember David Hestenes developed the idea, back in the seventies actually.

Mark Royce (28:03):

Okay. But the grassroots effort and the organization of creating a community of modelers is now 20 years old.

Ray Howanski (28:12):

20 years old. Yes. The reason it was started was because that community had already started through those NSF grants. The experience was so strong in those folks that they wouldn't let it die. Just couldn't let it die. And like I said, that's why it has, you know, grown and is so pervasive in science instruction to this day.

Mark Royce (28:37):

Yeah. Let's talk about how you see as the executive officer for AMTA-- What's the future for AMTA look like? I mean, it's not funded by any government stuff, is it? Are there government investment at all, or is this completely still grassroots?

Ray Howanski (28:58):

Well, first I will do a quick shameless promotion as our 20th anniversary here we are having a fundraiser. And that fundraiser is really for us to, and the reason I bring that up is, is for us to rebuild our website, so that we can, have updated resources. Have it more user friendly and to help our community of modelers connect better. We wanna help build that community, and so we wanna include some tools in our website so that we can bring everybody together, make the resources that we have more easily available, updated, and also make it more user friendly for folks.

Mark Royce (29:54):

I've been involved with this modeling podcast for six years now, and I've seen the website. It hasn't changed a ton since then. And from my understanding, it's like it's more than 10 years old from when it was created. I don't know exactly how old it is, but I have looked at it several times. And the resources are great. What is there is really good, but the navigation and some of that kind of stuff-- And I've been actually involved in some web development for some large organizations in the past, and it's not cheap to have a really good, functionally easy, website built. And

it takes a lot of talent and effort and money to do it. So the fundraiser, one of the prime objectives, I assume you're saying?

Ray Howanski (30:52):

Yes. That's one of our next steps because that's how most people have access to our materials and access to the organization. And we just really feel like rebuilding that will give folks at least a somewhat comparable experience as to what many of us had when we were able to, when we visit our face-to-face workshops. Because the experience that modelers have when they go to a workshop is just fantastic. And then we want them to continue to have that high quality experience. It's a really high quality experience, and we want that high quality experience to be continued when they interact with our website as well.

Mark Royce (31:37):

The website's really important because isn't that their primary door to get into a workshop?

Ray Howanski (31:42):

Well, it's how we reach out to people for workshops. Yes. It's how we connect our members. It's how we provide different resources to folks. Yeah. When they leave the workshop, that is how they stay connected to AMTA.

Mark Royce (31:55):

Is it the website where they sign up for a workshop also?

Ray Howanski (31:59):

Yes. Where they sign up for a workshop? Yes.

Mark Royce (32:01):

Okay. Well, I just wanna mention right now, the modeling website, if you're not aware already, is modeling instruction.org, is that correct? Modeling instruction.org. Yeah, that's important.

Ray Howanski (32:19):

Yeah. Yeah. So that is our primary connection and actually the other venture that we are... Started within the last month, we're trying to become more active on social media. Again, these are things, this is how information gets exchanged right now, people find out about things. So on the website, we do have listed all those connections to our socials. Right. We now, have a Blue Sky account and putting things out on Facebook and Instagram.

Mark Royce (32:55):

Yeah, but that takes staff to manage It. Does. I, I think if I'm understanding this correctly, your staff is pretty small.

Ray Howanski (33:03):

Yes. It's small.

Mark Royce (33:04):

There's you and how many other people are actually

Ray Howanski (33:10):

Sue Ray, who deserves an immense amount of credit, and Hannah, who we've recently brought on, has produced some great graphics with us as we start our social media campaign.

Mark Royce (33:25):

Okay.

Ray Howanski (33:26):

And then, I have to say, folks like Colleen as a senior --by that I mean, invaluable, like, you know, the expertise that she brings because she's run the organization from its inception and also Larry Dukerich, who has done so much

Mark Royce (33:48):

Oh, yeah.

