



SPOTLIGHT ON SCIENCE LEARNING: SHAPING TOMORROW'S WORKFORCE:

What Do Canada's Teens Think About Their Futures?

AMGEN[®]

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science

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Spotlight on Science Learning:
Shaping Tomorrow's Workforce: What Do Canada's Teens Think About Their Futures?

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Let's Talk Science is pleased to contribute this Spotlight on Science Learning 2014 report, in partnership with Amgen Canada, to build our collective understanding about the influencers and motivators of youth attitudes towards STEM careers. As we look towards the next twenty years, it is clear that science and technology will increasingly drive Canada's economy and shape our workforce. It is critical that we work together to inspire and motivate youth to keep their options open and remain engaged in STEM learning. Let's Talk Science has over twenty years of experience bringing effective programs and resources to youth and educators across Canada. For more information, please visit www.letstalkscience.ca.

Rick Dobson
Chair, Let's Talk Science



Rooted in discovery and innovation, Amgen Canada understands the importance of science education and is committed to raising awareness of the value of science literacy in Canada. We are proud to partner with Let's Talk Science and support the third Spotlight on Science Learning report, which takes a critical look at how and when students make decisions about their future education and career paths. Recognizing the importance of STEM for the future of Canada's economy, we need to take collective action – parents, government, industry, teachers and the community – to bridge the gap for Canadian students and help them make the connection between their interests and the value of science learning for any path they wish to pursue beyond secondary school.

Karen Burke, PhD
Director, Regulatory Affairs, Amgen Canada



EXECUTIVE SUMMARY

WHAT MOTIVATES CANADA'S TEENAGERS?

That's a vital question to explore as they go through high school and prepare for post-secondary life. Parents and educators need to grasp the beliefs and attitudes of young people. By understanding how teens think about their pathways, and what influences them, we can better help our youth to identify and capture tomorrow's opportunities.

Increasingly, those opportunities are linked to STEM – science, technology, engineering and math. Forecasts predict that many of the jobs that will be in the highest demand in the next two decades call for STEM learning. These are the jobs that will fill skill shortages, and that will contribute in large part to Canada's economic prosperity and innovation.

Even jobs or businesses that wouldn't typically be associated with STEM benefit from the knowledge, problem-solving and decision-making skills, and general math and science literacy that STEM learning offers.

A new survey shows that a high percentage of Canadian teens like science and believe it is fun. Yet students often struggle to recognize how STEM supports the types of roles and careers they value, and can benefit them in any work setting.

This is the third in a series of *Spotlight on Science Learning* reports, developed through a partnership between the award-winning education and outreach organization Let's Talk Science and the biotechnology firm Amgen Canada.

Building on past reports that examined benchmarks of progress in STEM learning, and the financial/opportunity/societal costs of dropping STEM courses, we wanted to hear from teens on what views and forces are shaping their futures. Earlier this year, we collected responses from 818 youth, aged 13 to 17, and representative of the Canadian teen population.

The survey found that students aren't necessarily drawn to specific jobs, but to a set of interests and values. The vast majority want careers that use higher-order skills. Teens place a priority on jobs that allow them to make a contribution (84 per cent); help people (79 per cent); make decisions (75 per cent); and solve problems

(70 per cent). They also express considerable interest in owning a business (48 per cent) and being an entrepreneur (39 per cent).

All of this speaks to overall ambition as opposed to the appeal of a certain sector or job. Given the broad motivators that drive course and career selections, it's important to show students: 1) how their preferences can apply in different settings; and 2) how certain courses – including STEM – can be a foundation to fulfill their ambitions.

As students plan for the future, they're driven mainly by their likes and interests, as well as (to a lesser degree) subjects they're good at or their dreams. So how do students feel about science? More than twice as many students say science is fun (72 per cent) than boring (34 per cent) and 70 per cent say they enjoy science in school.

Beyond enjoyment, students generally appreciate the importance of science. Some 69 per cent say understanding science is more important today than when their parents were in school. And three-quarters of students feel that a science background expands their potential and capabilities, regardless of what they will do.

However, these attitudes don't always align with personal ambitions or intent. For instance, while 56 per cent of students have some (34 per cent) or a lot (22 per cent) of interest in taking science at the post-secondary level, they are not taking the prerequisites (i.e. optional biology, math, physics and chemistry courses) at near those numbers. Many students don't associate science courses with their own self-interest in furthering their general career prospects.

