#240 Reaching and Teaching Neurodivergent Learners in STEM, with Dr. Jodi Asbell-Clarke

Time: 36:24
Owner: AVID Open Access

SUMMARY KEYWORDS

computational thinking, learners, executive function, students, kids, teachers, stem, jodi, education, talk, problem solvers, called, part, today, work, avid, book, learning, support, research

SPEAKERS

Dr. Jodi Asbell-Clarke (70%), Paul (12%), Rena (10%), Winston (8%), Transition (1%)

Dr. Jodi Asbell-Clarke 0:00
It was a dream job. And I went in and just started teaching the way I learned. I didn't want to do it the way schools were doing it. Being able to think about education differently was a gift that I was given.

Rena Clark 0:15
The topic for today's podcast is Reaching and Teaching Neurodivergent Learners in STEM, with Dr. Jodi Asbell-Clarke. Unpacking Education is brought to you by avid.org. AVID believes no student should fall through the gap. To learn more about AVID, visit their website at avid.org. Welcome to Unpacking Education, the podcast where we explore current issues and best practices in education. I'm Rena Clark.

Paul Beckermann 0:47
I'm Paul Beckermann.

Winston Benjamin 0:49
And I'm Winston Benjamin. We are educators.

Paul Beckermann 0:52
And we're here to share insights and actionable strategies.

Transition Music 0:57
Education is our passport to the future.

Rena Clark 1:02
Our quote for today is from our guest, Dr. Jodi Asbell-Clark, from her TEDx Talk titled, "We Know More Than We Can Tell." When talking about neurodivergent learners, she says, "You

don't have to be really good at tests to be a great problem solver. I believe that unleashing the potential of these diverse learners is the key to our future." All right, Paul, Winston, what do we think?

Winston Benjamin 1:31
For me, the thing that I'm hearing is really the teachers or the adults, so really challenge the way they perceive historical intelligence to be, because as it says, it's like, they're still good problem solvers. So teachers are the ones who kind of limit what students are capable of. And I think once we get out the way of students, then they will be able to reach their greatness. So a part of me is really pushing teachers to reconsider their historical concept of quality.

Paul Beckermann 2:00
Yeah, and I'm going to jump off that, too, Winston and just share my perspective that there are different ways to unlock the mind so that kids can thrive. You know, traditionally, it's been tests, but there's so many other ways that we can engage kids. You know, I think of UDL. We've talked about UDL on the show many times--Universal Design for Learning--different ways to give students options, either and how they're receiving information, how they're showing what they know, how they're engaging in that content. You know, if we can find different ways to engage our different kids, because they're all different, we can really unlock things and look at kids as having gifts, not deficits, if they're not good test takers.

Rena Clark 2:42
I always appreciate that strength-based lens. What is it that students can do? And let's focus on looking at that to help us design our assessments, our instruction. But I'm excited to dig deeper around this topic today. So I'd like to welcome our guest, Dr. Asbell-Clarke, to the show today. So she is the senior leader, research scientist, and director of EdGE, an organization which she founded in 2009, to study how game-based learning can transform science education. So, welcome.

Dr. Jodi Asbell-Clarke 3:17
Thanks. It's great to be here.

Rena Clark 3:19
And if you could just tell our listeners a little bit more about yourself, your background, your area of research, just to help them kind of understand where you're coming from today.

Dr. Jodi Asbell-Clarke 3:29
Sure. First of all, let me just say the EdGE is a group at an organization called TERC. And I did not, I was not a founder of TERC. TERC has been around for about 60 years doing, it's a nonprofit focusing on innovation and equity in STEM education. And I've been fortunate enough to be there for 30 of those years leading a team and teams of researchers in this area. And a bit about my background, I I started out studying STEM. I wasn't a great student. I wasn't like Harvard-bound or Yale-bound, or anything. I started at Keene State College, which was a great little place to start, but I started from the STEM perspective. I studied computational math, which

was what it was called back then. But I got the chance to co-op for IBM and ended up as a programmer on the first 25 missions of the space shuttle software.

Paul Beckermann 4:24
Oh, wow.

Dr. Jodi Asbell-Clarke 4:25
And, you know...

Paul Beckermann 4:27
My dad joke mind is saying. "That's out of this world."

