



Science Modeling Talks

Episode 68 - "The Importance of Building Student Community"

Guest: Beth Burns

Mark Royce (00:58):

Hi, Beth. How are you doing?

Beth Burns (01:00):

Great. Hi, Mark. It's so nice to meet you.

Mark Royce (01:03):

Yeah, it's nice to meet you too. Very nice. So, as we get going here, I wanted to ask you how you first got introduced to the modeling instruction approach. How'd you find out about it? What happened then?

Beth Burns (01:19):

Okay, so I was a member. I got invited to apply and I applied to the New York State Master Teacher Program. And it was for science teachers, math teachers, STEM educators. We've moved on from just like middle school and high school all the way down to elementary school teachers. But there were a bunch of us chemistry teachers. We had been talking about these new standards, these new Next Generation Science Standards that were coming out. And we had heard about modeling through some teachers in Buffalo that were using modeling physics. We thought, Hey, that's fascinating. We'd like to learn more. And we convinced our leaders within the master teacher program to send us someone to teach us modeling. So we did a two-week summer workshop. There were about 12 of us, all chemistry teachers, and Ray Howanski was our instructor.

Beth Burns (02:19):

He was fantastic. We were all in, like drank the Kool-Aid from the beginning. It was fantastic. We had a great experience. We did this at SUNY Geneseo. So he came up from the Philly area, I believe, and he came up to upstate New York. And, um, so we had two fantastic weeks, totally immersed in modeling. We did the Chemistry One workshop and it was fabulous. And we were so excited. There were a bunch of us that were gonna take it, the chemistry two workshop the next summer, in Arizona. But unfortunately there was a pandemic <laugh>.

Mark Royce (02:56):

Oh yes.

Beth Burns (02:56):

That was the summer of 2020. So there were three of us that still did the Chemistry Two modeling, but we did it online and we had your lovely wife, Brenda, and Larry Dukerich were our instructors for the online. So we did that. And then I did intro to modeling workshop with Scott Milam and Ariel Serkin. And then I eventually got into, I did the leadership workshop last summer where Colleen McGowan and again Brenda taught us how to lead a workshop. So my first opportunity to lead a workshop was at the beginning of this year. And I did that with Emma Mitchell, and

we taught the intro to modeling workshop. We did it online on Sunday evenings, and it was fantastic working with her. So we started in 2019, was my first workshop. So it's been, it's been a few years, but with some hiccups in the middle there, <laugh>.

Mark Royce (03:59):

So did you start employing the techniques in your classroom immediately? Or how did that all

Beth Burns (04:05):

Yeah. That next year I tried it and I did some modifications. 'cause the class I was teaching that it would've best fit is we have a local chemistry class. So they don't take like a state exam at the end of the year. So it's more just to satisfy a science credit. So we teach a local level chemistry course. And so I used a little bit of it, I modified it a bit. And then we did a lot of the activities, so we tried that with them. And since this year I'm teaching an honors chemistry class and started out the year more like the modeling instruction, kind of following along with the materials that are online and then modifying and adding stuff in as we've gone throughout the year. Teaching honors is slightly different than teaching the local. We go to much faster pace.

Mark Royce (05:08):

Cool. Well, tell me what you have found to be the greatest benefit of the modeling instruction approach in your classroom experience.

Beth Burns (05:19):

So I really like having the kids whiteboard and writing their answers and getting what's in their head out on the boards so you can see what they're thinking and you can see how they're trying to solve a problem. And I also like the ability, we bought whiteboards at school that are on stands, so they're vertical. So the other kids can kind of see what other students are doing. So if they get stuck, they can, we call it like go and spy, go check out and see what's going on. And having the kids have a chance to talk to each other and talk about science, has been really great. 'cause I think we need to move more to some of that critical thinking. Why do we know what we know and do we just trust or do we do some investigations and kind of create that knowledge as we're learning?

Mark Royce (06:10):

So I read, you used the term in something you wrote "Building thinking classrooms".

Beth Burns (06:17):

Mm-hmm <affirmative>. That's a book

Mark Royce (06:19):

I had not heard it.

