Dr. John Staley (00:00):

We have to look at mathematics as a story that we tell students across the grades, K to 12. And what we are all is the conveyors of a chapter in this progression of the story.

Dan Meyer (00:12):

Welcome back folks to Math Teacher Lounge. I'm one of your co-hosts, Dan Meyer,

Bethany Lockhart Johnson (00:17):

And I'm your other co-host, Bethany Lockhart Johnson.

Dan Meyer (00:20):

And if you folks notice a little extra charisma or vibe between Bethany and I this recording, it's because Bethany and I got to hang out in person, a real rare occurrence for us. Bethany was up here with fam and in my home. And, yeah, Bethany, what was your take on the whole situation? You know, gimme a thumbs up, thumbs down. Was it neat enough for you? You know, talk to us about it. <laugh>

Bethany Lockhart Johnson (00:43):

On the Meyer household? Well, you know, any time I get to see you, Dan, which is usually at conferences, this was like a whole 'nother level. You invited me into your home to hang out with your wonderful family. The only thing missing was that I really did — like, I was serious! I told you this beforehand! — I really did think I was gonna get to play some of those fluency math games with your kiddos. And that did not happen. In fact, I think once I gave them some Halloween stickers, they were done. They were like, BYE! You know. You said, "Actually, could you stop calling them math games?" is, I believe, what you told me <laugh>.

Dan Meyer (01:20):

<laugh> Yeah. You served your purpose in delivering a fantastic little treat for them. And then they were off scurrying into their, you know, their rabbit's den or whatever, to go gnaw on it. And we had aspirations for like, doing some social content, you know, to try to make our producer Martin happy. We had some Reels ideas. I thought I was gonna figure out all my fluency stuff. 'Cause I had a legit K–5 specialist in my home. So I was gonna put Bethany to work with my kids. But really, we just had a good time just hanging out, talking, talking shop, talking family, that kind of thing. It was a real treat to hang out with you.

Bethany Lockhart Johnson (01:54):

Hey, thanks. And if I come to your home and you immediately present me with a fall cocktail and then feed me an amazing dinner, I probably will get a little distracted off the fluency stuff. Sorry. But I will tell you: Dan had a really fun idea for a Reel. Do you wanna share it? Dan?

Dan Meyer (02:12):

I'll share it 'cause it probably won't get made. And I wanna clarify on the front end: I'm a secondary guy, so I want to set the bar real low for myself. So low I can step over it. So I had this idea, all right? Which was that ... I got a ping-pong table in my backyard, right? And I learned about choral counting recently from Bethany and other folks on the call, right? Where, you know, you can start at any number and go up around a circle by a fixed amount, maybe. So one kid says six, next kid says nine, next kid says 12, and

so on. So here's what I was thinking is me, Bethany, ping-ponging it, all right? Table tennis-ing it. And we start just doing choral by ones. So like, I hit the ball over: one. Bethany hits: two, three. And whenever someone misses, that, then, is the new starting number. And the new ... what do you call it? You know, the new skip amount. So if we make it to four, then we go 4, 8, 12. If I blow it there, it's like 12, 24, 36, whatever's after that. Who even knows <laugh>? But there's a little bit of time pressure, you know? 'Cause the ball's coming, the ball's coming, and you gotta hit that back. So I was feeling pretty good about that. We never did it. But you can all imagine how funny and heartwarming and a little bit profound the Reel would've been on Insta. You can imagine in your mind's eye,

Bethany Lockhart Johnson (03:25):

I did not see this ping-pong table you speak of. But if you had greeted me with paddle in hand, I would've been ready to go. I'd've been like, "Let's go." And also, I wanna clarify that in choral counting, one of the beauties is the choral nature of it, where you're counting together. So it's not like a popcorn, Dan has to tell me—

Dan Meyer (03:46):

Person on the spot.

Bethany Lockhart Johnson (03:47):

Yeah. I know it's that we're counting together. So if I don't know what a multiple of 12 is, because you missed the ball — I mean, just in case you missed it — then we're doing it together, so there's no pressure and it's just joy in counting. So let's, let's take that pressure off, that we would've been counting together.

Dan Meyer (04:06):

Mm-hmm. I love that, like, if 24 plus 12, I'm like, "Ahhh, I know it's 30-some," you know, but not 36. Then I can kind of get happy about, "We all said 30 and I said 30. I was a part of that. And I was like, you know, not quite at six yet, but can contribute." So, hey, I'm learning here. Thank you for that, Bethany.

Bethany Lockhart Johnson (04:24):

It's all about learning, Dan Meyer. It's all about learning.

Dan Meyer (04:26):

It is about learning. I wanted to offer one quick thing, fluency-wise, that's been happening in our lives around here. Got kids in K and 1, as I've mentioned before. They're like in the official, you know, learning-math thing in formal school environments. And, you know, I'm so grateful to have a little bit of time and energy at the end of my day. I'm not working two jobs. I can sit down and do a little work with them, homework of different sorts. And we're doing some mathy stuff. And they said to me, "Can you time me?" And I was like, "Wait, what?" And it kind of hit me a little bit. And come to find out that they get timed in school and they wanted to do the timing thing at home. I just wanna say, you know, I felt a little bit of conflict here. I wanna say just straight up, my kids' teachers are incredible, love them, could not do what they do. And obviously over the course of our season here, I've been working issues out about fluency and how to balance a kid's joy in math and their ability to work the mathematics fluently. Anyway, I'm still thinking about it. I was glad, if nothing else, that they weren't traumatized by the timing. That's nice, that they weren't freaking out about that, or shrinking back. But it did raise questions for me about like, "Is this part of the nature of math? Or like, is this extra?"