Dr. Jodi Asbell-Clarke 4:32
I must say it really is rocket science.

Paul Beckermann 4:34
That's cool.

Dr. Jodi Asbell-Clarke 4:37
But it was, I was 20 years old, running around with a pager and if there was a, you know, something happened, they called us in and said, you know, "Wy did this happen?" It was very heady, very cool. I worked with a lot of people who were extremely smart, some of the best problem solvers in the world. Some of them, a little quirky, and you know, hard to communicate with or, or just to thought differently. Never really noticed the difference. I just knew they were like really talented, and I want to be able to learn what they knew. And then through a series of things, got married, had kids, went to graduate school for astrophysics because I wanted to be an astronaut, but very quickly realized just my lack of sort of self-discipline and constrained thinking was neither good for being an astronaut, nor an astrophysics researcher. But, so I became an educator because I was just interested in too many things. I wanted to do too many things. So I ended up teaching at a lab school at the University of Illinois, University High School, great little, small school, where my job was to take sort of 99% college bound kids, really creative thinkers, and do whatever I could that wasn't traditional curriculum to teach them physics, and astronomy eventually. And it was a dream job, and I had never taken an education course in my life, but I went in and just started teaching the way I learned, which was through experience. I brought them downstairs and said, "Okay, we're gonna run races," so that they learned velocity and instantaneous velocity and acceleration, all that stuff, because that's how I would think about it.

So, I did that for a little while, and then ended up at TERC through a series of coincidences, and realized that being able to think about education differently was a gift that I was given. I was given enough experience to know I didn't want to do it the way schools were doing it, and now I was given a chance to get, use taxpayer money through very generous funding from the National Science Foundation, to figure out how we really should do it. And so when people ask me what I do, I, I basically learn how kids learn STEM. So through all that, through a series of

things, we use game-based learning to really reach kids that often get marginalized. And in 2015, TERC brought back a game called Zoombinis, that is a beloved popular game. I was not on the design team, so I can say it is the best learning game out there. And we were lucky enough together, fortunate enough, to get a grant to study computational thinking, which we can talk about more in the game Zoombinis. And we were able to demonstrate the game was great at showing kids computational thinking. But the side note was teachers kept on coming up to us saying, "Wow, it's the kids that never, you know, stood out in other aspects of class. They're becoming the rock stars. They are solving all the Zoombinis puzzles first, and the other kids want to know how they're doing it. Now they're seen as the class leaders." And so we just kept on saying there's something here, there's something here. Got our very interested in neurodivergent learners. And that's how we ended up where we are now, where I am, with our focus and interest.

Winston Benjamin 8:28
I appreciate your experience. There's so many different ways that we define neurodivergent. How based on if you are older, younger generation. Is there a way that you can help define what neurodivergent learners mean, in the K through 12 classroom today, as a way to ground our listeners?

Dr. Jodi Asbell-Clarke 8:48
The way I define neurodiversity, at the at the sort of fundamental level, is just the natural variation within brains. All brains work differently. And in the same way we have variations in size and hair and skin color, and all these things, we have different brain functions. So that natural variation and is is what I mean by neurodiversity. When I talk about neurodivergent, it means a little differently because it usually means in some way, at one end or another, or one extreme or another, of some of those dimensions. Well, let me back up and say why I don't define it as strictly ADHD or autism or dyslexia. While those would all be included, first of all, in our experience, many learners experience more than one of those and those classifications are very limiting in a sort of pedagogical or research way. And then secondly, there's so many factors that exhibit similar behaviors, and those are increasing in today's classrooms. Children who are under stress, anxiety, trauma, hunger, sleep, all those things, they all affect what we call executive function. And at the core of many of those other conditions we talked about before, also at the core of those, are executive function. So we just think about "How do we support people's executive functions? And how do we reveal and nurture the cognitive assets that every student brings?" And when we do that, we we can be inclusive of neurodiversity, while also not excluding anybody from that intervention or that practice. So does that make sense?

Winston 10:48
It does.

Paul Beckermann 10:50
Yeah, it's helpful, helpful to get that kind of definition, and to see it a little bit broader, maybe, than what some people might define it as or just assume it is. So, let's talk a little bit more about

the work that you're doing to support neurodivergent learners. Why have you kind of focused in on STEM as maybe the best way to support them or a way that you feel is effective?