Beth Burns (06:20):

Oh yeah. It's a book. Peter Liljedhal has written it. I think he is a professor up in Canada. And it was actually originally for math teachers. He has vertical whiteboards kind of around the room so the kids can see what everybody's doing. And he would just set up like series of math questions for kids to do. And it really ties in fantastic with modeling. It ties well in with science. So we use that as well. He encourages random grouping. So I like making my students switch up their lab group partners. Every time we do a lab, they get new partners. Then if they get used to that, then they get the chance to work with everybody. You don't always get to work with your friends or you don't always have to work with the same people and it's good. And then the kids really kind of get to know each other when they're forced to work with everybody in the room, not just a couple people.

Mark Royce (07:20):

Yeah. So the book, the book again, was called Building Thinking Classrooms by

Beth Burns (07:25):

Peter Liljedhal.

Mark Royce (07:27):

If you have information, send it to me.

Beth Burns (07:29):

I can do that.

Mark Royce (07:30):

And we'll put it on this episode on our website. And people can find it. If you have a link for whatever. Cool. Yeah. Anything else from that book that you thought was particularly cool?

Beth Burns (07:44):

Yeah, so I've used some of the strategies. I haven't jumped in with everything. He has a lot of different, like, de front the classroom and have the students be the center and so that it's student focused rather than teacher focused, which is what we do with modeling as well. And using the whiteboards and having them so that the kids can see what everybody's working on. And then, you know, kind of doing that debrief, go around and, you know, have our board workshops. And kind of talk about it and just have the kids have an opportunity to be like a scientist to talk about what they're thinking and why they're thinking

Mark Royce (08:23):

Yeah.

Beth Burns (08:23):

Based on the activity that we've done.

Mark Royce (08:25):

That's really cool. Another term you used that I'm not familiar with was called process oriented guided inquiry learning.

Beth Burns (08:36):

Yes. So we call them POGILs

Mark Royce (08:39):

POGILs.

Beth Burns (08:40):

POGILs. Yep. So it's just one more activity. There's a lot of really great POGILs out there that teachers have created. And some of them have been great that we've used, I used one that explained how the periodic table is arranged with the s, the P, the D and the F orbitals. And it,related it. And then we kept referring back to the model. They used kind of like a house where you had bunk beds and you'd have borders in the bunk beds. And, so it tied in with explaining how the periodic table's arranged. So it made a lot of connections for the students. So yeah, there's some

POGIL books that I think Flynn Scientific sells. There's POGILs out on the internet that you can search and use, and we have like an odd and sundry collection of, that we've used from books or that we've gotten from different resources.

Mark Royce (09:40):

That's P-O-G-I-L, right?

Beth Burns (09:42):

Yes. Yep. Mm-hmm <affirmative>.

Mark Royce (09:43):

So in your bio, I saw you teach high school. And also at the university.

Beth Burns (09:50):

Yes.

Mark Royce (09:51):

You teach high school during the, the day and then run over to the university and teach at Night <laugh>.

Beth Burns (09:57):

Yep. Yeah. I teach one general chemistry course, so mm-hmm <affirmative>.

Mark Royce (10:00):

So how do you see the difference in the way you approach students at the high school level and those at the university level?

Beth Burns (10:09):

Yeah, I think, and I have taught advanced placement chemistry in high school for a long time, which has helped me with the college kids. So the content between the AP course and the college course isn't too terribly different. There's a lot of similar topics. But the kids in high school that take AP classes usually wanna be there. So they're interested and they wanna learn. And the same thing with the college students. They're there, they're paying for the class, and they wanna make sure that they can be successful. So it's slightly different than students that are taking chemistry 'cause they have to meet a graduation requirement in high school <laugh>. And it's kind of fun. So the way the university that I teach at-- It's a one semester long, general chemistry course.