Bethany Lockhart Johnson (05:39):

Yeah, I mean, we had our whole season about math anxiety and you know, the timed test came up a bit and we had one of our guests who was like, "There's a space for timed tests." We kind of thought about that and we're like, "But will teachers do it in a way that's not traumatizing?" You know, I have some questions. Yeah. I would maybe ask, "How does timing show up in a K or first grade classroom? Like, what is the, the goal there?" And again, your kiddos seemed excited, wanted you to time them. But is that the experience for all kids? We don't know. But it might be interesting in a very, "Hey, I respect what you're doing" sort of way, but "I'm also curious, can we talk a little bit about how this shows up in the classroom?" Maybe it's just because you usually time them in every other aspect of their life, Dan, you're like, you know,

Dan Meyer (06:29):

Do the potty stuff faster. FAST-ER! Bethany, I love your confidence in me, but what part of our experience together makes you think that I could gracefully thread the needle between being encouraging and respectful and also asking a sincere but interested question about why you're timing my kid? <Laugh> I'll do my best at some point.

Bethany Lockhart Johnson (06:47):

Do your best. Do your best. Or ... I met your wife.Why don't we leave that to your wife? Because she is charming. She's fabulous. So, we'll leave it there. But you know what, though, this is a really great invitation, Dan, for our listeners to be listening to what kinds of conversations are coming home. You know, what kind of language, how are kids talking about math, talking about reading? Because once our kiddos are in that more formalized schooling environment, we don't really know what's happening, right? So how can we even just tune in a little bit to hear, are they saying things that kind of grate against the way we're hoping to think about math or have conversations about math in our home? And how can we make sure we're not having our kiddos traumatized by that language, by those exercises? So I wanna hear more. Please keep the stories coming, Dan.

Dan Meyer (07:40):

Will do. And I think we we're lucky enough to have really smart guests on the calls in this season, who can help us sort some of these issues out. So I might just be selfish here and ask about my own situation of our current guest. To tee up the current episode here. Just to recap where we've been in our season, you should hit the back catalog if you haven't. We've talked about assessment of fluency with Dr. Val Henry. We've talked about how to balance fluency and use that to develop enthusiasm for math and problem-solving, with Dr. Art Baroody. And we've talked about developing fluency in a classroom setting that also really prioritizes listening and conversation between students, with Lauren Carr. It's been a fantastic season. We also had, of course, Jason Zimba on, to talk about the nature of fluency itself. Been a whirlwind. And we have on the call today, Dr. John Staley, who's gonna talk with us about how to develop these kinds of skills we're talking about in teachers at a system level. John has seen it all. John has worked with the Baltimore County Public Schools for nearly three decades in roles such as teacher of middle and high school; math coordinator of secondary mathematics; director of math, PreK to 12; and currently the coordinator of special projects. So we're excited to talk all things fluency with John here ... but especially right now, about my own children. You know, what's up, <laugh> welcome, and how would you handle this? What should I do here? <laugh> Big welcome to John.

Dr. John Staley (09:05):

Hey, Dan. I'm taking notes from you on this one. 'Cause we have a grandson who's, OK, he's almost 20 months. And we're not quite doing that timed fluency with them yet. But I'm hoping the same thing that you're hoping, that as teachers think through what that does for students, the question I ask on the front end is, "How does that impact their confidence?" And so, K 1, 2, 3, as you keep moving across the grades, when do students who aren't as fast as the other ones begin to believe that maybe they're not as good at math? Because they can't do it within this certain time limit, this certain speed, they're not the first one to finish. And so that's always the minute that timer goes on. I'm wondering what's gonna happen, as far as not whether or not they can do it and get there, but how it begins to chip away at a student's sense of confidence and willingness to go try and do and show what they can do. So all of that is what I'm thinking about with you, for your kids that are in kindergarten, first. Our grandson is not quite there yet, but, you know, just thinking about how that has played itself out even with our own children.

Bethany Lockhart Johnson (10:15):

Thank you so much for being here, Dr. Staley. John <laugh>.

Dr. John Staley (10:20):

Yeah, please. John.

Bethany Lockhart Johnson (10:22):

<laugh> Thank you for being here. And I really appreciate you saying that. I have a two-and-a-half-year-old, so you know, K, 1 — and I'm a kindergarten teacher — so, you think about our kiddos, we're trying to help them build language of the discipline. We're helping them make sense of what is math, and seeing math all around them. And if we are bringing in that timed nature ... I love how you put it: At some point, for some of our students, they're gonna make meaning out of that, right? If their time either goes down, doesn't improve, or does improve, we don't know how they're gonna make meaning of it. And so thank you for saying that. And thank you for being here. You're coordinator of special projects. Little did you know your special project is Dan Meyer. So <laugh>, he's got a doozy of a question for you, right? <laugh>

Dan Meyer (11:13):

I am a project. Yeah.