Many students also don't take science because they don't want to "go into science". They don't recognize what STEM can put into their toolbox.

The biggest obstacles to sticking with STEM are feeling that their grades aren't good enough in these subjects and that these subjects are too hard. Another challenge is misperceptions about the workplace.

For example, students are more likely to associate engineering jobs with machinery than problem-solving. While 79 per cent of teens say discovering new facts and information happens in science, far less say the same about technology (58 per cent) and engineering (44 per cent). Although most students think science is fun (which should drive interest) and 64 per cent think science-related jobs would offer an interesting work environment, only 56 per cent say the same about technology jobs and 53 per cent about engineering-related jobs. It's important to show students that they can find what's important to them in STEM-related work settings.

While teens don't always see how certain fields and jobs suit their interests, more than nine in 10 youth are thinking about their career a lot or sometimes. With this focus on the future, it's important to pique interests at a young age. In the survey, students said parents (76 per cent) have the greatest influence on their educational direction, with teachers a distant second (24 per cent). Considering this role, parents' own perceptions about science education are influential. People who actually work in the field are also seen as credible sources, so exposure to them as mentors is vital.

Just over six in 10 students plan to attend university or college/polytechnic and another 6 per cent want to take an apprenticeship. Sixteen per cent plan to pursue at least two of these three options. Interest in the university track shows a significant gender difference – almost half of female students say they're headed to university compared to one-third of males.

Measuring the attitudes and interests of Canadian teens reveals other ongoing gender differences. For instance, male and female students are drawn in different degrees to certain STEM sectors, often reinforcing existing stereotypes (e.g. women in science and caring for sick people, men in engineering and skilled trades).

Gender differences are also evident in high school optional course selections, with more female students interested in biology and more males interested in information technology. More males than females are interested in being an entrepreneur (44 per cent versus 35 per cent), but more females want a professional job (67 per cent versus 52 per cent).

Can women find great satisfaction in a science, technology, engineering or math-related career? Eighty-four per cent of all respondents said yes; however, there is a nine-point gap between men (79 per cent) and women (88 per cent) who agreed. Overall, almost one in five Canadian teens (19 per cent) still feel that careers in engineering and/or technology are best suited to men, and almost as many female students (17 per cent) feel that way as male students (21 per cent).

Along with gender differences, the survey found several variations in responses based on age. Yes, science is fun – but to a point. At age 13, 79 per cent call science fun, and three-quarters enjoy science courses. By the end of high school, 68 per cent of students describe science as fun, and more than one in three say they have little interest in it because they don't know where science can lead.

Those attitudes affect post-secondary plans. At age 13, only one in 10 students has no interest in taking science in post-secondary. By age 17, one in four says the same. At age 13, 79 per cent of students also say they understand STEM is important for adult life, but that falls to 66 per cent at 17 years of age.

THE RESPONSES IN THE SURVEY REVEAL SEVERAL CHALLENGES:

- Explaining the range of jobs that fit the values students already place on a career.
- Raising awareness of all opportunities, and the path required to get there, at the time when students are making major educational and career decisions.
- Clarifying what actually goes on in STEM jobs and helping students see that STEM-related careers offer stimulating work environments.
- Correcting misperceptions about what a STEM career requires. For example, 60 per cent of respondents believe they need a university degree. That's true in many cases, but students need greater awareness about the many STEM-related careers that call for a college certificate or diploma, and about the skilled trades (which can be STEM-heavy).
- Canada needs more people who can apply STEM learning widely. This includes our future scientists, engineers, tradespeople, health care professionals and other jobs that we traditionally associate with STEM. Just as important, STEM learning supports any job, because all benefit from the competencies developed through STEM engagement.



STUDENTS WHO HAVE A QUALITY STEM EDUCATION WILL BE HIGHLY EMPLOYABLE

– in STEM sectors, fields that aren't obviously STEM-related, and occupations they may not even envision. Canada's teens want to make a difference, help people, make a contribution, solve problems, and build their own ventures. Yet students don't always understand how STEM learning supports the roles and careers they value.

Ensuring that Canadian youth are prepared to thrive in a new environment – as productive employees and citizens – is a shared responsibility. Educators, parents, industry, governments, non-profit organizations and other societal influencers all have a role. These players need to help youth of all ages and both genders realize that STEM is key to building the skills they already want to use, and can apply in any field.