Beth Burns (11:00):

And so we kind of cover most of the topics, kind of go a little bit in depth. So in the fall I tend to have more physical therapy students. And then in the spring I tend to have more nursing students. So it's kind of fun to see kids that are going on in science and need chemistry, but they're using it for slightly different application than maybe necessarily going to be a chemist or work in a lab or do that. So it's kind of fun to kind of help them be successful and encourage them to get their homework done and come to class, all those important things that make them successful.

Mark Royce (11:41):

Yeah. Yeah. Wow. I think you're kind of busy, I would guess <laugh> 'cause of your teaching both in the two institutions, but Wow, that's, it's pretty wild. Yeah.

Beth Burns (11:54):

It's fun. I enjoy teaching chemistry and then it's fun to see the kids be successful as they work through.

Mark Royce (12:03):

So you were teaching quite a while before you got involved with modeling?

Beth Burns (12:10):

Yep. So I started teaching in 2001, and I had come from... When I graduated from college, I worked for a pharmaceutical company. So I worked in a lab. And I always tell the kids I made drugs, but the good kind, <laugh>. So I worked for Bristol Myers Squibb, and then I had the opportunity to move back to the area where I grew up. So I'm back in Rochester, New York. And I worked at Kodak for a little while. And then I realized that corporate wasn't really where I wanted to be. I enjoyed helping people. So I went back to school to be a teacher, and it was a good choice. So I had done a couple things before I went into teaching, which was good, gave me good people skills before being let loose with high schoolers. But it was a great experience to help like, why do we have to learn this? Then I have examples of what you're using chemistry for in everyday life. So

Mark Royce (13:14):

That's a very similar story to my wife's story. I don't know if you know that she was, before she became a teacher, worked in a chemical lab. You know, analytical lab. So you guys both chose to become teachers rather than breaking bad? That's, uh, ...

Beth Burns (13:36):

Oh, yes. Absolutely. <laugh>. I tell my students I like my job. I'd like to keep my job. I will not be doing things like that <laugh>.

Mark Royce (13:44):

That's awesome. So tell me, so you went from the corporate world to teaching. And then you've been teaching since you said '21. What did you see as the big difference between how modeling impacted your teaching?

Beth Burns (14:07):

So, I think it gives the kids instead of just like spitting out information for them to write down and remember for a test, I think it's really getting the kids to think about what's happening and to, see... they're making observations about the reaction. And they're thinking about what's happening. And they're, kind of like... The way modeling is taught, it's kind of like a historical perspective. So it's kind of like how scientists in the past discovered chemistry, and so we're kind of helping them or guiding them along and getting that same idea. I like, we laugh about the fact that we don't talk about protons and neutrons until, like, we just introduced it in the last unit and it's April <laugh> instead of talking about it like electrons we'd started talking about earlier. But, you know, it's just kind of the progression of how chemistry has been discovered. And chemistry's hard. You can't see it. So, for students to grasp it, it's, it's a hard topic to relate to.

Mark Royce (15:13):

You talked about a little bit earlier, about the NGSS and how you guys were looking, when you got introduced to modeling, you were looking at NGSS. How do you see the ties between modeling instruction and the NGSS? Would you change anything?

Beth Burns (15:33):

No, I think it really aligns very well. It gets the kids thinking about what's happening, and then I think especially with

the NGSS, they're trying to teach the kids kind of like a process and then learning to apply it to a new situation, so to a novel idea, which is really important. That's what scientists do all the time. So it's kind of, making it a little bit more so that they can obviously be successful, when the new science assessments come out here in New York State. But also to be more inquisitive or more curious, like, why is this doing this? What's happening? What's going on? These observations that I'm seeing, like what is happening on that subatomic or on that particle level, which is, again, hard to see.

Beth Burns (16:33):

So we're using models to explain that. And then we use that common phrase, all models are wrong, but some models are useful. So we use that a lot. And we talk about how we've modified and changed things. Like we just went through the history of atomic structure in class and kind of like, we came up with one idea and then that didn't quite fit our experiences, and so we modified it. So I always tell my students, I'm like, when you go off to college and you go on and get a PhD and you discover a better picture of what the atom looks like, you're gonna come back and tell me what it is, and then I'll teach it to my students.

