

## **KNOWLEDGE BUILDING HELPS CLASSROOMS GROW**

DR. SCARDAMALIA: It's what comes easily. Kids are naturally curious. You'll find questions.

You'll find that part will come easily. The students need to do the planning. The students need to be able to evaluate, are they getting anywhere. The students need to identify their gaps in understanding. The students can be part of designing the assessment tools. They can actually help you say what will help them think harder. If you can make high level thinking transparent, students-, it's not that they resist it. It's just that they haven't seen this world. They need to live it. They need to be engaged. And they need communities, their peers, people need to support it. Those highest level capabilities that we tend to think reside only, and could ever only reside with the teacher, need to be taken over by the student. Let's get students to create knowledge by creating knowledge. I think we have to show ideas rising in ways the kids can get excited. They can see their idea connected with somebody in Malaysia or somebody in Nairobi. Like they get to see what's happening with their ideas. They get to see ideas rising to new heights, connecting and breaking off and finding. So I think we can use our environments much, much more effectively to make that process more exciting. As a community, we can design powerful, powerful feedback mechanisms that will really help classrooms grow. Schools were not built to generate new knowledge. This is a very modern problem. It's a very modern challenge for schools. Complexity is just in our lives. It's in our century. And learning to live with complexity, and understand and like complexity, are really important. It's where you get the emergence of new competencies. So I think the 21st century skills movement quite perceived the need for new kinds of work in education. Bringing design knowledge creation from the very beginning is, in fact, what makes the work meaningful. We succeed when we all succeed.

## **EMBRACING TECHNOLOGY**

- STUDENT 1: In kindergarten to grade five, we weren't even allowed to bring our devices, because they thought we'd be playing games and stuff.
- STUDENT 2: Exactly.
- STUDENT 1: And then in grade six, I was in another school. We were allowed to bring devices, but we're only allowed to play during recess and not use it during class time. So basically, you know, just playing games during recess. But then I came to this school just this year in grade seven, and I was amazed. We are using it for learning, everything. It really helped.
- STUDENT 2: When we first started school, when I was in grade one, kindergarten, we always had books, paper, pencil. And now we're doing-, we have tech everywhere.
- STUDENT 3: It was all book, paper, pencil. But now it's kind of like the technology that we have, it's not about like doing it physically, but you should use your imagination through it. That you have fun with it, instead of just, you know, get it done, get it done by this day. You should have that quality, have fun with it.
- STUDENT 1: I could just pull out my phone and research stuff. And especially I remember just a week ago, I was finished my math test, so I got out my iPad, and I just downloaded a new book to read. Instead of having to go somewhere and search for new books, there's a whole collection of books like right there for you on ebooks.

## IMPROVABLE IDEAS IN THE CLASSROOM

TEACHER: So this whole process started. We've been talking about weather in the class, which is an out-branch of our astronomy that we started the winter term with. And wind was really difficult, because the kids didn't have a lot of ideas of where the wind might come from. Maybe from the flapping of birds.

STUDENT: Jacob Two-Two's wearing a Mohawk.

TEACHER: That makes perfect sense to me. Mateo, add some colour to it, okay, while you're there. And then so they'd started talking about how wind affects things though. So it affects the waves, it affects the leaves, it affects us when we walk down the street and get blown by it. So that's where our challenge came from. Could we come up with something that could be so affected by the wind that it would move forward. And the challenge is up there. So the wind or a fan will only blow an empty carton so far. What can you design to make the carton travel further when it's blown? So on the blue sheets here, the kids just drew-, they got blank paper and they drew their first ideas. So the next thing was actually to get the kids to bring in their cartons and actually make them. So whatever they said they wanted to make, whether it was a cow catcher or bunny ears or wings, whatever they wanted, we made it. And as much as possible, I tried to help them make it out of the materials that they had asked for. And once all 22 were made, we went into the gym next door, which has a tiled floor, and we set up a starting line, and we got the blow drier out, and we tested each one. And we measured it, we measured it with metre sticks. The first ones only need one metre stick. But some of them actually got into the 300s, which was pretty amazing. And the idea was that we were really watching not whose went furthest, but why some of them were going further than the others. And because the kids were so excited, nobody was cheering just for their own. The kids were screaming