In the generation ahead, science, technology, engineering and math will continue to be driving forces of success. The time is now to support youth's engagement in STEM, to ensure they fulfill their potential – and Canada's.

Are Canada's teenagers poised to capitalize on emerging opportunities – for their benefit and the well-being of the country?

Various educational bodies, industry associations, public sector organizations and think tanks have weighed in about the jobs we have to fill and the traits we need to develop over the next 20 years. We've heard from experts about the importance of becoming more innovative, productive and entrepreneurial as a country, and growing as a knowledge economy. Today's youth will bear the greatest responsibility in evolving this economy. Hearing their voices will add greatly to this national dialogue.

Canadian teens face many decisions about what they want to do with their life and the paths to get there. Those paths are often uncertain. Are the high school students of today preparing for tomorrow's world? How do they think and feel about certain opportunities in high school? What is influencing their ideas? Do they grasp the importance of being educated in science and technology, to them and society at large?

It is vital to get these answers and understand the implications. By understanding the perspectives and motivations of teens, the stakeholders involved in supporting them can be better positioned to do so.

Methodology

A new survey offers insight into how teens think as they go through high school and make post-secondary choices. Vision Critical conducted an online survey from May 20 to 26, 2014, among teens aged 13 to 17 who are entering grades 7 to 12 in the fall of 2014. The 818 respondents (whose parents are Angus Reid Forum panelists) were representative of the Canadian teen population.

Society highly values science, technology, engineering and math (STEM) learning. Beyond the traditional career paths that call for a STEM background, employers are looking for a certain skill set. Jobs in every field call for people who are analytical, curious and critical thinkers, and able to make connections – the very qualities that exposure to STEM learning nurtures.

The body of evidence clearly indicates that STEM engagement is necessary for our individual and collective prosperity. The challenge is whether Canada's young people fully understand where that engagement can take them.



A sizeable – and growing – number of teens say science is fun. Does that attitude last and intensify? Will the appeal of science open up their eyes to career possibilities, and nurture a foundation that is important for just about any job in tomorrow's workforce?

TRACKING SCIENCE: FROM THE CLASSROOM TO CAREERS

This is the third in a series of Spotlight on Science Learning reports, developed through a partnership between the award-winning education and outreach organization Let's Talk Science and the biotechnology firm Amgen Canada.

The initial Spotlight on Science Learning report, published in 2012, was a first-of-its-kind look at 11 key benchmarks of progress in STEM learning: starting in elementary and secondary school, moving on through post-secondary education and going into the workforce.

A key observation was the significant drop-off in the uptake of high school science and math courses once these courses are no longer compulsory. A follow-up 2013 Spotlight on Science Learning report delved deeper into the multiple impacts of shedding those courses.

Canada needs more people who can apply STEM learning widely. This includes our future scientists, engineers, tradespeople, health care professionals and other jobs that we traditionally cite when we think of STEM. Just as important, STEM learning supports any job because all benefit from the competencies developed through STEM engagement.

The first Spotlight on Science Learning report focused on the “what” (key benchmarks of STEM engagement), and the second on the “why” (this matters because we all lose when youth don't pursue STEM). Now, in the third Spotlight on Science Learning report, we turn to some of the “how” and “when”: How do teens think about their futures, and when do they make key decisions about it?

Spotlight on Science Learning #1:

“A Benchmark of Canadian Talent” (2012) drew on a national expert panel of members from STEM industries and education communities. The report identified 11 benchmarks that need to be tracked to monitor Canadian progress in STEM learning (www.letstalkscience.ca/research-publications/spotlight-on-science-learning). The panel explored the opportunities of the future (where jobs are growing and what proportion call for STEM skills); the talent development pathway (how students fare in science and math and whether those abilities and interests translate into post-secondary plans related to STEM); and the importance of supporting a science culture (free choice participation in science-related activities).

Spotlight on Science Learning #2:

Creating a large pool of STEM-based talent is crucial to keeping Canada competitive and Canadians employed. Failing to stick with STEM education is a choice, but it has costs – costs we all share. “The High Cost of Dropping Science and Math” (2013) looked at three areas of impact (www.letstalkscience.ca/research-publications/spotlight-on-science-learning). There are the financial costs (making up lost courses); the opportunity costs (lost future earnings); and the societal costs (reduced innovation in Canada and unfilled jobs due to incompatible skills).