Dr. John Staley (11:14):

I understand that.

Dan Meyer (11:15):

Could I ask you a question we've asked some guests and found really illuminating here, John? Which is ... you know, we talk about fluency in math, and a lot of ideas flood into the mind, for a lot of math folks. So we wanna take it outta math for a second. And we're curious. Is there an area of your life — as personal as you wanna make it here — where you feel like you've been developing fluency yourself? What is it? How's that process been for you?

Dr. John Staley (11:39):

Yeah. The one area is ... so let's go personal. My quiet time with God. You know, I try on a regular basis, daily, to have quiet time. That might entail a whole bunch of different things. From listening to music, to reading the Bible, to journaling, to just prayer, to just sitting and being quiet. So I've got different things that I can do within that quiet time. But as I think about from day to day to day, it's always a growth in process for me. So, in other words, there are days when I'm thinking I'm doing well with it. There's days when I'm light. And the consistency of doing it across the days is something that I continue to step back and look at. And I take that time personal because there are days when I know, "OK, man, I didn't give much time." And there's days when I know, "OK, I put in time." And so the goal is, "How do I think about continue to build, grow, and develop?" I've got multiple strategies that I can bring into it. So as I think about "building that fluency," I'm thinking about, "Which strategies do I need? Which ones do I want to use that day?" And quite often, from day to day, it depends on what's happening with me in life. What's happening with me and my wife Karen, and our children, our grandchildren, and the situations that have come our way. So fluency will vary. But that idea of my time with God helps me with dealing with situations that come up.

Dan Meyer (13:07):

I appreciate you sharing that. It's real personal. And I'm thinking about how often in fluency development there's an element of feedback attached to it. You know, if I'm developing fluency in the kitchen, it's like, "Well, how do people receive my fall cocktail?" Let's say. Or, when you're talking about discipline that's spiritual, and how you get feedback on how you're doing, it feels like a real interesting part. Takes a real sensitivity to know, "How am I doing with this process on developing fluency?" And that's really interesting.

Bethany Lockhart Johnson (13:43):

I also wanna to flag that. It's that consistency. You talked about that consistency. And when we're thinking about fluency, we're doing it consistently. And not only the feedback, but that growth, right? That growth with "It's gonna change, it's gonna evolve." Now here, Dan Meyer, Dr. Staley, what if you put a time pressure on that? What if you said <laugh>, "You have to get it down by this time, or you have to get an ice cream scoop to show that you have mastered these verses, or whatever your walk is looking like..." Hmm. Is that gonna change your relationship with your journey? I wonder. See, I'm still thinking about this question, Dan. <Laugh>

Dr. John Staley (14:28):

And that idea of feedback, Dan, and time, when you put both of those together — 'cause you think about days when I'm thinking, "OK, I need to be spending 15 minutes, 20 minutes, 30 minutes; and I spend three minutes, or I spend five minutes — it's gotta be a nonjudgmental zone. Especially as you think through and process self. So as you think about your children, Dan, as they process what they're doing, when they no longer enjoy you, timing them at home: Ooh, I wonder what's going on. And it's not because of something that you've done that's changed it, but it's because of some kind of interaction with something in the space of where it's happened. So like, what I don't do is run around saying to my wife, "Hey, you know, I spent 15 minutes with God today, 10 minutes, 12 minutes, two minutes." Because I don't want it to be in a judgmental space. And so that time element, of how much time do I spend or don't spend, that's me. That's an individual piece that I have to internalize.

Bethany Lockhart Johnson (15:24):

Thank you so much for that perspective, John. It not only helps us get to know you better, but it's also, like, in my brain, all these little connections are zinging. And thinking about how that evolution —your journey with that — how that's gonna impact the way you approach it tomorrow, the way you approach your conversation, or your walk tomorrow. Anyway, thank you for that. You know, you identified a potential risk when it comes to fluency development: that oftentimes fluency can be used as an excuse to hold kids back from progressing in math. And I'm wondering if you can talk a little bit about that concern. Because I don't know if folks even sometimes see it. They may say, "Oh, well kids not fluent, therefore they may not have access to a certain aspect of the material as quickly." But you're talking about on an even bigger level. Actually holding them back from building a further relationship with math, or progressing in math. Maybe you can give an example of how you've seen that in your career?

Dr. John Staley (16:25):