Ray Howanski (33:48):

Tireless. Stuff with the resources and revisions, so forth. Your wife, Brenda, who's done a lot of revisions on the resources, and some stuff through grants, but a lot of things that people have done just contributing their time, just because they believe in the cause of what's happening here.

Mark Royce (34:10):

A lot of volunteer support.

Ray Howanski (34:13):

And then of course, you know, the board, which, you know, changing, you know, changes over time, but, you know, the board contributes a lot of time. Keeping things organized. What I've been amazed at, you know, I was a chemistry teacher for many years. I taught biology, and then was an administrator. And by the way, the reason I became administrator was primarily because I wanted to make sure that modeling instruction continued on in our district. And I can say that it gives, it's a framework not just for science, but really it's a framework for all areas, I think. And I it helped us, the philosophy and the approach, I think is just consistent with good instruction, you know, no matter what the topic is. Yeah. So, in terms of our staff, you know, doing the writing, the nonprofits, it's just a completely different animal than, than working in a district.

Ray Howanski (35:15):

You'd be amazed at how folks like Colleen, and all the folks she worked with over the years have been able to get this up and going and thriving for 20 years. And, and, and the other piece of that, you know, is as we look at the organization evolving, it was a big hit during Covid. So with which lots of organizations, you know, had to readjust over Covid and of course, AMTA did. Right. They adjusted. But I think, again, like many organizations, the restart after covid, I think has been more challenging than a lot of organizations have realized. So that's part of, in the ask for our vision, that's really part of what we're doing. We're trying to restart, still recovering from those covid years. Trying to mesh this digital learning experience with the online, um, and also the face to face. We know what's really effective and we want to have all that work together.

Mark Royce (36:25):

Yeah. That's really amazing. For the future of AMTA, I think the fact that you guys are getting ready to launch a fundraising program is extremely important. For the sustainability of the organization. When do you guys anticipate the launch of the fundraising, and then how, how will people be able to get involved with giving?

Ray Howanski (36:53):

So we've launched it and, again, when you go to the website, we do have places there, and we have connections with social media, which we have already started posting the last couple weeks about the fundraiser. I want say a couple things here though. One I think is really important, AMTA has been able to secure some matching funds

from a generous contributor. So right off the bat, they said the first $10,000 he will match. So that's really enticing. So whatever you give times two, right? You have somebody that's matching what you give. So that's great. And we continue to reach out to folks to see what are corporate donors we can get to support these efforts. So that's part of it.

Ray Howanski (37:52):

That's the upfront, that's the, the facing, you know, the experience that people will have. And hopefully at the end of this year, we'll have resources and be able to make that happen. Be able to get this website rebuilt and up to 2025 standards. Of what people expect in their digital experience. But there's the other part that continues to happen, Mark, and that is things like, data science is a big thing, you know, that that is another, so we can't lose sight of the content, right. What we have is really good content, and we've also continued to revise our middle school units in modeling instruction, develop courses and units in astronomy. More offerings there. In mathematics. Middle school, mathematics, mathematics, modeling. And like I said, data science is one that is really becoming a big part of the dialogue in instruction in STEM.

Ray Howanski (39:02):

And quite frankly, we wanna make sure that the data science is equal representation of science and as well as math. It's really easy for sometimes data science and working with data to get subsumed in one area. I think David Hestenes really early on really emphasized that one of our big problems is the fact that we separated science and math, right? So working with data science is an opportunity to bring them back together again, So, I know Colleen is doing some work with some of these organizations, really trying to make science a part of this dialogue and making sure the science has a seat at the table. As we develop ways to work with data science in the classroom.

Mark Royce (40:04):

What is, and do you have an understanding yet of what it's gonna cost to do the things that AMTA is wanting to do? Like, let's do a dream level, not like a frugal-- what's the real amount of money that is needed to be raised?