A MATTER OF VALUES

What do you want to do when you grow up?

That's the age-old question for young people. Many are answering not with a specific job or career label but rather with a set of interests and value statements.

The survey asked what type of work students are drawn to. The vast majority want jobs that allow use of higher-order skills. Specifically, respondents place a priority on:

- Making a contribution – 84 per cent
- Helping people – 79 per cent
- Making decisions – 75 per cent
- Solving problems – 70 per cent
- Using communication skills – 70 per cent

These responses transcend specific fields and types of jobs – they're about values and higher order skills. That's something very positive, which educators, parents and other influencers can build on. If these are the broad motivators that will drive course and career selections, it's important to show students how their preferences can apply in different settings.

Interestingly, 65 per cent of students show an interest in working with their hands – and two-thirds of them had a parent in the trades, perhaps underscoring parental influence.

When the options presented in the survey are more specific – for example, create new products (50 per cent), work with machinery (35 per cent), design, i.e. engineering-type of design (30 per cent), and care for sick people (28 per cent) – the interest levels drop. These activities happen to rely heavily on STEM skills, and are or will be in high demand in the coming decades.

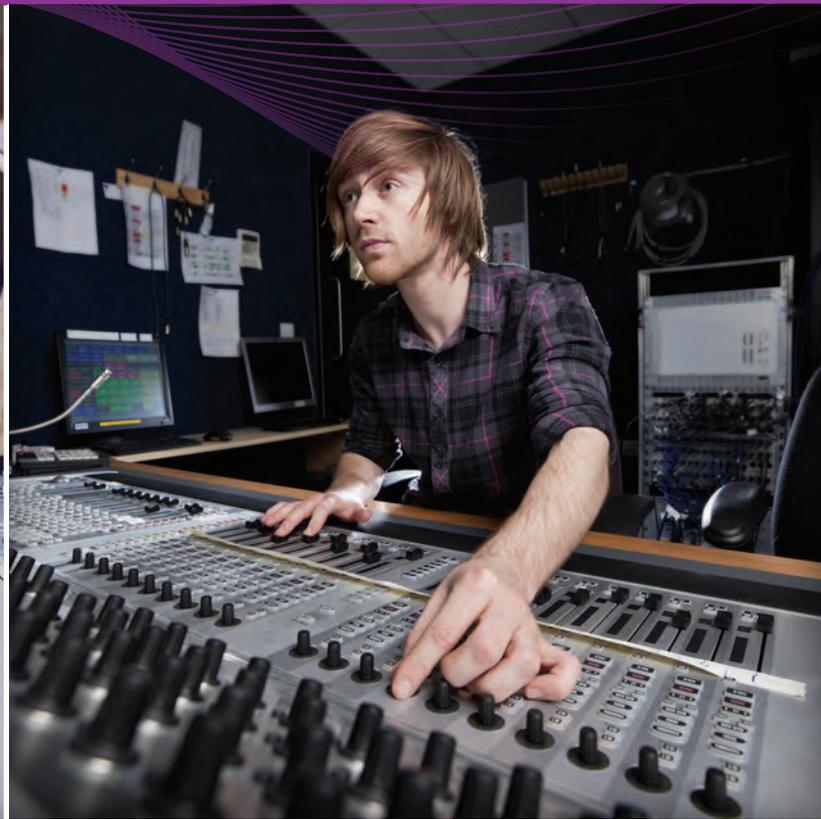
Students also express interest in owning a business (48 per cent) and being an entrepreneur (39 per cent). Again, this speaks to overall ambition as opposed to the tug of a sector or specific job. Given the appeal of working independently, it's helpful for students to understand:

1. high-growth business areas
2. how STEM courses can be a foundation for entrepreneurial ventures
3. the hard and soft skills required to successfully run a business from staffing to financing.

The table on page 13 shows how a diverse range of STEM career opportunities address the values and qualities (attributes) that are important to students. Dozens of opportunities open up for students of all types and interests, some calling for a university degree, and others for a college certificate/diploma or an apprenticeship.