Mark Royce (17:13):

<laugh>. Hmm. Since you've led a modeling workshop, I assume that means you're tied in with AMTA.

Beth Burns (17:25):

Yes. Yep.

Mark Royce (17:27):

I'm just curious about how you have found the AMTA to help support you as a teacher. Is there ways that

Beth Burns (17:35):

Yeah, absolutely. There's definitely a network of people that you can contact. The people that I did my initial modeling training with, even though they're all in this area, I still keep in touch with all of them, but I have now met teachers that are modeling all over the country. And when I did my chem two workshop, I met someone that teaches in California. So we were talking about like, what do you do with your AP class and how do you use modeling there? And then when I went to the leadership workshop, all of those teachers, we still stay in touch. And when we find new ideas or new things we share, we have like a text chat that we're all on, so it's nice to keep in touch and then if you have ideas or you have questions, there are tons of ways to contact teachers. I've reached out to teachers using Twitter, using Facebook. And then also, there's the Discord channel. There's a way for modeling teachers to talk to each other all across the country. And people are fantastic. People are very helpful when you have questions or, Hey, how do you do this? Or, you know, I tried this, but it didn't work. Do you have any suggestions? There's people that are very willing to help.

Mark Royce (18:57):

I've been talking with Ray Howanski and some others at the AMTA about where things are, and I just want to kind of give them a little plug right now. They're launching a fundraising campaign to help strengthen and improve the website, the AMTA member's website to make resources a little easier to get ahold of and make the site a bit more accessible. And it's pretty exciting. So, that's why I wanted to plug it during our conversation.

Beth Burns (19:40):

They also have like coffee hours that you can join. And I can't remember, I think sometimes they're even open to people that aren't necessarily members. But if you're interested, you can join. They have a lot of PD that they offer -- professional development that they offer. There's, you know, like, I think I just went to one that was about, I think it was called VIS Chem. They had someone come in and they went to learn about it and then attended a workshop

about how to visualize chemistry so someone's made some videos. So you can see kind of what's happening on the particle level, which, again, hard to picture. So they've created some great animations, and I heard about that through the AMTA.

Mark Royce (20:22):

Yeah. They're a good resource. They have lots and lots of resources available. And that's, uh, for those who don't know, it's modelinginstruction.org. Modeling instruction.org. So I want to encourage our listeners, if you're not already there, go visit them.

Beth Burns (20:43):

Yeah. And it's all the subjects. They go from physics, chemistry, biology, middle school, astronomy. There's all of 'em.

Mark Royce (20:52):

Yeah. And it seems to be a growing community too, across disciplines, and it's really awesome. And I wanna encourage you to help donate to their fundraising efforts. It will be well worth it and they need to raise quite a bit of money for doing a website redo. And there's some other things they've got planned, which I'm not exactly sure. I think Ray may have talked about it a little bit last month on the previous episode. So, let's give everybody your best modeling tips.

Beth Burns (21:31):

My best modeling tips.

Mark Royce (21:33):

You've been doing it six years now.

Beth Burns (21:36):

<affirmative>. Right. And, you know, I keep learning, I keep doing more things. One of the fun things that the beginning of the year starting, starting in January when I helped Emma teach the intro to modeling course. We were very cognizant of the fact of putting people in groups, and doing that often. And so that is something I need to do more in my classroom. So I like the more things I do, the more opportunities I see to try some new things. And it's just being willing to try. But having them working in those small groups and working together and mixing 'em up so they're not always with the same people, it really built a sense of community. So we had a fantastic group of participants in our intro to modeling course that I think they really connected and hopefully they now have, you know, they're talking to each other. Like I talked to all of the people that I attended workshops with to learn and to build their practice.

Mark Royce (22:37):

So what did you learn through modeling that most impacted your classroom?

