# Transcript

## Dr Gary Stager on unlocking children’s mathematics potential

You're listening to the Victorian Academy of Teaching and Leadership podcast, where we showcase conversations with some of the world's biggest thought leaders in education. We're also bringing the thoughts and reflections of teachers and school leaders from across Victoria.

Emma Moore:

Hi, I'm Emma Moore. I am one of the Maths Master Teachers at the Academy of Teaching and Leadership. Today, we're here with Gary Stager. He's an internationally renowned educator. He works with teachers and leaders to embrace technology and amplify mathematics for all students to unlock their potential. He has a PhD in science and maths education, and if you're looking to electrify children's mathematics in education, Gary is a great place to start. Today, we're talking about unlocking the potential of our students for their future in maths. It's a great episode for teachers and educational leaders who want to make sure that mathematics is a positive experience for our students in their everyday lives.

So, Gary, thank you for joining us. And I would like to just start by asking you some questions about your own experiences in maths education. I've listened to some of your TED talks, and initially, you don't sound like you were positive about your K to 12 experience.

Gary Stager:

Well, first of all, I apologize for you having to listen to my TED Talks. Although, in the spirit of mathematics, I would like to point out that I've done double the number of Sir Ken Robinson. The audience size is a little different. I want to live in a world where kids wake up in the middle of the night with a burning desire to get back to school to continue working on something that matters to them and where their teachers wake up every morning and ask themselves, "How do I make this the best seven hours of a kid's life?"

And one of the problems with traditional mathematics instruction is that regardless of how hard a school endeavors to achieve those objectives, and I learned this from my colleague and mentor and friend Seymour Papert, there's a part of the day or the week where you reintroduce coercion into the system, where what you're being taught doesn't make sense, doesn't appear relevant, isn't fun, you may not feel so good about your own abilities, and that tends to be the maths lesson, or the maths class. And that coercion that you reintroduce into the system, regardless of how learner-centered, constructivist, groovy, progressive, play-based the rest of the schooling experience is, it's ultimately corrosive to everything else that the school is trying to do. So as I said in my talk yesterday, if you fix maths, you change the world.

Emma Moore:

So, listening to some of your work as well, you mentioned a gentleman called Mr. Jones, and Mr. Jones had a really positive effect on definitely your computing, but was it maths as well?

Gary Stager:

I think that there are... And I have no empirical evidence or research to support this, but just an intuition. I think there are two kinds of students or maths learners. I think there are the kids who are good at arithmetic or the kids who are good at algebraic stuff, and they don't tend to be the same. And I was really good at arithmetic. That was never a problem. And maths was fine. I had plenty of terrible school experiences, but there were always teachers I could hang out with. Even if they were abusive, I could hang out with them. So, I can remember from the earliest days thinking about thinking and thinking about teaching and thinking about what the teacher was thinking. And I always... always drawn to teachers who were kind of in on a joke or understood the game that we were all participating in.

So, in year seven, I had a computer programming class. It wasn't gifted and talented. It wasn't school to work. It wasn't vocational. It was in the rotation. They call them specials or electives or something. We call things electives that no one elects in schools. It was between baking a soufflé and making a tie rack. One semester, you did carpentry. One semester, you did cooking. One semester, you did Mr. Jones's computer programming class.

Now, it's worth pointing out that this would've been about 1975, and Mr. Jones would've only had one or two teletypes in his classroom. There was no Academy for Teaching and Leadership he could have gone to to learn how to teach programming to kids. So he had to have pretty good instincts, and he had to have been excited about what he was doing with computers in order to be able to convey that to the kids.

And for the first time in my life, I felt intellectually powerful. I felt creatively expressive, because we didn't know what was impossible, if anything was possible. We challenged one another. We pulled each other up by our bootstraps. We read each other's programs. We improved upon them. There was actually a several-year period where I hadn't seen a piece of software that wasn't written by someone I knew directly.

And so, I spent a lot of year seven, I don't remember if I did it much in year eight, and then in high school, you could sign up for more computer time. And I used all of it, to the point where I remember having the bug to a program that was bothering me come to me in an epiphany while sitting in a biology class, and I shot my hand up, and I took the hall pass to go to the restroom and ran to the other end of the building and fired up these teletypes that rocked the wing of the school in order to fix my computer program. And being 15 years old being busted for leaving class to debug a computer program didn't make you all that popular, or manly.