any time one kind of went off to the second or the third metre mark. It was incredibly exciting. So then, as soon as we did the test, kids had so many ideas about what they wanted to do to redesign their, what we started calling land ships. We actually had a parent come in who's been a glider pilot, and he started talking to the kids about some of the reasons why some of those features worked so well. So then the kids wrote down how far theirs went. Here's one that went seven centimetres, 13, 68 centimetres, 207 centimetres, 141, huge range. And they talked about why though. The wings helped it because the wind pushed them. The sail worked, but it needed wheels. So the kids were being very, very thoughtful about what they wanted to do. And then the next question was, how do you plan to redesign your vehicle to make it go even further. I want another sail and four wheels. I want to add six wheels. Maybe my sail should be straight. So that was a great way-, the kids started talking about symmetry, you heard them earlier. That helped a lot. I'm going to add wings on both sides, like Cece's, symmetrical. So the kids were actively calling on the other children's ideas to build them. And because they were so excited, getting the kids to do this kind of writing, which might seem like a lot of writing for five year olds, but they're so engaged. They're so interested. They want to communicate those ideas. It's a piece of cake getting them to write. In fact, they're asking when their turn can come. And it's the same with the measurement. It wouldn't be my expectation that kids could read 357 on a metre stick, but there they were. We were adding them up, 100, 200, 300 and 57. It's so exciting. So then we run out of-, we constantly run out of wall space. So these are the pictures of the kids with their redesigns. And now they're comparing it. So their first test, 33 centimetres, their second test, 138 centimetres. How much further did your redesigned land ship travel? So whatever they did, things really changed for them. Huge sense of satisfaction. And they just wanted to redesign it again and test it again. So we did one more test, right, adding ramps just 'cause we thought it would be fun, and giant fans

with the kids running behind them. But we haven't had a chance to write about those yet. So that's where they are. And the whole idea is that no matter what you do, you can always do better. That we can always improve, especially if we really are responsive to what other people do and what other people suggest.

## **IT STARTS WITH STUDENT CURIOSITY**

**SPEAKER 1:** We're really thinking about, in terms of knowledge building, how to have children take part in inquiry, and at the same time, be assessing the work that they're doing. How can they operate as a knowledge-creating group, the way knowledge-creating groups operate outside of schools? And part of that is definitely asking questions, finding information. But a very important part that's often neglected is the opportunity for the group to assess what they know in order to determine what they don't know, and what they need to do in order to acquire that information. That traditionally was the job of a teacher. A teacher would determine, I need to bring in this resource or maybe organize a certain field trip. But now we're giving more and more agency to children, allowing them to determine, what is it that we would benefit from as a group?

**SPEAKER 2:** I think the first thing to recognize is that kids are inherently curious, that they really do want to ask interesting questions about things that interest them the most. So if I were to tell a teacher, if you really want to get started knowledge building, the key fundamental idea is making sure that the kids are going to ask questions that they feel are the most authentic to them. Questions that they would be willing to work with over an extended period of time, because they find it fascinating, not what the teacher thinks is fascinating. Even though the teacher can guide them toward various questions, you do want the kids to be the ones that are the generators of those questions. The promise is, is that one question will lead to another question. And another question will lead to perhaps another idea. The real world coming into the classroom, questions and things that they have wondered about, really does become the hook that gets them thinking about what matters. As opposed to necessarily questions that might be generated by the teacher, these are the questions that become generated by the students, and things that they have been wondering about. So it just takes the education system, it just turns it 180 degrees around.

SPEAKER 1: One of the principles of knowledge building is how pervasive knowledge is. That as you go deeply into an area, you find it's connected with other aspects of the curriculum. We, as educators, have compartmentalized the curriculum in order to deliver it. But not because that's how learning really takes place. Hearing this will say, well, oh, my goodness, you mean I'm throwing everything out and it's sort of no holds barred? You know, I need some structure. And what I tell those teachers is sort of a one percent rule. Change one percent of your practice a day. Really think about, how can I give more opportunity to students in my class to have ownership in what we're learning? As we, as a class, have these experiences, children acquire new information that answers some of their earlier questions. But they start to realize that new information then generates new questions. And they are part of this process. We end units often with a sense of satisfaction, knowing we've accomplished a lot, but also knowing that there was much that we didn't get to. Of course, as a teacher, I would ensure that we covered the big ideas of the curriculum. But I like the sense of children leaving wanting a little more.

SPEAKER 2: The idea of getting the kids to generate the questions is the critical, most fundamental part in all of it.

## KNOWLEDGE BUILDING EMPOWERS STUDENTS

- STUDENT 1: When everybody says something, you're talking of what you think is a good idea. It might not be one to anybody else, but it is to you. And that's I think what everybody at first was a little bit shy of. But we've done so much work, so everybody's not shy of anybody now. So they can just talk their heart out and think.
- STUDENT 2: If you take one person's idea, and then you take another idea, then you put them together and you figure out like a new idea that can include both of the other ideas.
- STUDENT 3: So you can take Lucas' idea, and Oben's idea, and you can build on each one by something that you brought out of that. Like listening to his explanation of something, you can think, okay, well, he said this and I have my theory on that. So I can build on my theory with his ideas. We can take what we saw from their idea, and add it to our idea. So it's not like a right answer and a wrong answer. It's kind of taking everything from both answers, and making your kind of statement on that.