Dr. Jodi Asbell-Clarke 11:14
What's funny for me, I started in the STEM, and now I'm focusing in on neurodiversity. But I will say the connections that are made, well, it's interesting. STEM companies--SAP and Microsoft, and Ernst Young or EY they're now called--back in the early 2000s, started neurodivergent hiring programs. Many of them started focusing specifically on autism. And there was actually a company--is a company--in Sweden, I believe, that was was hiring specifically people with autism to debug software, because they knew that who wouldn't you want more than somebody who is detail-oriented and wants to like compulsively dot every I and cross every T, and really sees patterns and sees inconsistencies, and they feel them. It's a sensory experience for them. So they were hiring people with autism, but then they realized they needed to change, like how they did their hiring programs because, you know, they weren't going to interview some of these people and understand what they wanted. So, so they they changed things, and then other companies began to see the advantage of this. And so by the time I started talking to directors of the neurodivergent hiring programs, I was going in thinking, Oh, they're going to tell me it's a philanthropic pursuit, and somebody's you know, CEO's nephew had ADHD and wanted it or something. And it wasn't that at all. They were, they were saying, "Oh, no, it's a competitive advantage. We can't hire enough employees for the talent that we need in these areas, and what we're finding." And so, that really surprised me and made me start researching, and ended up with a book that I think we're going to talk about, about the overlap between some of the assets that have been studied for neurodivergent learners, such as pattern recognition and creativity and systematic thinking and persistence and the habits of mind that are thought to be associated with STEM problem-solving and, and how do really good problem solvers see patterns? They think about things systematically. They are creative and have idea generation and innovation. And those are all what the research says some of these strengths are. That's the connections we see.

Rena Clark 14:13
Well, you alluded to a little bit after your discussion that you wrote a book. So we are going to talk about that. And I'd love to hear more about your book. And you kind of shared why you chose to write about that. But if you want to dig into that a little bit more, but more importantly, as a teacher educator, if I were to come and read this book, what would you expect to be some big takeaways for your readers?

Dr. Jodi Asbell-Clarke 14:38
So, first of all, it comes out in mid-November, so it's great timing, and it's called Reaching and Teaching Neurodivergent Learners in STEM. And now about 10 years ago, but for about eight years, I was co-teaching in a middle school, sort of in parallel to my research at TERC. I was just volunteering in a local school and ended up in the classroom of the most awesome teacher ever named Sadie Bradbury. And she and I wanted to do PBL, project-based learning, excuse me. And I had never, that wasn't an area of my research. It was always something that I knew I naturally did, but it wasn't part of our research. And it turns out, unbeknownst us, Nova Scotia

curriculum, the province where I live was, was actually wanting to pilot this in schools. So, we were getting a lot of background support and enthusiasm for doing this.

So I spent eight years in a school with very high needs kids. These kids had everything going on from what I talked about. There was autism, there was ADHD, there was dyslexia. There were all of those things together. There was trauma. There was anxiety. There was everything going on in this school. And, and so I just watched how Sadie built the relationships with the kids and developed agency, learner agency, sort of empowered these kids as learners. And how she naturally differentiated the curriculum, made it a different experience. The same curriculum could be the different experience for every kid. And that same, the ways we were able to assess learning became differentiated. And after 25 years in the field of doing this theoretically, and watching it all unfold in classroom, it just felt like such a gift. And I had so many stories to tell of kids and how it played out and what didn't work, and lessons learned, and bridges burned. And so, and then I was granted a sabbatical at TERC to take four months and just go write. So that was no-brainer. I got to do this. And, and I think the true gift was really seeing those kids for what they could do, and, and just realizing if we could assess them differently and give them different opportunities, there's so much there. And at some point, it turned around, and I thought, wait a second, I'm a citizen in this world with all these problems. And if these kids aren't tapped into, we don't have a chance. You know, these are the kids that are going to be at MIT if we get them there. And they're going to be the innovators and the solvers. So that became my mission.

Winston Benjamin 17:52
I appreciate the way you talk about education and its power, right? Identifying what students are successful with. So one of the things that you kind of alluded to, but I would like to hope that you can expand on this a little bit more, is the idea between the relationship between computational thinking and executive function. Right? We know that executive function skills are critical to ensure student success, right? But how does computational thinking help support the executive functioning and development, right, as you see, from your students to help with?