But I spent all of high school programming and was involved in a computer club and such and taught other kids how to program. And it wasn't long in year nine when the person who was in charge of mathematics for the school district and who had brought computers to the district in 1964, I believe, it may have been '62, it's kind of extraordinary, guy named Dr. Henry Peterson, who was the math supervisor, took a liking to me and made me one of the systems operators for the mainframe. And I had keys to his office. I could use his secretary to take phone calls for me, which was extraordinary when you were 14 years old to have a secretary. And I was running this timeshare system that schools all over the region were dialing into, metaphorically, to be able to share the mainframe.

And I remember there was one moment in year nine where I had written a computer program that when people logged into their accounts, a error message would be generated randomly that would tell you, "Something went wrong. Please try again," and on the second time, I was stealing their password. And this turned out to be the exact same hack that the Russians were using in Cliff Stoll's book called The Cuckoo's Egg, which I only read many years later, so I felt kind of pleased about that. And the notion that this was dishonest or dangerous or criminal was preposterous, because, as I mentioned, I had keys to the office, and I had the spiral-bound notebook where all the passwords were written. This was just something fun to do. And when one of the year 12 students grabbed me by the collar and dragged me before Dr. Peterson to say, "This kid is hacking," I'll never forget, Henry Peterson said, "At least he's thinking," and pointed to me.

Emma Moore:

And isn't that the principle of a white hat hacker, so that you can actually go on and test systems? Because if you can prove that the system has a fault in it, then you're actually doing the person who created the system some good by revealing its weaknesses and allowing them to go back and maybe strengthen their system.

Gary Stager:

Sure. And I don't talk about this very often, but I graduated high school in 1981 after having spent a bazillion hours programming computers. I thought, "Well, that was kind of fun, but no one will ever have a computer." And I went to Berkeley College of Music to pursue being a jazz musician, which I did for a number of years until my conspicuous lack of talent caught up with me.

But when I returned home for Christmas break about six months after I graduated high school, my mother said, "Get a summer job." And I knew I could probably get a camp job, because those are jobs for summers. And I applied to work in a number of camps, and no one would hire me to be a music counselor, because I didn't play the guitar, but I stumbled upon a camp that said, "Hey, we want to start a program to teach kids the program. Why don't you do that?" And at 18-and-a-half years old, I was considered senior executive team and had employees under me and started one of the first computer programming camps for kids, where the kinds of experiences, the quality of experiences that kids were engaged in then is quite consistent with what I'm doing today.

And then, to come full circle, just a few months after I began doing that, I ran into Dr. Peterson in a supermarket, and I told him, "Hey, the craziest thing's happening. I'm teaching kids to program and getting paid for it," because then, like now, if you're 18 years old and you could do things with computers, people will give you disproportionate levels of authority and compensation. And just would put the button on this story, and he said, "I'm running this consortium of 150 computer-using school districts. I've got a problem with some teacher education programs we're offering. Would you like to come in and teach the teachers?" So, by the time I was 19 years old, I was pretty much doing what I'm still doing today.

Emma Moore:

So, can I just go back and clarify just a couple of things? So, firstly, can you explain what a teletype is? Because there may be younger teachers listening to this who wouldn't know that Mr. Jones only had access to maybe a couple of teletypes.

Gary Stager:

It looked like 19th century steampunk giant typewriter that weighed a zillion pounds that had a big roll of paper that shot out of it, and all of your input and output was generated on this paper, and it was connected, via wire, to a computer somewhere else. And the notion of timeshare was the idea that lots of people were sharing time on this computer simultaneously. We got displays towards the end of high school, but up until that point, almost everything else was done on paper, and before that, it was done on punch cards.

Emma Moore:

And there was one other thing you said. You mentioned something about a disproportionate amount of power. And I'm just clarifying my own thoughts. Is that disproportionate amount of power attributed to somebody who is able to use the computer programming? Is that what you were saying, that [inaudible 00:11:31] you saying? So, just going back slightly, then, just to connect to the story you were telling us about when you were in the school and you were in the computing office and you had access to a secretary, as you called it, when you were only 13, 14 years old, you had a disproportionate amount of power in that particular regard that, obviously, it elevated your status, it made you feel good that you were doing something worthwhile, and that there was purpose in what you were doing?