Easiest part: Let's continue with Dan's story. This timed testing, this timed testing of facts — which quite often really is people linking this idea of fluency to automaticity, to recall, to memorization. So, how many facts do I have memorized? Especially if I'm going through and I'm doing it so quick that I have to be "boom, snap, snap, snap," right there. If I'm a student who processes, I need time to think a little bit and process. When I'm put in those situations where that kind of fluency is, is elevated, that's where, man, I could be all over the place. I can shut down. The anxiety's kicking. And things like that. But that one fluency is about fact-fluency. About the memorization. The automaticity. Quite often it's addition-type problems. It's your quote unquote your addition "facts." It might be some subtraction facts. It might be held to within 10, within 20. And later on it becomes your multiplication facts. So my students don't know their multiplication facts, or types of words that you hear. And that's quite often about the middle of third grade, fourth grade, fifth grade, where that becomes a dominant set of importance that people chase. And when that's happening, you start to see groupings. You start to see people grouping students who can't quickly and fluently recall them — AKA memorize them — right? But often sometimes you see memorization without understanding of what they mean. Memorization or multiplication facts can happen for students with some drills and practices and games and things like that. But if students don't understand what the multiplication means, behind that fact that they just spit out, that's another piece of it. So as you think about how that plays out in groupings in elementary schools, then it changes into identification for students to go into different math courses, especially as they go into middle school, which is ... when I say different math courses, we're talking about tracking beginning to happen, based off of, "Can I fluently recall?" We're not even talking really about procedural fluency yet. "Can I do addition and subtraction and do it within a timely manner? Do I have a strategy that I can use?" So a lot of it's fact, then it shifts to computational fluency. It leads into who we see as who can and can't, because they get put into different groups. Some of those groups get identified early, third, fourth, fifth grade. Next thing you know, they're in different sixth grade classes. And that leads into, ultimately, when you step into high school, people looking at what came from fluency in elementary, leading into who you're deeming as being ready or not ready for algebra. It just has that trickle-up effect that really is mindful of NOT what students can show and do. And also it impacts their confidence. You see students coming into middle school and their confidence begin to crumble and begin to be shaken. I haven't gone out and studied this, but I would almost say it's connected to this idea of what they can do and how fast they can do it in grades three, four, and five. Prior to that, man, they're doing, doing, doing. They're trying, trying, trying. Then, when they stop showing that willingness to try, that willingness to raise their hands because they're not fast enough, we gotta step back and say, "What's going on here?"

Dan Meyer (19:58):

Yeah. It's interesting. You're really describing a self-fulfilling prophecy, as it were, where students who are told "You are not this or that," will wind up living into those expectations. Be they, you know, higher or lower, for kids. And it all seems to start from these assessments that humans — flawed, wonderful humans — are making about the kids in front of them. Evaluations and judgments that are inflected with every kind of bias and history of the person, but also their ideas about what fluency is. And you've put a name to this — I think it's really effective —which is "fake fluency indicators." I think you kind of hovered a little bit over some of those in your answer just there. But it's interesting to me that the fake fluency indicators hurt both kind of kids. They hurt the kids that get advanced, who don't have the understanding that you described. And they hurt the kids who have the understanding, but don't measure up against this quote unquote "fake fluency indicator." So could you ... under that umbrella of "fake fluency indicator," what are some of the ways that systems and teachers evaluate students as fluent or not, that you think should be reconsidered, or considered more deeply?

Dr. John Staley (21:10):

Um, man. OK. How much time do we have today? <Laugh> No, let's let's start with just one. The first one: thinking about and connecting to this idea of how fast can students recall these facts. So let me ... maybe it's 30 seconds; maybe it's one minute, to reproduce these facts. That right there, when you start thinking about fact recall and ... I won't call it fact fluency, but fact recall within a certain time limit. That right there begins to be one indicator that says, "Are they doers of math or not doers of math?" The idea is, "Are they THINKERS of math?" And the question we have to ask ourself about that practice of timing them, is how does that help support their thinking and making of sense in mathematics classroom. As people who do work in math, when was the last time you were asked to reproduce or do something within a 30-second timeframe? And the question becomes: Is that a practice that mathematicians have to do on the regular? And people will say, "Oh, they have to be able to recall certain facts." So when you think about what comes up sometimes as the faked math indicators or these readiness indicators, that piece right there. Computational fluencies. So when you think about can students add or subtract? And let's say, with addition and subtraction, it's a continuum for computations. And so when you think about the computational continuum, you have to think about: Where are students in the space? How do they have strategies that help them with adding and subtracting and doing problems that involve addition and subtraction, so that they're able to accurately and efficiently produce an answer. Produce a solution. Develop a solution to a problem that you put in front of them. So as you think about whether or not you wanna say, "Yes, they're ready," or "No, they're not," and this is a place where I need to slow them down or not slow them down, you have to ask yourself that question quite often. With these indicators I've seen in high school or middle school, when you start to say "algebra readiness": Are students ready to quote unquote "study the formal course of algebra"? Now how are we gonna define that formal course? It's often words like, "My students don't know their facts. My students don't have good number sense." Well, the questions that I ask, what we have to push in on, and what I've pushed in on with teachers and teams is, "OK, tell me which number facts or what facts don't they know, so that we can work on them." "Oh, well, sometimes they don't have their multiplication facts memorized. They don't have those down pat. Sometimes it's their work around fractions." And so we have to dig in up underneath of it. So what's important about fractions, when we talk about algebra readiness? Is it because they can't do the operations or they struggle with doing the operations? Or they take time to do the operations? Or is it because they don't understand how fraction sense goes into proportional reasoning? And that right there, for algebra readiness, is more important. Because when you don't understand proportional reasoning, ooh, that hurts you later on when you start to talk about slope and rate of change and everything along those lines. Which have nothing to do with the computations of adding, subtracting, multiplying, or dividing fractions. Or have very little to do; I won't say nothing,

because you use some of that skillset there also. So we have to think about what we wanna label as those gatekeepers that will keep students from progressing along their math trajectory. They're in a preK to 12 or a K to 12 math learning trajectory. And so we really have to think about how we can continue to move students forward and build their skills, their knowing, their depth of understanding, when it comes to content, versus using these as stopgaps. And the stopgaps might not be in the way we design courses. So we put 'em in this course or that course. But it's about the mindset that we as the teachers, we as those supporting teachers, bring into the classroom when we talk about students, when we talk about their skillsets, when we talk about what they can and cannot do. And how do we shift that language from talking about what they can't do and what they don't have, to what they can do and what they bring with that we can build from that.

