

EDUCATION

A JOINT VENTURE WITH AMGEN CANADA AND LET'S TALK SCIENCE



Dr. Karen Burke, director of regulatory affairs at Amgen Canada, explores science with two children at an event called Random Acts of Science at First Canadian Place in Toronto last year. Let's Talk Science and Amgen Canada teamed up to conduct hands-on science experiments in public areas.

More hands-on science in schools will help drive Canada's economy

21st-century success

It is early September, and British Columbia high school science teacher Laura Verhoeven is getting ready to leave for a week-long camping trip with her grade 11 sustainable resources class. They are headed to Galiano Island, to work with the Galiano Conservancy on an ecological restoration project aimed at bringing diversity back to a forest that was clear-cut in the 1970s. It's one of the Conservancy's biggest projects, and it's an example of sustainable physics at work. No industrial machinery or fossil fuels will be used — just human power.

"On the first day, we hike in and the kids learn all about forest ecology and sustainable forestry and ecological restoration," says Ms. Verhoeven, this year's winner of the Amgen Award for Science Teaching Excellence. "Then, the kids will pull down a tree using chains and pulleys — real physics. The kids are so excited. They get to see these cool guys working in ecological restoration — a field that needs more people — and they can start to see the huge scope of the many careers in science."

Ms. Verhoeven's efforts, and the project-based approach to learning employed at Pacific Secondary School: Metchosis Technical Centre, highlight what's possible when it comes to science learning — and also what's needed in the education system, according to the recent Spotlight on Science Learning: A Benchmark of Canadian Talent report. The result of a collaboration between Amgen Canada, a leading biotechnology company that develops medicines to help people with serious illnesses, and Let's Talk

Science, a national charitable science outreach organization focused on creating programs to engage students in science learning, the report is a first-of-its-kind look at the state of science, technology, engineering and math (STEM) learning starting in elementary and secondary school, moving on through post-secondary education, and going into the workforce.

The report identifies a core list of 11 benchmarks that need to be tracked in order to properly monitor Canadian progress in STEM learning.

It's a snapshot of where science learning is today and a starting point to ensure the necessary steps are taken to secure Canada's place on the global stage. Going forward, the demand will be for highly skilled talent. Stefanie Sanford, a senior education expert at the Gates Foundation, puts it simply: "The high-wage, medium-skilled job is over."

The challenge here in Canada, as Spotlight on Science Learning makes clear, is that increasingly, students are opting out of science courses after grade 10, when they are no longer mandatory, effectively shutting the door on employment opportunities and affecting the future productivity and innovation of the country as a whole.

"In so many careers that will be opening up, STEM is going to be critical. One of our key philanthropic initiatives at Amgen is around science education. We've undertaken previous studies with Let's Talk Science to learn about student attitudes toward science, which were very revealing. We decided we needed to know more about the state of science learning in Canada and so put together a panel of experts from across the science community to identify

the measures and benchmarks we should be tracking," says Dr. Karen Burke, director, regulatory affairs, Amgen Canada, and a member of the expert panel.

The key benchmarks identified and analyzed by the panel include youth attitudes, student performance, participation in optional high school courses, enrolment in and graduation from post-secondary programs at all levels, apprenticeships, job forecasts and employment shortages.

"We learned that Canada is strong in terms of performance but weak in terms of size. After grade 10, when it is no longer

Three of the top four required STEM education: technicians, skilled trades and engineers. According to HRSDC, 75% of the new jobs created between 2009 and 2018 are in high-skill occupations. In the next 10 years, as Baby Boomers retire, about four million replacement jobs will open up but those jobs have changed enormously, says Dr. Bonnie Schmidt, president, Let's Talk Science and chair of the panel for Spotlight on Science Learning.

"What was classified as a blue-collar job 20 years ago is so technologically influenced now that the required skill level coming

they think very traditionally — white coats and test tubes — when it comes to a career in science," Ms. Verhoeven says.

The bottom line: Governments, industry, parents and educators need to do a better job of showing students the varied career paths open to them only if they continue their STEM studies. They also have to start thinking about creating a culture of science learning. For Dr. Schmidt, the conversation around science has to change from one that has been focused on productivity and the adult learner in the workplace to one that is more holistic and integrated and begins with children in elementary school.

"The study reveals there are millions of young people in Canada who are closing doors far too early when it comes to science. For us, the goal is to move this on to the public agenda and make it a topic of public discourse as it is in the U.S., as it is in China, as it is in India. We need to drive a national discussion about the importance of science learning for Canada's future. We need to be thinking about growing talent in Canada starting in the sandbox and all the way through life, not just at a graduate level," Dr. Schmidt says.

"That's why, when we were determining which benchmarks to measure for the report, it was important to track trends in science learning before the graduate level. We looked at enrollment and performance in high school and application rates and enrollment in post-secondary education. We found kids are quite capable and are performing well but as they progress in school they are dropping science."

The question is why? Dr. David Blades, a member of the panel and the director of the Centre for Excellence in Teaching and Understanding

Science at the University of Victoria, is teaching the next generation of science teachers.

"The reality is students have very good attitudes toward science in elementary school. It's one of their favourite subjects. That changes in high school, where courses are taught as university prep and often in a lecture style. The problem is there is so much content that must be covered," says Dr. Blades. "We are killing interest by the way we are teaching science. There is no linking of science to students' everyday lives as citizens and consumers."

He points to the discussions going on in the province of British Columbia about the Enbridge pipeline and environmental impact as an example of how science can be made more real in the classroom. "Students should be having those same discussions. That's citizenship science, and that's not what we are teaching." Instead, he says, the content is abstract. "We have to change the way we think about teaching. It can't just be about delivering content any more."

In other words, less memorization and more hands-on understanding — more Bill Nye, the Science Guy, Ms. Verhoeven says. For example, in her sustainable resources class she has her students build renewable energy models such as wind and water turbines.

"I teach them about the principles behind the renewable energy technology, but they have to design it and build it. Sometimes they produce power, sometimes they don't, but I'm more concerned about how they apply theory. Were they on the right track? Trial and error is part of the process. That's science."

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mandatory, we saw a huge drop-off in the number of students taking science," Dr. Burke says.

"That was a surprise because this is exactly the type of learning necessary for the jobs of the future. Other countries around the world are focusing on science learning and encouraging it. If Canada wants to be globally competitive we have to focus on this or we risk being left behind."

Consider the numbers: Manpower Group, a leading workplace staffing organization, surveyed 40,000 employers in 39 countries about the job categories that were the most difficult to fill

into that job is much higher," Dr. Schmidt says. "But no one is talking about this."

As a result, there is a disconnect for students when it comes to the science they are learning and the potential for future careers, Ms. Verhoeven says.

"When you ask students 'what are the jobs in science?' They'll say 'doctor, nurse, rocket scientist'. They don't think that a welder or electrician uses math and physics. A lot of kids say, 'I'm not going to be a doctor so why study science?' They don't see how STEM is used in so many professions and, at the same time,



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