## THE ROLE OF THE TEACHER

SPEAKER 1: You see it. You feel it as soon as you're walking in the door. You don't see, in our case, 22 kids doing exactly the same thing. You're seeing children doing very different things.

SPEAKER 2: Yeah.

SPEAKER 1: When I walk upstairs towards the grade five, six class, I'm often having to get out of the way of the kids who are working on the stairs in a small clutch. They're not even in the classroom, but because they're so motivated and engaged, and doing their own thing, Ben knows he can let them out the door, and they're going to be working and they're going to be bringing things back. You get this incredible hum of energy from it. But also when you walk in the room, you see it everywhere. When parents walk into the classroom, when other teachers walk into the class, and when the children themselves walk in, everything that's happening is there for them to see. The journey is available for them to track themselves.

SPEAKER 3: Yeah.

SPEAKER 1: And my kids stand so often in front of the work that they've done, huge amount of writing, because they're interested in what they're writing about. Yes, they do want you to know how far their wind machine went the first time compared to how far it went the second time, and how much better it was. And then they go up there, and they're constantly looking at it. They're looking at their own, they're looking at others. They're having conversations about, if I do this again, I'm gonna change it this way. And it becomes outside of what the teacher has done. It's a huge-, I mean, the teacher is still an enormous part of all of that. But it takes on a life of its own.

SPEAKER 3: Yeah.

SPEAKER 1: And the teacher is one member of that community. The children came to me just quietly and tugged on my shirt and said, can a bird fly higher than the sky? In this conversation that came up from this one question, that came up from this one story, that shaped our next six weeks. We started

looking at all these layers of the atmosphere, and when did it switch? If I, as a teacher, had sat back and thought about what do we want to learn about, astronomy, I would've never imagined that we would be talking about stratospheres and tropospheres, and I would not have imagined that we would be doing any of the things that we ended up doing. It would have been so much smaller. So my job was to figure out where are these big ideas that are coming from them? How do I bring them back to the group, so it becomes really fruitful and really relevant for the whole group sitting around the table? How do I make sure that each one of these kids can feel part of this story and this journey, knowing that they're not all going to be at the same page.

SPEAKER 3: In a way, inquiry is differentiation.

SPEAKER 2: Yes, by definition.

SPEAKER 1: Absolutely.

SPEAKER 3: Right, like it just is differentiation, by definition. Because every child will be taking their approach. They'll be...

SPEAKER 1: Yes.

SPEAKER 3: ...they'll be contributing their questions, their ideas, and it's our job to give them the ways to do that. There's so much of a role for the teacher to play all the way through.

SPEAKER 1: Hugely, constantly anticipating the resources that they're going to need...

SPEAKER 3: Yeah.

SPEAKER 1: ...the experiences that they're gonna need. And I always think of it too as that kind of like scooping back in, you know, that child that's gone down this route. And it's great, what they're doing is fantastic, and they're totally into it. But you also want to bring them back, so that they understand that part of their responsibility is to share that back with the group.

SPEAKER 3: You're not in this situation, I think, where you are in a traditional classroom of having a deficit of information...

SPEAKER 2: Definitely.

SPEAKER 1: Yes.

SPEAKER 3: ...about what children know.

SPEAKER 2: The opposite.

SPEAKER 3: It's the opposite. You have an enormous surplus, and it's just a matter of trying to capture it in its entirety. You know, if you just write down what the children say, and then keep that day after day, then you have that discourse logged down in some way, and you can just see. You can see the change.

SPEAKER 1: Because they're so engaged, those skills are building enormously, which I'm keeping track of. But also they're understanding that they can follow their own questions. That's the deep part, that regardless of the content that you pick, that's being built no matter what.

SPEAKER 3: Our unit quickly evolved, and it even changed in terms of when I would write it down on the schedule, I used to write electricity, and then I started writing physics. Because it just changed kind of...

SPEAKER 1: Yeah.

SPEAKER 3: ...into a unit about physics. But it was my job, I think, one, to identify that...

SPEAKER 1: Yeah.

SPEAKER 3: ...to see that this is what they need to understand, that they are trying to understand something at this level, and they can't, and here's the piece that they need added in. Then I needed to try to find resources...

SPEAKER 1: Exactly.

SPEAKER 3: ...to help them understand that.

SPEAKER 1: Yeah.

SPEAKER 3: And I need to find things for them to read, things for them to look at, things for them to try, right, all those things. And then because it's a complex topic, I needed to help them with all of those steps.