Bethany Lockhart Johnson (25:30):

I love the way that you're framing that it's not just about the students. The power that teachers and the educators have in taking the results of a timed test, or taking what they're seeing, like you said, as an indicator that they're not ready — that power that they have. And how can we help teachers have a deeper sense of where students are at? Or ... maybe not deeper, but a broader look at what mathematics can look like. It's not just about the speed. It's not just about this number on the test. That student may be able to recite six times seven; they may have memorized the verses to the fluency lyrics; but they don't have the understanding of what that actually means. And how can you as a teacher use your knowledge to help hone into: Where's the actual gap? Where's the actual space that they need support in? Rather than just send 'em home with more timed tests, or say, "Practice these flashcards more." That feels really huge to me. And it feels like a call, an invitation to teachers.

Dr. John Staley (26:43):

True. And, and Bethany, what you mentioned about that space: We have to think about with our students. We have to stop thinking about just, "I have them for this one year." It's "I have them for one year and it's a handoff process: I'm getting them from, and they're going to." So that idea of "where's the space and where's the handoff and what do I need to work on" is really critical. Especially, I will say ... now here we are in 2023 and we are, what, a couple of years out of schools having responded to the Covid pandemic? And we know, over the course of that pandemic, students had different learning experiences. Let's just put it that way. So we need to still be thinking and still working. We cannot have fixed all the different things that happened during that pandemic for some students who got richer learning experiences, and some students for which that learning experience was not as rich as we would like for it to be. So we have to keep thinking about what's the vertical nature of mathematics. And how from year to year, especially when it comes to — and I'll go to computational fluency — how we go about building and developing that computational fluency from year to year. So when you said teachers need to step back and recognize where students are? So true. So true. Because if this is where you are, that's where you are now, how do I help you go to your next? What's your next? And that's the importance of me understanding the vertical nature of how computation grows and develops. For addition, for subtraction, for multiplication, and I'll say for division, also. But really, if you think about addition and multiplication, those two are so powerful and lead into algebra readiness. It's so key and critical. In elementary school, when you think about decomposition of numbers versus just going with this quote unquote "a standard algorithm" that we teach procedurally sometimes? But just decomposition of numbers. Just ones, tens, hundreds, thousands place. And students understanding how to take a number and and decompose it into those three, and then adding that? That sets them up for later on when they're simplifying algebraic expressions. When they're adding like terms and everything. If I understand constants, if I understand linear, and then quadratic terms, I can equate that

to what we did with ones, tens, and hundreds. And so this is the importance of me as a teacher, and those who are supporting teachers, providing that space and time for vertical work to happen. That allows us to connect with what they learned in earlier grades and how they learned it. Now, I don't need to know all the problems and the procedures, but I need to know how the conceptual understanding was laid, that led to quote-unquote, "the procedural" at that grade level, so that as I'm building in the later grades, I can build from it. Multiplication is another example. In third grade, when you start to introduce it, if you rush to the fact fluency of multiplication, multiplication facts, and the procedural piece, which really is not really quote unquote in many places "required" until fifth grade, but if I just rush at the procedures, I overstep the ability to use place value and a grid method in grade three, to introduce it. Well, it's a nice visual. It also helps 'em with place value. But then later on, when I get to algebra, and I'm teaching multiplication of polynomials, if I use a grid method there, the connection of those two, just from what you did — I remember working with a team at a school years ago, and the third grade teachers sort of wanted to skip that method. And I shared with them where it goes, and said, "You're laying a foundation for later on, when I'm using algebra tiles to really use algebra tiles or a different kind of manipulative tool, that visually shows them. And I can easily just layer in numbers or algebraic expressions. And so the importance of understanding where you begin and where some of the foundational pieces are beginning in grade 3, 4, 5, and grade 1 and 2, also, with addition and subtraction, especially in how that plays up into the upper grades, and prepare students with their algebra readiness. It gives teachers something to build from. No, as a high school teacher, I'm not gonna totally activate prior knowledge from doing a ones, tens, hundreds addition problem. But I have, because the place value piece is so critical with understanding the terms within an expression.

Dan Meyer (31:21):

Yeah, definitely. I think it's really easy for me as a teacher to imagine my grade is a silo. Or the end of it is a gate. And my job is to give students everything they need to get through that gate. And it's harder to see me equipping students with resources that they will carry with them through K to 12. And I'm really curious: You've mentioned several times about this kind of this vertical understanding of mathematics in different domains as being really essential for helping students develop fluency, and for not holding students back unnecessarily. I'm wondering, we have administrators who listen to this show. I'm curious, do you have ideas for how to create those moments of vertical understanding both within a building — like, say, K–5, 6, 8 — but also, and especially, across buildings? Getting those K–5 teachers talking to 9–12 teachers, saying, "Hey, here's what we got for you. We're giving these students these decomposition skills. If you know that's there, draw on that. Don't ignore that." When kids get to algebra, and they're combining like terms, are there structures you put in place from your vantage point that have worked?