For additional ideas on STEM-related job opportunities, see tables in Spotlight on Science Learning “The High Cost of Dropping Science and Math” (2013), www.letstalkscience.ca/research-publications/spotlight-on-science-learning

ATTRIBUTE	STEM-RELATED JOBS – UNIVERSITY DEGREE REQUIRED	STEM-RELATED JOBS – COLLEGE CERTIFICATE/ DIPLOMA OR APPRENTICESHIP REQUIRED
Work with my hands Measure and record information Deal with paperwork/administrative work Make a useful contribution to society	<ul style="list-style-type: none"> • Surgeon-all types • Engineers-all types 	<ul style="list-style-type: none"> • Skilled tradesperson-automotive, electrical, avionic, industrial mechanics, beauticians, cook/baker • Technologists/technicians
Use mathematics/calculate things Measure and record information Make decisions Deal with paperwork/administrative work Make a useful contribution to society	<ul style="list-style-type: none"> • Actuary • Accountant • Exploration geophysicist • Financial analyst • Operations research analyst • Statistician • Demographer • Data miner (emerging occupation) • Geomatics engineer • Meteorologist 	<ul style="list-style-type: none"> • Database analyst • Investment advisor • Payroll administrator • Geomatics technologist • Mapping technologist • Records management technician
Solve problems Make decisions Measure and record information Use my communication skills Make a useful contribution to society	<ul style="list-style-type: none"> • Engineers-all types • Environmental economist (emerging occupation) 	<ul style="list-style-type: none"> • Engineering technologist • Laboratory technician/technologist • Pollution control technologist • Powerline technician • Environmental auditor • Interpretive naturalist
Work with machinery Make decisions Deal with paperwork/administrative work Make a useful contribution to society	<ul style="list-style-type: none"> • Agricultural engineer • Mechanical engineer 	<ul style="list-style-type: none"> • Agricultural equipment technician • Aircraft maintenance technician • Mechanical design/engineering technologist • Millwright (industrial mechanic) • Automotive mechanic/technician
Design buildings, bridges, cars, etc. Make decisions Measure and record information (i.e., data/record management) Use my communication skills Deal with paperwork/administrative work Make a useful contribution to society	<ul style="list-style-type: none"> • Architect • Civil engineer • Electrical engineer • Environmental engineer • Landscape architect • Prosthetist and orthotist • Software engineer 	<ul style="list-style-type: none"> • Architectural technologist • Civil engineering technologist • Electrical engineering technologist • Electrician • Landscape architectural technologist • Prosthetic and orthotic technician • Telecommunications technologist
Care for sick people Be responsible for other people Help people Make decisions Measure and record information Make a useful contribution to society	<ul style="list-style-type: none"> • Chiropractor • Radiation therapist • Doctor • Nurse • Dentist • Nurse practitioner • Optometrist • Pharmacist • Physiotherapist • Athletic therapist • Audiologist • Dietitian 	<ul style="list-style-type: none"> • Cardiology technician • Radiological (X-ray) technologist • Cytotechnologist (emerging occupation) • Licensed practical nurse • MRI/CT/ultrasound technician • Nuclear medicine technologist • Optician • Pharmacy technician • Physical therapist assistant • Audiometric technician • Dental hygienist • Dental technologist • Ultrasound technologist (medical sonographer)
Work in a laboratory Make decisions Measure and record information	<ul style="list-style-type: none"> • Research scientists-biologist, chemist, physicist 	<ul style="list-style-type: none"> • Biological & chemical technologist • Forensic laboratory analyst • Medical laboratory technologist
Work with animals Make decisions Use my communication skills Measure and record information Make a useful contribution to society	<ul style="list-style-type: none"> • Veterinarian • Zoologist • Marine biologist 	<ul style="list-style-type: none"> • Veterinary technician • Animal health technologist
Create new products Make decisions Measure and record information Make a useful contribution to society	<ul style="list-style-type: none"> • Biomedical engineer • Biotechnologist • Nanoengineer 	<ul style="list-style-type: none"> • Biomedical engineering technologists • Nanotechnologist
Work on my own Make decisions Measure and record information Use my communication skills	<ul style="list-style-type: none"> • Owning your own (technology) business 	<ul style="list-style-type: none"> • Self-employed auto mechanic, electrician, beautician



CAREER CHOICES: STUDENTS ARE “LIKE-MINDED”

As students plan for the future, are they driven by their dreams? Thoughts of a big salary? Job security? All are important, but far and away, likes and interests win.

When asked what influences their decisions about education and career aspirations, 86 per cent of teens said interests. This is a considerable increase from the 71 per cent of students who cited interests in the 2011 Angus Reid survey for Let’s Talk Science and Amgen Canada. Still, the relatively high number of students who said subjects they are good at (64 per cent) or their dreams (50 per cent), means these are areas that can be inspired.