Beth Burns (22:44):

I think it was just like the way we explained things and then you're realizing like, what an impact that has. There were so many like aha moments. When I took my first chemistry modeling workshop to be like, you know, I kind of always knew, like I understood the chemistry, but really digging down and going through that process of learning it kind of in that way, really helped, break down some misconceptions. And helping for when my students have misconceptions, how do I help them to see like why things are the way they are or why things happen. So I think that's like a big huge benefit of that. 'cause you're kind of building the knowledge, you know, kind of as they had built it historically, that model of what the atom is. The modeling materials are fantastic and you can use them like as they are or you can modify them. You don't have to follow directly. 'cause we'd always talk about how modeling is more

of a pedagogy, like a way of teaching rather than like exactly how to do it. It's not a prescription, I think it's mostly, it's like getting the kids to think about science and then getting what's in their head out so you can help them with those misconceptions and misunderstandings.

Mark Royce (24:16):

I like how you said the resources in modeling instruction are very helpful. But you can also modify, I think that's how innovation happens, you know, by being willing to, as a teacher, follow your heart. Yeah. And use the resources, but also don't be afraid to try some things in your classroom if you feel like led to do that. I think that's really cool.

Beth Burns (24:50):

Yes. Yeah. Like, so there's some things that, in the interest of time, we have, at my school, we have shortened shorter periods than a lot of other schools. Like a lot of schools have block scheduling, so they have longer periods of time with their students, and we have 40 minute periods, so it's hard to start, do an activity and then wrap it up before they leave. So sometimes we have to come back to what we've been doing the day before. So a lot of times what we do is I take pictures of their boards, their whiteboards, and then I upload them to a Google slide deck and then, we can come back and talk about it the next day. So, you know, it's depending on your circumstance. Like, and I know across the country some states have to teach different topics than other states.

Beth Burns (25:41):

So it's, you know, what are you, what do you need to put in and what do you need to get through to get through your content for the year? And I think using the ideas and using the whiteboarding and having the kids do that, whether it's a modeling activity that you got, or if it's one that you had before, you can still use modeling techniques. So the whiteboarding and talking about your whiteboards with groups is something that you can do like whether you use a modeling activity or if you come up with something or use an activity that you've had that you've really liked, that you've used over the years.

Mark Royce (26:21):

You know, it's interesting, almost everybody I've interviewed mentions the whiteboarding processes as one of the key things in the modeling approach. Why is that so?

Beth Burns (26:37):

Well, I like the idea, and people have mentioned this before, probably, like the whiteboard, you're more flexible. You can erase it quickly. If you put something down that you don't like, it's very easy to change. We usually give the kids some, we kind of talk about norms, in the beginning of the year when we start whiteboarding, like, don't erase somebody else's work. You know, ask permission if you're gonna change something. We come through sometimes I like make comments and put notes on the board and I ask the kids to leave it there. So that gives us something to talk about. But I think it's that luxury that it's not permanent. It's erasable. You can change it, that it's, you're not stuck with what you wrote. Especially if you start doing something and you kinda look around, you're like, oh, I'm off track. I wanna go back and change what I'm doing. That there's that flexibility. And I always tell the kids, I'm like, the whiteboard, I'm like, it's, it's not a test. It's, you know, you're not getting graded on it. It's just, what do you think now? And we're gonna talk about it ... but them coming to their own, like, why did I do this and how do I wanna change it? And giving them that kind of autonomy in their own learning.

Mark Royce (27:55):

Yeah. That's great. That's great. Well, gosh, it's been awesome talking with you. I'm really glad you made the time to do this. It's very interesting, it's really interesting for me to hear the stories of modelers and how they are approaching it and how it's really impacting their students. And it's really great, really great talking with you, Beth. Thank you. Do you have anything else you wanna share before we go?

Beth Burns (28:29):

No, I think that I covered everything. I hope. If not, there's more to learn. <laugh>.

Mark Royce (28:35):

Yeah. Well, and then you let me know and we'll have another conversation.

Beth Burns (28:41):

Fantastic.

Mark Royce (28:42):

Okay. Well thank you so much.

Beth Burns (28:45):

Thank you.

Mark Royce (28:46):

For joining me today.

Mark Royce (28:47):

Okay. I'll see ya.

Beth Burns (28:49):

Take care.