Gary Stager:

Oh, sure. And I wasn't alone. Around the same time, Bill Gates, Paul Allen, Steve Jobs, Steve Wozniak had similar experiences where some smart adult got ahold of a bunch of expensive gear and said, "Here, kids, see what you can figure out. Lock up when you're done." So, there were a lot of times where I was the last person in the high school.

Emma Moore:

So, you mentioned another person there, Steve Jobs, who also talks about education as being restrictive, and he felt like he wasn't allowed to be as creative as he wanted to be. And that's something that really appeals to me if we're talking about modern mathematics in classrooms in Australia, is something that I try to achieve when I'm teaching is that presenting maths lessons in a way that students feel like they can bring themselves to the task, what they're thinking, how they want to be creative within that moment. And for me, that's part of that unlocking the potential, that there's space in the task to be an individual. Would you say that's something that you would feel is very important in how you perceive maths education, or computing, is that the task has got to allow an individual or creative element in it where a child feels like they can be themselves?

Gary Stager:

Absolutely. I mean, all of my work is rooted in a Piagetian notion that knowledge is a consequence of experience and that you can't design learning. I think instruction's actually overvalued. But the learner is the one who does the learning, so they have to have some emotional investment, some purpose, some meaning, some clear understanding of why they're engaged and what they're doing. And engagement is hugely important, that they have some connection to it. I don't want to compare myself to Steve Jobs in any way, but he's of a category of critics of education who I think they're yearners, to use a term Seymour Papert used to use. They know something's not right, but they have no idea what to do about it, so they engage in a lot of mischief that's kind of destructive to the institution.

Emma Moore:

Do you feel that there has to be an element of choice, maybe, in motivation, that we can't always prescribe or describe a sequence of learning, that maybe a sequence of learning is actually very hard to achieve, because it's not always sequential in a beautiful, linear process that we would-

Gary Stager:

It's messy.

Emma Moore:

... like. Yeah, education is definitely messy. And this brings me back to this. There are two verbs in our curriculum, in our maths curriculum, and I personally feel like they are very, very important, and they're actually important to helping children think mathematically. And the words are explore and investigate. And I'm not sure that all teachers realize that they are important to developing mathematical understanding, giving children the chance to explore and investigate, maybe with fewer parameters. I suppose if you want, you could even use the word play, but that doesn't appear in the curriculum. So, I try to engage in those verbs in a way that can be meaningful and have a purpose, but allowing some element of choice for the direction for the children.

Gary Stager:

So, I would add some other verbs, like do and make. And I had a moment with Seymour Papert once where we were working on this project inside a troubled prison for teenagers, and we were trying to create a kind of utopian learning environment for kids who had been abused and neglected by the society and who had had really terrible school experiences. And at a weak moment, he asked, "What are you thinking about doing with the kids next?" And we said, "Oh, we were thinking of doing some geography or teaching some geography," and he shot back, "And what can they do with that?"

And I think there's the idea that that kids can do things, because that's the richest kind of experience, but there's also the do with. There's also the utility of that. So what can they do with that? And when we were sort of taken aback, he said, "Well, I didn't mean to upset you, but what you teach the kid should have a reasonable likelihood of leading to a deeper question or a larger theory. Otherwise, why bother?" And that sort of comes back to your issue of sequence and choice. Often, choice is accompanied by voice, and there's a lot of rhetoric around student choice and student voice.

Now, first of all, you better mean it. If you're saying that we're giving kids choice and voice, then you ought to be authentic, and the kids ought to have some veto power as well. Otherwise, you're just playacting, and you're further disempowering and lying to children. Having said that, kids can't choose from what they haven't seen or experienced. The same thing goes for teachers. So, if you have a toddler, you don't ask, "Do you want to walk or be carried?" You ask, "Do you want to walk on the footpath or on the sidewalk or on the grass?"