When considering what they’ll do after leaving high school, personal likes and interests again came first (89 per cent), followed by skills and abilities (84 per cent). Earning potential (78 per cent) and job security (69 per cent) are also important, but less so.

Not surprisingly, students are excited by the idea of doing what intrigues them and takes advantage of their perceived talents. They want what they like. So what do students view as interesting and playing to their strengths? How do these assessments match up with courses and career paths? The answers clearly influence academic and job decisions.

WILL ENJOYMENT AND APPRECIATION TRANSLATE INTO AMBITIONS?

With likes and interests so critical in making life plans, how do youth feel about science? Start with a fill-in-the-blank: science is _____. More than twice as many students say fun (72 per cent) as say boring (34 per cent). Some 70 per cent say they enjoy science in school. And 65 per cent enjoy science-related articles and TV shows.

Beyond the enjoyment, students generally show an appreciation for the importance of science. For example:

69 per cent say that understanding science is more important today than when their parents were in school.

81 per cent agree that if fewer students pursue science, this will have an impact on our society in the long term.

A strong majority of students (about three-quarters) feel that a science background expands their potential and capabilities, regardless of what they end up doing:

78 per cent say that science offers them many different career options.

73 per cent say that having a good understanding of science will help improve their career prospects even if they don't go on to have a career in science.

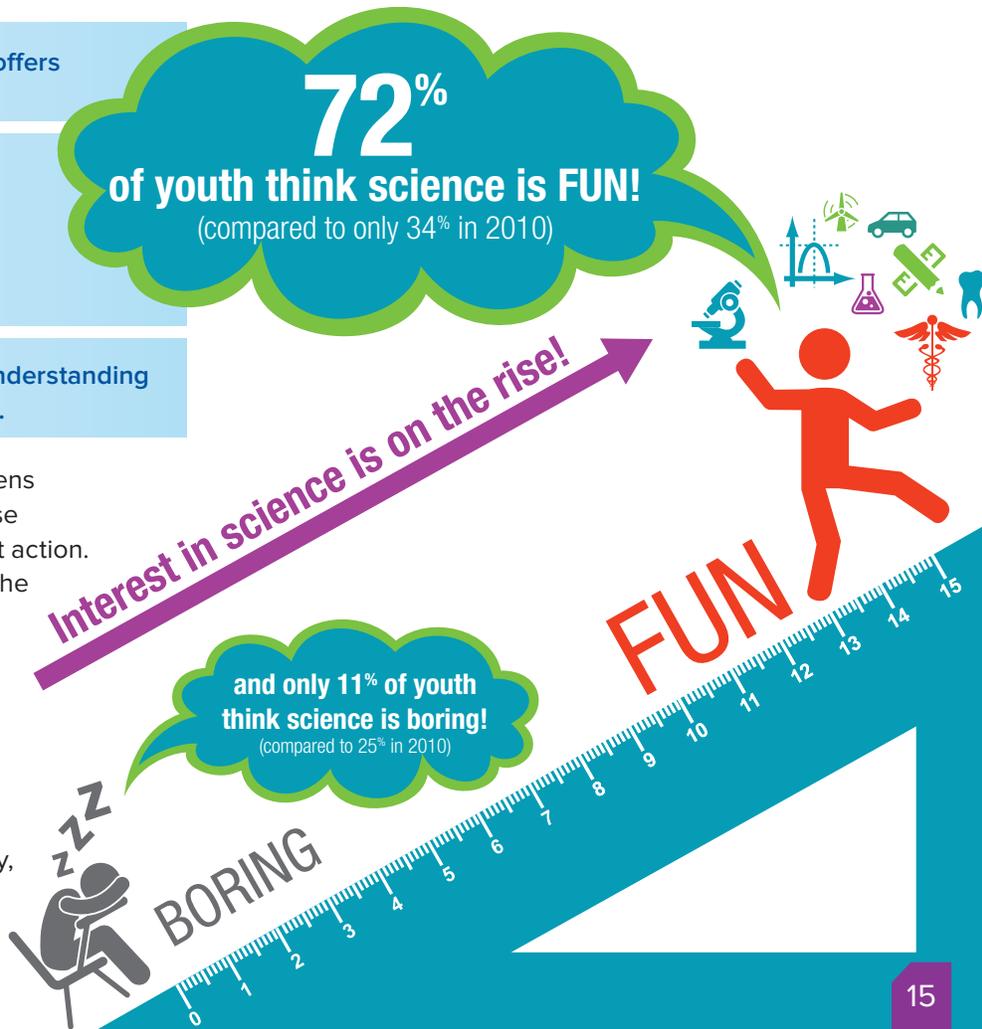
74 per cent say that a good understanding of STEM is very important for adult life.