Dr. John Staley (32:21):

So some of the structures have been around the teams that schools have built and developed. Sometimes it's from a professional learning community. Sometimes it's just from grade-level teams. Sometimes it's just content teams. So when you think about the opportunities to provide space for teachers to grow in this area with vertical nature, you have to set environments where it's non-threatening. You have to set an environment where all teachers, so let's go with a K–5 team. When they come together, you are bringing in math that goes across the grade levels, and helping the teachers see examples, problems, problem sets, and the strategies that play themselves out. Especially if you're using a curriculum resource. And I'll say that because what you wanna see is the design in the curriculum resource, and how that's exposed. A lot of schools who are using a curriculum resource have access to it online also. So it's no longer this, "You gotta give each teacher, say K–5, you gotta give 'em six teacher

edition books for them to see it." But also, focus it. So don't go try to do all of the domains in math in one year. You know, focus this year, say — or a year — on, "let's look at the addition and subtraction." 'Cause subtraction, addition sort of go together. But just look at how addition and subtraction grows and develops across our curriculum. In a K–5 structure, if you have a preK–5 curriculum structure across that structure, what are the key pieces that get elevated each year? So don't talk about every single little nuance. Don't go to every single lesson the way we tend to take our curriculums and lay it out and got a hundred plus lessons and this many on this. But think about the big idea of what's happening at each other grade levels. And so what's the big idea of addition that happens in K 1, 2, 3, 4, 5? What's the big strategies that we elevate at that space? What are the strategies that we spend more time on? What's the representations that are used? What's the tools that are used? So if we're using number lines in grade K or 1 or 2, how do we use that number line across the grade levels? Because later on it goes from whole numbers on the number line to fractions on the number line to decimals on the number line. So how does it show up? And how do we as a teacher team see it show up, with just the use of a number line? I'll just use that as one tool. If we're just using a number line, how do we work with that later on so that we're consistent? We're building from not tearing down what teachers in prior grades have done. And the reason why I say. "pick one space; don't go pick multiple domains to study in one year," because you said you gotta try to do it all: by trying to do it all, you get very little done that has meaning, and that students can hold on to, that teachers can hold on to. So that's one. When teachers have that time to really look at the vertical nature of adding numbers across K to 5. And then how do I take a document? How do I create some kind of resource? Maybe it's a one-page or a two-pager that I can hand off to my middle school, so that they can see the key strategies and how they've been built and developed. And how do I develop this If I'm working as a system? How do we develop a vertical tool that shows from K to 5, addition across and where it grows. So that my high school teachers can see, "Hey, here's where it comes from; here's where it came from; here's what they were doing in elementary, that I can connect to, that I can build from, that I can reactivate." And maybe the space that I reactivate is a space where they were finding joy in math. Third grade, fourth grade, second grade. Oh, wow. Boom! A problem like that, they found joy! By the time they got into middle school where maybe their confidence started to shake, they weren't finding that joy again. And now that they're sitting in high school, they're really like, "Man, am I a doer of mathematics? Am I not a doer of mathematics?" Sometimes you gotta pop that back in with a, "Hey, psssht, this is a problem y'all did back in second grade! Remember y'all did it with X, Y, Z, and this and that? OK, let's go. We're doing something similar. But now with algebraic terms."

Bethany Lockhart Johnson (36:42):

It feels, too like it's just so worth it. As a teacher, I, I know how pressed we are for time. And especially when, let's say, we have just a few meetings with our team a week. If we're lucky, we get to see our team, right? But if we focus, and like you're saying ... I think you're inviting us to zoom in on something — let's say addition — and really understand the story, the progression, and how that grows and builds. Like, if each teacher is holding their grade=level knowledge, but how much richer it'll be if they're able to see that they're a piece in the story. Because they're gonna get students that come in at all different points on that trajectory, right?

Dr. John Staley (37:29):

Yep.

Bethany Lockhart Johnson (37:30):

And so that feels really powerful to me as a teacher to think, "The more that I know about that story, the more — even when I'm working with my students with fluency — it's gonna change the way I teach those addition, subtraction, multiplication, division facts." Right? Because now I wanna put it in the context of a bigger story. I want to teach them how these number facts or being able to decompose and compose numbers and use strategies: the power in that. Right? I feel like it's gonna really change the way I teach my students. And it's gonna mean, hopefully, we're printing off less, you know, cutesy timed tests and just saying, "Here, memorize this." But instead, we're weaving it into the story of mathematics, because it's one piece. And it can serve us well. Or be a gatekeeper if we don't have that.