I have this problem with educators who want to do child-centered, constructivist, project-based work who said, "We'll just let the kids work on what they're interested in." If kids have been through a lot of schooling, particularly if they've been good at schooling, they may suffer from a trust deficit, where they think they're going to miss out or lose out or not get that top mark if they guess wrong, and they don't know the range of things that are possible. So, I urge teachers to provide a variety of experiences for kids. Maybe they're shorter in duration, and they're varied and they're powerful enough to allow kids to choose a path or to choose a project that's rooted in some actual experience. And I think this is a really important distinction.

And then, the teacher needs to be engaged in understanding the thinking of each child to make thinking visible, to make private thinking public, to make invisible thinking apparent, so that they can then look at the curriculum and say, "Mary or Johnny or Susie have demonstrated an understanding of the following zillion concepts that are in the curriculum," without saying, "We're going to teach this curriculum in some uniform sequence of steps that everyone is going to comply with at the same time. We spend an awful lot of time in schools. We ought to be able to achieve the curriculum in a more pluralistic, learner-centered fashion.

Emma Moore:

I love what you're saying, because what you're saying, to me, is that we really need to develop relationships with the children, and we really need to understand them. And that brings me back to how to make this fun for all. With class sizes being... I suppose, reasonably, you could expect to have 25 children in a class in Australia for any year level. And, obviously, if you have those good relationships with the children, you can bring this back to you... You could know maybe what they would love to be invested in.

But how, as teachers, can we have fun for all the learners? And this is where I think teachers can feel insecure. What if it's something that the teacher doesn't find fun? How can you explore something fun with the kids that is not necessarily something that you're particularly interested in? I suppose a good example for me is that, like yourself, my son is very interested in computing and all things that computers can do, but to me, it's actually quite challenging. I just don't share that passion, but I can see what it brings out in him, and I definitely want to foster that in the kids in my classroom. So how can we make teachers feel better about taking those risks?

Gary Stager:

We need to remove the stakes for everyone. We have to put assessment on the back burner. We have to recognize that assessment is, unfortunately, the homework of teachers, but it should go nowhere near the children. We're inventing all sorts of dishonest tricks now to make kids engage in assessment tasks so that they're constantly proving something to some boogeyman out there somewhere. Mathematics has been used for generations to rank and sort children, to decide who to gets go to university, decide who's clever. And so, we need to abandon these ideas.

We need to recognize something that I've been saying in my talks the last few days, which is that mathematics isn't static, it continues to change and evolve, that mathematics is a way of making sense of the world, it's a way of seeing, and that computing is a way of making mathematics. It expands the breadth and depth and range of projects that are possible. It allows you to engage in more modern forms of mathematics. We're adding colors to the crayon box.

So, I'm not sure that fun is the primary objective. There's a story that my colleague Carol Sperry experienced that she shared with Seymour Papert, he made rather famous, which was watching two prep kids at the beginning of the school year, one leaving the computer lab and one entering, and the kid entering the computer lab said to his mate who was leaving, "What's it like in here?" And the kid exiting the computer lab said, "It's hard. It's fun." And I think if you spend any time pondering your hobbies, they have an increasing degree of difficulty, which is what keeps you engaged in them.

We have sort of weird notions of increasing difficulty when you look at maths curriculum. It tends to be focused on greater abstraction, rather than being hard, fun. And computing is a way of concretizing those abstractions, that you're communicating some idea to the computer. You receive immediate feedback, not right or wrong, but does it work? Papert said the question to ask when you're programming a computer isn't, "Is it right or wrong?" but, "Is it fixable?" And that's the kind of mindset... I hate to go down the mindset path, but that's the kind of mindset that I think is useful. But you really need to do something cultural that lowers the stakes, while maintaining the intensity level.

Emma Moore:

I want to come back to the assessment, because I feel that's something that teachers... Like you said, it's a necessity. It's a structure that's been put there, and it is for the teacher. However, I really want to explore hard is fun, because, again, trying to link what I love about maths and what you're talking about within computing is this process of debugging, that it's not a problem in computing. It's just part of the process. And as you said, Seymour Papert said, "It's not a problem. Can we fix it?" That's awesome.