Ray Howanski (40:23):

Yeah. So, I don't know. This is kind of in between frugal and dream, I guess. We, talked to some folks. Got some, if you will, estimates of what this will take. And, about $25,000 is probably is what it's gonna take really just to get this to happen. Now, it'll most,

Mark Royce (40:43):

That seems like what it would take to get a good website built.

Ray Howanski (40:46):

Exactly.

Mark Royce (40:47):

But beyond that, there's some other needs.

Ray Howanski (40:50):

Yes. Beyond that, all the resources, right? You can double that. As we go in for these other needs. So

Mark Royce (40:58):

Yeah, that makes more sense to me.

Ray Howanski (41:00):

Yeah. So that 25 is really just to get that website rebuilt and like I said Yeah. Then you have all the work behind it, right? The content,

Mark Royce (41:12):

Right. Yeah. It's a lot.

Ray Howanski (41:15):

That's why we're here, right? Modeling instruction and AMTA is, I sure has faced many challenges over the years, and we're gonna face this one and we will continue delivering experiences to STEM teachers that are looking for that quality professional learning experience, right? It's really important that organizations like AMTA are there for teachers that have come out of school... I mean, it'd be great if we can get more involved, though we try to all the time through those pre-service programs, but Mark, so many of us, I think many of us know this, you get done school, you go out and you go to your job and you realize that you weren't as ready as you thought you were. And, and how important is it to have a quality organization like AMTA with the materials and resources that are there and the continued professional development experiences that can be offered to give those folks and, also senior, you know, seasoned teachers like, you know, myself, who come in later on and you continue looking and when you find it, you know, it can change careers. It really changes the learning of that teacher. But then just think about all the students that are impacted as each of those teachers learns that new high quality instructional method, each of those teachers reaches thousands and thousands of kids. And changes their experience. So evidence-based thinking, right? The ability to change your mind in a conversation to say, oh, I learned something just because I thought that was true, now I can know differently, and now I can improve my understanding and accept information like evidence-based thinking and the ability to change your mind. Just those things. Learning how to have a face-to-face conversation. And learn from each other. These are things I think that whether you're a science person or not, I think we would all recognize that these are things we want people in our society to be able to do.

Mark Royce (43:40):

Yeah. Wow. Yes. Absolutely. Well, I wanna encourage everybody who's listening, if you haven't already, go to the website modeling instruction.org and dig in and if you haven't done a workshop, find out on the site how to get involved and get signed up for a workshop. 'cause there are several going on around the US And then also fund AMTA. Take a a few minutes and figure out how you can help develop and help promote and sustain the efforts of the AMTA and modeling teachers all over the US. There are thousands who are invested already in using modeling in their workshops, and I wanna encourage you to be a part of that movement. And one way you can help is through the fundraiser. Well, Ray, it's been awesome talking with you again. We've talked in the past about teaching, but this has been really cool just to focus on AMTA 'cause we don't do that all the time in this podcast. And it's really good to have you share your vision, share the vision of the community and the board, and all those who are involved. And I'm just really wishing you the best of luck as you guys are developing in this area and moving forward

Ray Howanski (45:08):

As a modeler, I'm gonna give you some high phrase in that you have a key aspect of modeling,Mark. And that is the ability to ask questions that make me say things that help me understand my own thinking as a boss,

Mark Royce (45:27):

Well, that's great

Ray Howanski (45:29):

Because one of our expressions is we don't know what we're thinking until we hear ourselves say it. Right. So,

Mark Royce (45:36):

Well, if I have any ability in that, it's because of my 45 year marriage with my wife, who is a science person,

Mark Royce (45:45):

Even though I'm not, I've lived with a very science-focused person all my married life. So it's very cool. Well, thanks again, Ray. And, we'll talk again, I'm sure, before too long. Okay.

Ray Howanski (46:01):

I always love talking to you, Mark. Thanks.

Mark Royce (46:04):

Have a great afternoon. You too.

Ray Howanski (46:06):

Enjoy that gentle rain.

Mark Royce (46:08):

<laugh> <laugh>. Thanks.