Dr. John Staley (38:26):

Bethany, the word "story" is key and critical. We have to look at mathematics as a story that we tell students across the grades, K to 12. And what we are all is the conveyors of a chapter in this progression of the story. If we look at it as an isolated chapter, then the question really becomes, "What am I doing to my students, and for my students?" So if I'm that teacher, and it's gotta be about me staying in that space — and maybe that's where my comfort level is at this time — I invite you to begin to grow a little bit. And I invite you to begin to look at small chunks of it. You might think that students need help in everything. OK? But what I would offer is that you step back and say, "OK, where are my students' strengths that I can begin to build from, and that I can begin to help them with, making more sense of the story of mathematics that I have to tell them this year?" And by building from that perspective, it allows me to continue to keep going if I'm trying to build from your deficits what you've been struggling on for years. I think even us as adults, if you try to say, "John, man, we're going to help you run five miles a day," and I would say to you, "Yeah, OK, help." I would tell you after a little bit of time, and if, if I'm not sure what magic you have, but I gotta find the time, the space, the energy to really want to do it. And if I've been struggling at that for a number of years, I'm not sure if I'm going to keep on wanting to do it. And so if students have been struggling for a number of years, or perceived as struggling, and that's always the lens that we come at, versus a lens of, "Hey, here's what you know; here's what you can do! Man, I like the way you were working with your number work. I like the way when we studied the domain of geometry, wow, you really got a sense of spatial reasoning, and you can really push in on those parts." Hmm. OK. "I see how you were connecting what we do in number to algebraic thinking." And so I'm thinking about their strengths in the content area. Boom. When I elevate that, I can build from that. When I elevate your deficits, it's almost like, "Yeah, you're strong in this, but you can't do this." And so which do we as adults trigger, to help us wanna keep going and trying? I'm not sure if every time you turn around, you saying "But you can't," "But you still can't do this," if that helps me keep going and wanting to go. So you got content strengths, you got process and practices, and then you even have disposition strength. You have to think about your students. And here's the hard part of all this work. We often think we wanna do it for ALL of our students. And when we begin trying to do it for all of our students, I'm trying to figure out logistically, "How do I do it for this student? This student? This student? This student? Da da da da da." What I would offer you to think about in some cases is how about if I pick three students? How about if I pick three students to really begin to understand what it means to build from their strengths? An asset-based approach. How to identify what their strengths are. How to think about how I activate prior knowledge based on their strengths. How I use their dispositions to help them grow. 'Cause if I can figure it out for three, then I can begin to grow it more. But it's, "How do I go about figuring it out" first, with a manageable way that I can do it. If I'm an elementary teacher, I got 20 students, 30 students, and I'm trying to do it for all 30, it might become overwhelming. Let alone once I move up into middle school, or if I'm content-specific in elementary school, fourth grade, fifth grade. Quite often you see that happening, and I've got all the fourth graders, and maybe that might be

a hundred of them. You're asking me to do something for a hundred students. Hmm. Can I do it for three students, first? I think I can,

Dan Meyer (42:21):

We talked a lot about asset orientation in various episodes of this podcast, and you've talked about the ways that we can artificially and incorrectly label someone or something "not good enough," right? And I think your description of the runner and the teacher, I think, are a great moment to draw those ideas in. Where you would not wanna see a running coach say to someone like, "You are a runner if, and only if, you are able to run five miles." Like, that coach is gonna be looking at, "OK, so what do you got? What are you bringing here? Can you do four laps? Two laps? Do you have grit? Are you able to push through those moments you feel absolutely gassed?" And in the same way, a teacher listening might say to themselves right now, "Oh, what we're talking about here, there's the good teachers and then there's the other teachers. And I don't know if I'm one of the good teachers." But what you're describing here I feel is interesting to me, of figuring out what you've got on a smaller scale before then saying, "OK, the three kids is, you know, the two laps, so to speak, around the track. And the five miles is like the entire class." And we can just easily communicate to ourselves a deficit orientation of who we are, based on the enormity of the challenge. The challenge at full scale. Anyway, it's just been a fantastic to chat with you about all these ideas at a system scale. Before we go, is there a final thought or idea you'd like to leave with listeners?

Dr. John Staley (43:36):

I think two things. One thing is this idea of, "Where do I begin?" Especially, let's start thinking about my students' strengths and building from there. It's first for us to look in the mirror, and look at our beliefs when it comes to computational fluency and when it comes to this idea of fact fluency. And what are our beliefs around it? Quite often what we are doing is what we've learned and what we believe — no, I'm not gonna say beliefs — sometimes it's what we've seen for some students. For pockets of students. But when we look at those students who have not been successful, take a quick look at that. Take a deep look at that. And identify your own biases. When it comes to, "Oh, if a student by this grade doesn't have this, if they can't spit off their facts, what does that mean?" Well, what does that really mean? And so think about those biases, and think about how we look at students and how we speak about our students and what role does speed come in there, versus not come in there. So that's one piece. The other part is really go and take some time to gain an understanding of computational continuum. Computational fluency across the grades. I think that part right there helps you at any grade level — K–5, 6–8, 9–12 — understand where the math is coming from and where the math is going. Why don't I teach certain tricks? Because I know those tricks don't work when they get to X, Y, Z. And so, think about that and the role and work there, as you keep going and think through things. And just, really, the bottom line with fluency and everything related to fluency: I think we have to really be critical of ourselves, and think about what impact does it have on students' sense of identity as math doers, you know, their self-confidence. What does it do to them when we think about and how we execute our work with fluency? Be it facts — and I'm gonna keep going back to facts, because I think that's that automaticity piece is something in there that people speak about with fluency, but computational fluency. So how does it impact their self-confidence, their identity, and then their sense of agency, their willingness to show you what they know and they can do in multiple ways? And I think that's the biggest thing. The bottom-line message is: fluency will impact students' identities and agencies as math doers. The question we have to ask ourselves is, as we watch our students grow across the years:When does it start to chip away at their self-confidence? And when does it continue to help coat their self-confidence and build it even stronger? And how do we shift our process from, in many cases, identifying struggling

students — a deficit mindset — to more of a strengths-based and an assets-based approach? So I'll leave it right there with that.