And I wish I could support teachers and students to know that that's also part of that mathematical process as well. It's okay if things are hard and that you have made, for want of a better word, mistakes or there are bugs in your process, but it's the ones who can be resilient and go back and say, "Okay, that's all right. How can I fix it?" And again, it comes back to the high stakes part that you've spoken about that the answer is this high stakes, because you're judged on it, because someone's going to come along and look at it, and that's going to be how you're actually measured against other people. How can we teach children and teachers who are feeling underconfident about this that the process and the finding of the bugs is actually part of the thinking mathematically, and that is fun, and it can be hard, it's okay? How do we develop that in children, that resilience?

Gary Stager:

Well, we don't kill it in the first place. But if we're thinking about education as a system, we have to create those experiences for teachers. So, the summer institute that I've been running for 15 years called Constructing Modern Knowledge urges teachers to take off their teacher hat, be selfish with the experience, and put on their learner hat and spend four days working on personally meaningful projects. We ask them what they want to make, and then they figure out who they want to do it with, or work alone. And by the end of four days, teachers routinely invent, create things that take our breath away, that no one's ever seen before, that in previous years would've earned you an advanced degree somewhere. And it reinforces over and over and over again how having a powerful experience where you have a good prompt, sufficient time, appropriate materials, and a supportive culture that includes a range of expertise, you can do things that are bigger than yourself.

I would argue, how is that system working? If we're to believe the critics who say we're continuously failing, then why do we keep doing the exact same thing over and over again? That's the definition of insanity. I think if kids were having richer experiences, they would do just fine on the exam, as long as the exam was fair to income and on the up-and-up. If the exam is designed to perpetuate failure, then that's what you'll get. And all that external assessment also makes teachers lazy, because they don't have to understand the thinking of their children. They don't have to know their students. Someone else is doing the checking, so they don't have to think about ways to intervene.

And, I'm just bringing it back to my own experience, I was in my 30s before I understood that a mathematical proof was designed to prove something. Now, that's a fairly simple idea, but all of my maths teachers managed to make that so complicated. And it was some 37-step process where you had to indent properly and do all sorts of various typographical things for a mathematical proof, that I took leave of my own senses and never realized, "Oh, I'm just making an argument." Kids know how to make arguments, and we can help to make better arguments, and that would transfer across a great number of disciplines, but not if we're teaching proof as some isolated task or meaningless vocabulary word. When you go into a classroom and you see the angle poster on the wall, I always ask a teacher, "who do you think is reading that?" And we had an experience yesterday where I gave a problem to 50 of your colleagues, and the answer was projected in front of them, and not a one saw it. So, that's not good teaching.

And we're sort of on this treadmill of we teach them, and we teach them, and we teach them, but they don't stay taught. And that's because we teach about things, rather than providing opportunities for kids to experience the thing. I want kids to be mathematicians, rather than being taught math. So, I want them to be historians rather than be taught history. And we're really good at, and I'm borrowing this idea from Alan Kay, the inventor of the personal computer. Alan Kay says that what we teach in school, at best, is maths appreciation. If you compare art appreciation class to a good art class, I think the distinction becomes a lot clearer.

Emma Moore:

What I'm hearing is that idea that we need to be careful as educators about the words we choose to use when children are exploring and engaging in maths. If we use words like, "That's wrong," or if we create environments where children don't feel like they can take that risk, and there's research out of Melbourne University about mathematical wellbeing, and the same way that you have dimensions of physical wellbeing that you place a degree of value on, and that can be cultural, and it can be personal, but we bring these values to our life and to the way that we approach education. How can we be careful with the words that we use to make sure that children are valuing the right parts of the maths?

There is an element of accomplishment. And some children do. Like you said, you were good at arithmetic. Some children value that. It's a sense of their identity. How do we allow those different identities to develop and enrich their lives without affecting other people's so that a child can value the fact that they are good at arithmetic, that's okay, that's part of who they are, but also that we can value the child that's happy to mull over the problem and take time and be persistent, and that's not less maths, it's just a different value to the maths?

Gary Stager:

Well, at the same time that I learned to program in Mr. Jones's class, I fell in love with jazz and music theory and started composing. And I know that what was happening in my head felt exactly the same. So, I had those kinds of experiences. I was able to make those kinds of connections. I mean, I think the answer to your question is in your question. You just have to do it. The best piece of advice that I share with any educators I work with is, "Less us, more them." Anytime you think you should intervene on behalf of some educational transaction, it's worth asking, "Is there less that I can do and more that they can do?"