Dr. Jodi Asbell-Clarke 18:31
So first of all, I want to say I'm glad you use the word support as opposed to change or improve. I would love to think that our work changes and improves it, and we're just starting to ask that question. But that wasn't even our goal to start. It's to support it so that we can improve and nurture STEM problem-solving. And this also takes me back a little bit to what I've realized I didn't answer in the last question, which is, "What can teachers take away from this?" So, in our work, we're building a model and it is a team effort. I have a team of 10 people behind this and we're building a model using UDL that you mentioned before, universal design, and cognitive load theory, which is like don't overwhelm people with too much information at once. And, and also differentiation strategies and executive function supports, which I'll get into, and we built. We were, we were fortunate enough to get a research grant from the U.S. Department of Education, a 4-year grant to build a set of materials that, for teachers and learners in grades three through eight. We really homed in--our research is really homing in on grades three through five--that was our sweet spot, and we built a model that we were able to show not only

helped kids learn computational thinking, but also, dramatically, the kids who benefited most were the kids who had scored lowest on executive function tasks that we gave them. And we did it by things like graphical organizers so that they can collect their information and help support their working memory, and highlighting tools that help highlight the salient information that they--not telling them how to find it, but just highlighting it for them when they find it.

And metacognition tools of having them explicitly express what they just learned, whether if they did, if they solved a puzzle or game, how did you solve that puzzle in the game? And we do those graphically and verbally and textually. Whatever the kid needs. We have all those different ways. So we provide multiple modalities, multiple ways of representing information, and multiple entry points for the teachers to use. So maybe, let's say, we're doing a coding activity, which we do some of . Or maybe one person starts with a blank slate and the tools. One person starts with a set of code that's all made, but has a problem and needs to be debugged. And somebody else might start with some of the tools all filled in and need to be filled in. Those are all perfectly valid ways to attack a problem. And some people might find their strengths in one and some in the others. So providing those strategies is something, again, that would be provided through the books. A lot of those strategies are described in the book, as well as other teaching and learning strategies. And we're building on that. That was an early phase research project, and we've applied to get the mid-phase. We hope to be able to learn how that we got those effects and be able to scale that up.

And we also found through that work that teachers really need professional development about the executive function and how it plays the connections. And, because some teachers understand a lot about computational thinking, and understand about problem decomposition, and pattern recognition, and abstraction, and algorithm design, and these things that we talk about with computational thinking, but they don't necessarily understand or other parts of STEM problem-solving. But they don't necessarily understand about children's variations in executive function. Other educators may really understand about executive function, but they have never heard of computational thinking. So to make these connections, that problem decomposition is just breaking things down into smaller parts, because sometimes that will reduce the cognitive load or help, you know, help kids with compromised working memory. And abstracting ideas and seeing patterns is part of the generalized problem solving that may or may not come with cognitive flexibility, which is part of executive function. So, seeing these connections is going to make a better STEM teacher. And it's going to make a better support teacher that can support EF. And but that comes with a lot of PD. So we're trying, we're proposing right now. We have a proposal due next week, to run PD around this through AVID, with AVID as a big part partner in that.

Winston Benjamin 23:52
That's awesome.

Paul Beckermann 23:54

So you talked about this connection of computational thinking and executive function as part of the work that you're doing through this grant. Was that the connection to the program called INFACT?

Dr. Jodi Asbell-Clarke 24:05
Exactly. INFACT is "Including Neurodiversity in Foundational and Applied Computational Thinking." And, and we got that, as I said, from the U.S. Department of Ed. And we had partners, a bunch of university partners, come and just put our heads together of what's the essence of computational thinking, and where are those assets of neurodivergent learners and how can we put those together and how can we support executive function in that? And those are open access materials that are available. They are going to be available through AVID's OER resource. They're currently available on TERC. T-E-R-C is TERC, and on our website through the IMPACT Project.

Paul Beckermann 24:05
So if a teacher is interested in checking out these materials, they can they can go to TERC. They can go to AVID Open Access. What will they find there? And how can they like, leverage those, those resources?