Bethany Lockhart Johnson (46:26):

So wonderful. You have such a perspective. You're able to zoom in, but you're also able to give us that bigger picture and help us see the importance of that vertical understanding. We really, really, deeply appreciate your time and your perspective. I think it's really gonna help us, and hopefully our listeners, to look in the mirror and to help reframe the way that we might be thinking about it and if we're subconsciously or not using that fluency as a gatekeeper. Thank you so much for your time, Dr. Staley. John.

Dr. John Staley (46:57):

Well, thank you, thank you <laugh>.

Bethany Lockhart Johnson (47:00):

JOHN.

Dr. John Staley (47:00):

Thank you for the opportunity to share.

Bethany Lockhart Johnson (47:05):

Dan, I am so happy that we got to hear Dr. Sta—JOHN <laugh>! That we got to hear his perspective on this. It also reminded me, because sometimes when folks think about that vertical understanding of mathematics, for me anyway, it can start to feel really overwhelming. Right? Like, there's so much to know; how do I learn? But it's also about that zooming in on those particular topics. And it made me think of like how Val said, where is gonna have the most impact? So she was talking about if we're focusing on doubles, well that's only gonna get you so far. But if we're really thinking about 10 compliments and we're thinking about decomposing and composing 10, and working with 10, the power that's gonna have over the course of a student's mathematical career. Right? Talk to me, Dan!

Dan Meyer (47:54):

Yeah. The vertical continuum. That kind of work was really interesting to me. As was this idea that as you get higher up into middle and high, maybe even elementary, it feels, I think like easier to say "Kid doesn't know it."

Bethany Lockhart Johnson (48:08):

Yes!

Dan Meyer (48:09):

With fractions, for instance. It's like, "The kids just don't know 'em." You know? And I appreciated John's broadening of that perspective. Saying "know and doesn't know" — that's a binary, light-switch kind of measure. It's more like, "What do they know?" And there's some things that you don't know, like the operations, which can be developed throughout, for instance, algebra. Whereas ideas of scale and proportionality, if you don't know those, that's gonna create some real fundamental limitations. So I just appreciated that. At elementary, I just find it hard to imagine a teacher saying, "Ah, that kid doesn't

know number." It's like, "Well, no, there's like a lot going on there." So I appreciated the check on making that kind of binary evaluation of a thing that's really a continuum. And a very vast space. So that was very interesting to me.

Bethany Lockhart Johnson (48:57):

But I think that is happening more often than we think. He was talking even like third, fourth, fifth.

Dan Meyer (49:02):

Yeah.

Bethany Lockhart Johnson (49:02):

Are we already starting to say that about students? "Oh, they don't understand that," or "They don't get that." And one other thing that I wanted to flag, too, is the way that he was ... I can just imagine him talking to teachers and to students and just that asset lens of pulling from what they already know to say, "Well, you know THIS! Well then, yeah, use THATto solve THIS!" As a teacher, I wanna be able to facilitate those connections, and help students see this bigger picture of mathematics and how it plays together. What a rich conversation! I'm really, really glad that we had that opportunity. And I wonder what would happen, Dan, if you asked your kiddos like, "Sure, I'll time you ... but why? What do you wanna be timed for? Tell me more. Why are we timing? Tell me." You know, and just see what they say. What do you think about that, Dan?

Dan Meyer (49:54):

Yeah, already they're starting to roll their eyes at me. I dunno who taught them that. <Laugh> But I'm getting some periodic eyerolls, and I can definitely see some eyerolls happening there. But I might give it a try. It hasn't happened a whole lot, the whole timing request. But I'll keep you posted. Believe me, I'll keep you posted. Just wanna say to you all out there, thank you for listening to our conversation with Dr. John Staley, Coordinator of Special Projects with the Baltimore County Public Schools. You folks can check out the show notes for links to connect with Dr. Staley on social media here and there. Get in touch with us by joining our Facebook discussion group, Math Teacher Lounge Community. And I tell you, next time on the show, we're bringing you a special episode that I recorded at NCTM, the National Council of Teachers of Mathematics annual conference, with Dr. Jennifer Bay Williams. It's all about games, games, more games, and using games to develop fluency in particular.

Dan Meyer (50:46):

[from NCTM] Here's my question. It's an annoying one to start with, here, to debrief this. But, like, what is a game? You know?

Bethany Lockhart Johnson (50:52):

Make sure that you don't miss the special episode recorded at NCTM, or any other episodes in this season. And you can do that by subscribing to Math Teacher Lounge on the podcast platform of your choosing. And, you know, while you're listening, go ahead and we hope you'll leave us a rating. Let us know what you think. And let other folks know what you think of the show. If it brought value to you, we hope you'll share it with an educator in your life. You can find more information on all the Amplify shows at our podcast hub. Go to Amplify.com/hub. Thanks so much for listening.

Dan Meyer (51:25):

Byeeee.