This trip to Australia that's finishing now, I ran a family art and maths night at my favorite school in the world, Spensley Street Primary School, here in Clifton Hill right outside of Melbourne. 55 children and their carers came at 6:30 at night to do maths with computers. And a good time was had by all. And it was P to six kids. And there was a teacher there who I taught when she was in year six and a parent who I knew when he was a teenager. And that was all fun. So I did that, and I taught robotics and physical computing programming and turtle geometry to year ones and twos at Princess Hill Primary School, and I worked with some private schools, P to 12, to help their teachers think about thinking and teaching in the 21st century. And I did some university lectures at a conference stuff, and I worked with teachers here.

When I was planning this trip, people asked me, "What are you going to do with all those disparate groups?" And I said, "Probably the same thing." And that's sort of a glib way of saying that I've got a bag of tricks, but that computing ends up being a common platform, and programming environments like Logo, which allows you to be a mathematician, to communicate mathematical ideas to the computer and see what happens or to bring a robot to life or to make sense of sensor data you're getting from something and turn it into a graph or turn it into, when the lights go off, an alarm is sounded, or when a rodent triggers the trap, something happens, where you're dealing with inequality. There was all maths. It was all problem-solving. It was all thinking. It was all about how to teach project-based learning.

And someone asked me, "How do you do this with year ones and twos?" And it's not very different from how I would do it with adults. One of the things that I'm working on is shutting up and having the discipline, the self-discipline, to recognize that less is more. And if you've got 55 P to six kids at 6:30 at night sitting in front of you on a rug waiting to get their hands on computers and you want to convey something to their parents and give them enough information to have a meaningful experience, you have to very carefully decide how much you're going to talk and what you're going to share with them, so that they can just get on with it. So, one of the pieces of advice I leave with teachers all the time is, "If you're talking for 40 minutes, try 20. If you're talking for 20, try 10."

Now, when I work with teachers, I ask them to observe some of the ways in which I interact with them, which is often just raising an eyebrow or pointing at something or saying one word, which is just enough for them to solve the problem for themselves. And that's the result of practice. And, oddly enough, I think I had a pretty good education in the art of teaching. And the art of teaching has been removed from a lot of teacher preparation programs. And I recognize that I stand on the shoulders of giants and that every problem in education has been solved somewhere before.

So, you need to have the self-discipline to say, "I'm not going to teach the entire curriculum when I'm in this room with the kids for 15 minutes. I'm just going to do something that's going to allow them to really use the 15 minutes well." And then, when they have the next question or I sense a lull in the energy level, a dip in the energy level in the class, or I recognize that one kid is doing something really cool, and I'll point it out to the other kids, and then it spreads virally through the community, that's where I think the learning best occurs.

Time is the scarcest resource in schools, or the endless bells and sirens and announcements, or the year one kids going from subject to subject to subject, so they're interconnected, so they don't have time to become good at something. The teachers don't get to know the kids. They don't get to make connections between maths and nature and history and music.

Or, to come back to your initial question, which is, lack of precision in language, we need to recognize that the words we use are important. And so, for example, I get really nervous when people say, "Well, we don't want to have summative assessment. We want to have formative assessment." And formative assessment just means lots of little tests and a big test, as opposed to just a big test. I want fewer tests. And people start talking in terms of failure being virtuous. And even using risk-taking worries me a little bit, because what's the actual risk? What's actually going to happen? But I don't think failure is a term that can be remediated in schools. It's toxic. You can't possibly inspire a child with the same thing you threaten them with. So I never use the word failure ever, ever, ever. The way I think about it, again, I learned from Seymour Papert, which is the best projects push up against the persistence of reality.

Emma Moore:

I'm glad you mentioned Spensley Street and Princess Hill. I used to work in that area. And they are two schools that do come up quite a lot when people are talking about having a different approach. And there are many schools out there who are trying to be more responsive. I'll come back to your comment about formative and summative assessment and a personal belief, and it's definitely taken from Dylan, William, and people who have written a lot on the topics, is it's not what you do as the assessment, it's what you do with it, and that if it informs your teaching and changes your direction based on something that you have seen occurring in your classroom, then that would be formative assessment. Because I think of formative assessment more of as keeping a pace of my teaching, "What did I do?" I would say that that formative assessment...