Dr. Jodi Asbell-Clarke 25:06
So, ostensibly, they're designed for grades three through eight. I will say our research showed the sweet spot is really three through five. We need to do some more work on them to get the kind of applications that would really engage middle school learners. But what they're, the essence of the materials is to teach those foundational thinking structures, problem decomposition, pattern recognition, abstraction, and algorithm design, that are what we call computational thinking. And it's a mode of problem solving. It's not just coding. It's not just robotics. It's not just games and puzzles, although we do all those. But it's a mode of problem solving, and we apply it to daily life problems, getting up and getting, you know, what's the routine you use when you get up in the morning? Get out the door? How do you structure that? How are there repeat loops in there? Or is there conditional logic in there? And do you use functions and variables? We introduce it all within games, what we call get-up-and-go activities, where you're walking through mazes, and directing people through mazes with commands, but all in the essence of these logical problem-solving talents.

Paul Beckermann 26:28
Awesome. Thanks for explaining that.

Rena Clark 26:30
So our listeners have heard a lot today about the mentioning of executive function and computational thinking. But let's go back to this: three strategies that might help teachers that are trying to nurture and develop for executive function for students in the classroom. What would you recommend?

Dr. Jodi Asbell-Clarke 26:50

So, the first one is a huge one, which is differentiation. And that takes really knowing your learners, and knowing what is going to interest them and engage them and activate them. But without that, you can't do anything. That's a strong statement. But it's, for me, it is a ground zero. And then, understanding what parts of executive function may be keeping your learners from, each of your learners from, expressing what they really know. And so that may be working memory, where they just can't retain it long enough to be able to act on it. It may be cognitive flexibility, where they see a system of rules, and it's just really hard for them to assimilate new information into that. It may be a tension, where they're just very distracted by other things. And it may be metacognition, where they can get the pieces, but they're not sure how to put the pieces together into the story of their learning and where they are. And it may be all of those or some of those. So those are just some of the elements that one can scaffold or support, to be able to then get to the deeper understandings and their deeper passions and interests. In my interviews for the book, I talked to scientists and professionals who had made their way through their own neurodiversity. And almost all of them said, they love their brain, the way it works. They wouldn't change anything, except for how other people saw them and that stigma.

Paul Beckermann 28:37
That's a T-shirt. We have T-shirt moments, things that are just golden. There's one right there.

Dr. Jodi Asbell-Clarke 28:45
So how the learner sees themselves, how the learner sees the learning experience, that's got to click, and then everything else can happen within that.

Paul Beckermann 28:56
That's great.

Winston Benjamin 28:59
I appreciate that point, because from those three tips, we're gonna ask everyone: what's in your toolkit?

Transition Music 29:07
Check it out, check it out. Check it out. Check it out. What's in the toolkit? What is in the toolkit? So, what's in the toolkit? Check it out.

Winston Benjamin 29:18
So what's in your toolkit? What's something that you're walking away that you're like, ooh, I'm gonna grab that if I need to use that in a moment? What you walking away with Paul, Rena?

Rena Clark 29:26
I think this goes back to something I said at the beginning. But this is all around relationships, but we really need to see the strengths. What is it that students can do, are capable of, and then build off of that. And then also thinking about how that might work within PBL or project based learning. It seems like it is a way that we could really apply those strengths in different ways, have different modes of learning and assessment that aren't just as we said earlier--tests.

Paul Beckermann 30:01
Yeah, and Jody mentioned PBL. She also mentioned UDL, universal design for learning. So I'll drop that one back in the toolkit because giving kids different ways to, you know, engage in content, to represent what they know, to take action and express things, that is part of that differentiation equation, and that can go a long way. cass.org has great resources out there if you're looking to get started in UDL. We have a podcast with Katie Novak, where she talks about UDL and blended learning. You can check that out. There's lots of resources on UDL, but I encourage our listeners to check into that.

Winston Benjamin 30:39
And I'll throw something in again. Jodi, you mentioned this. AvidOpenAccess. There's tons of materials that's going to be supporting Jodi's work, and all this work on how to engage with neurodivergent students in STEM learning, so please check that out. Jodi, I'm gonna--Miss Jodi--I apologize. My mother would kill me if I didn't say Miss Jodi.

Miss Jodi, do you want to throw something in our toolkit?

Dr. Jodi Asbell-Clarke 31:09
Well, um, in my book, I have three chapters that are called strategies. One of them is computational thinking. We've talked about that. One's project-based learning. We've talked about that. The third we haven't talked as much about as game-based learning. And it's not that I'm out there to make more gamers. There's, there's lots of other ways. But there are a lot of kids who are in games who are identifying strongly with games, and who have a lot of confidence and self-efficacy in games. And so, if we can extract the learning and that they're doing in games, which is, there is a lot of implicit problem-solving in those games. And if that can be used to bridge to real life skills, I think that's another way of reaching learners who sometimes are left behind.

Paul Beckermann 32:01
And let's not leave our toolkit without reminding our listeners of your book coming out Jodi.Tell me if I get this wrong, but Reaching and Teaching Neurodivergent Learners in STEM. Correct?

Dr. Jodi Asbell-Clarke 32:12
Yes. The subtitle is Embracing Uniquely Talented Problem Solvers. And it comes out on November 14. Rutledge, Taylor, and Francis. And it's already--I saw I got a link--you can preorder it on Amazon.

Paul Beckermann 32:28
All right! So check it out on Amazon. All right, well, it's time to jump into our one thing.

Transition Music 32:35
It's time for that one thing. One thing. One thing. Time for that one thing. That one thing.

Paul Beckermann 32:47
All right, Rena, what's your one thing today?

Rena Clark 32:50
I love all of this. And I appreciate us diving into this topic. I'm hoping we'll talk more about it in future episodes. But once again, it goes back to know your students because you can't really do a great job differentiating or as we talked about scaffolding when you don't know your students. So, know your students, and then go from there.

Paul Beckermann 33:12
Very good. Winston.

Winston Benjamin 33:14
I think I'm gonna jump with that. Knowing your students but also Jodi mentioned that. Get PDs on computational thinking or executive function if you don't know what the opposite or either one are. Because I'm really good at supporting students and executive function, but I'm not really that good in computational thinking. So it is important for me to get the PD to support my students. So if you're out there and you know your skills, go get some support on the other side so you could be the bridge that allows students to walk across so they can learn more.

Paul Beckermann 33:48
Ooh, nice metaphor, Winston. I'm going to just, I've been dwelling on the fact, you know, that neurodivergency is an asset. These kids with autism that these these big tech companies are seeking out because they have these unique skills that can really be assets to an organization. It's not, well, we're just gonna be nice to this group of people, you know. They may be struggling in some situations. No! We want them! They are really good and they're the best that we can get. So I love that and I love that you said our problems of the future are not going to be solved unless we bring these folks into the equation, so, really cool and authentic affirmation of these these folks and the skills that they have. Jodi, you get to jump in our one thing, too. What would you like to leave our listeners with? A kind of a final thought?

Dr. Jodi Asbell-Clarke 34:40
Oh, I think just, I hope maybe somebody that you meet, you might look a little differently at after these conversations and just, you know, it might be somebody you live with. It might even be yourself. Um, and if I, just I think, we all need a little bit of that, and I hope that I could have sprinkled a little bit of that into this conversation.

Rena Clark 35:13
I think you have and I, I know I appreciate you being here today. So thanks again, Jodi, just for sharing some of your research, your knowledge. And for everyone listening, again, you can get Jodi's book sounds like on Amazon, Reaching and Teaching Neurodivergent Learners.

Dr. Jodi Asbell-Clarke 35:28
And I'm sure many other places.

Paul Beckermann 35:32
We're not getting kickbacks or anything.

Rena Clark 35:35
Click that button and it's at your door the next day. It's lovely. But once again, we do appreciate you being here.

Dr. Jodi Asbell-Clarke 35:42
I really enjoyed it, and I appreciate your interest, and I look forward to working more together.

Rena Clark 35:51
Thanks for listening to Unpacking Education.

Winston Benjamin 35:54
We invite you to visit us at AvidOpenAccess.org, where you can discover resources to support student agency, equity, and academic tenacity to create a classroom for future-ready learners.

Paul Beckermann 36:09
We'll be back here next Wednesday for a fresh episode of Unpacking Education.

Rena Clark 36:13
And remember, go forth and be awesome.

Winston Benjamin 36:16
Thank you for all you do.

Paul Beckermann 36:18
You make a difference.