And it could be used. I'm not saying that it can't be used. If a child could or could not do something in one of my lessons and I had something, an observation or a piece of work that made me think, "I've got to go back and do that better." But also, the same thing could be said of when the child does achieve it. I don't need to go away and resit a, for want of a better word, summative assessment, because I know the child can do it. They did it right there and then. And does it matter whether they go away and do that thing in the test-like situation?

So I'll come back to mentioning assessment, the bar that teachers feel they must complete. How can teachers be creative in the way they do these assessments, with giving the children this opportunity to explore in their own time and space and what they're interested in? How can we use something to gauge our own effectiveness, if not to gauge what the children can or cannot do?

Gary Stager:

So that's called teaching. And there's nothing more rewarding than leaving the school and thinking, "I need to find the right book or material or idea or project to connect with that kid or that group of kids tomorrow to keep things moving in a positive direction." But again, I think assessment is this sort of loaded word. And we should recognize that all assessment interrupts the learning process. Even if I just say, "Hey, Emma, what you doing?" I just made you stop doing it. So, it's up to reasonable adults to determine what level of interruption is acceptable. But I think the less we think of it Dickensian terms of, "It's our chore. It's our job. It's our obligation. It's the primary responsibility of teachers to prove or document or test that a kid knows this or that," I think everyone benefits more from it. The teachers will know the kids better. They'll be more thoughtful in their teaching. And kids will ultimately achieve more.

Emma Moore:

That reminds me of something else I've heard you say before as well, is the fact that the maths doesn't leak out, like if we don't continuously keep going on a treadmill, that the maths will stay in there. It's not going to fall out in some sort of magical way. I'd like to just go back to something you said about teachers going away thinking about, "What can I do to make that experience happen for that child? What can I do? What can I read? What resource can I find?" And would you say that that's a good use of teacher time, that if we could create time and space for teachers, it's going away and finding out what they can do the next day to keep that kid engaged, to make sure that that kid comes back to school wanting to carry on with that task?

My favorite maths lessons are the ones when the bell goes for lunch and we've got the resources out, the classroom's messy, it's really noisy, and we have to go, "Oh, we ran out of time, and we haven't packed up again." And they're always the best lessons, because the kids were... And they want to come back the following day. They want to keep going. So, is that what teachers...? If we could make more time for them, is that where we should make the time, to find the next thing, the best thing, to do that thing the following day, to be responsive teachers?

Gary Stager:

I've worked with all sorts of populations of kids in situations where no one else would put their hand up and say, "I'll do it," where kids have worked five, six hours consecutively on something that matters to them. So, we need to be rethinking some of these structures, and we need to create the experiences for teachers where they can learn like they want their learners to learn. And at my summer institute, Constructing Modern Knowledge, in four days, teachers have a transformative experience, because they're reacquainted with their own power as learners and their own confidence and competence and creativity. And then they make sense of how they could create a similar experience for their students. Will it be identical? No, but they leave with some inkling that things need not be as they seem, and they're prepared to try some things to create a more productive context for learning.

Emma Moore:

I love that, because it comes full circle back to the title that we started with, is that, how do we unlock kids' full potential? And it is about providing them with experiences for them to explore themselves and to find out what they love. And they don't know what they love, unless they have the chance to expose themselves and be aware of the world that's out there for them.

Gary Stager:

Yeah, we want to provide a context in which kids are introduced to things they don't yet know they love, and then, they can choose one of those things as their project, and that's the thing that they can become good at. That's what keeps schools viable into the future. As I often say, the only thing I didn't have at home was band. That's why my kids went to school, for things like band, that they could... We have to be able to answer the question of why are kids being co-located in the same physical space at the same time? How do we gain the greatest affordances, the greatest benefits from that experience? And that's what keeps school vital and critical and essential for sustaining democracy and for achieving all the things that we want for our community.

Emma Moore:

So, a big thank you to you, Gary, for joining us today on your incredible insights into how we can unlock the potential of children and electrify their approach to mathematics. And thank you for everyone listening.

We hope you enjoyed this episode. Please subscribe to Academy podcasts, and leave us a review if you learned something new and interesting. You can also follow us on social media to stay up-to-date.