It's encouraging that three-quarters of teens grasp STEM's significance. However, these impressions do not align with subsequent action. Furthermore, students are less aware of the importance of STEM than their parents.

In a 2011 Angus Reid survey for Let's Talk Science and Amgen Canada, reported in the first Spotlight on Science Learning, an even higher percentage of parents understood the importance of science education in their own lives. In that survey, 84 per cent of parents believed a basic

understanding of math and science was useful in their jobs (this included people whose careers weren't "science-related"), and 94 per cent said science was useful for everyday life outside work. However, the same survey showed that fewer than one quarter of parents spoke to their children about the importance of science for their careers.

Overall, students like science and understand its importance to society and their futures. The interest and awareness is there, but does it translate to their own ambitions?



DOES STEM TAKE ROOT?

Students agree that Canada needs more people with STEM backgrounds, and that they would benefit from strong STEM abilities. However, they don't always correlate that with their own academic and career preparation.

The current survey revealed several disconnects:

1. To pursue options, you have to take options.

Overall, 56 per cent of students say they have some (34 per cent) or a lot (22 per cent) of interest in taking science at a post-secondary level. Yet they're not taking the prerequisites, i.e. optional courses, at near those numbers. When it comes to taking optional courses during their final year of high school, only one-quarter to one-third of students really want to study environmental sciences (24 per cent), physics (26 per cent), chemistry (27 per cent), Information and Communication Technology (ICT) (30 per cent), biology (31 per cent) or math (32 per cent). There's a crucial gap between awareness and desire let alone actual behaviour.

2. Low interest in self-interest.

What prevents students from taking optional courses? Students are most inclined to freely choose courses when they: 1) are interested in the subject (75 per cent); 2) need the course for future studies/career preparation (59 per cent); and 3) are good at the subject (45 per cent). While three-quarters of students acknowledge that having a good understanding of science can improve their career prospects, they don't associate science courses with their own self-interest in furthering those prospects.

3. It's hard to distinguish STEM education from STEM jobs.

Many students don't take science because they don't want to "go into science". However, even jobs that wouldn't typically be associated with science benefit from

some STEM training. Students talk about the importance of work that uses problem-solving and decision-making skills, or makes a contribution, but they may not realize that STEM studies can provide this important grounding. Likewise, students who are interested in starting a business or creating something may not see how a basic math or science background will help them do what they want to do. It appears that many students don't recognize what STEM will put into their toolbox.

4. Career plans can hit an obstacle.

Student respondents showed some interest in five broad STEM areas that are in demand: 1) technology (instrument technician, computers, etc.): 46 per cent. 2) science (research, manufacturing, pharmacy, etc.): 40 per cent. 3) skilled trades (automotive, cook, cosmetician, etc.): 36 per cent. 4) engineering (civil, electrical, chemical, etc.): 28 per cent. 5) math (accountant, economist, etc.): 22 per cent. However, based on the number of students that actually take optional science and math courses at the high school level and then STEM programs at university and college, the early interest appears to wane.

5. Job demand doesn't always spur supply.

Even if told that most jobs were in STEM-related fields, 27 per cent of students are no more likely to choose one of those careers – the same proportion as would be more likely (28 per cent). What prevents students from studying STEM in the future? Two big reasons: my grades aren't good enough in these subjects (29 per cent); and these subjects are too hard (22 per cent).

Student interest in STEM areas



46%

TECHNOLOGY

(instrument technician, computers, etc.)



40%

SCIENCE

(research, manufacturing, pharmacy, etc.)



36%

SKILLED TRADES

(automotive, cook, cosmetician, etc.)



28%

ENGINEERING

(civil, electrical, chemical, etc.)



22%

MATH

(accountant, economist, etc.)



39%

ENTREPRENEUR

PERCEPTIONS OF STEM WORK

If students are driven by their values and interests in career choices, do they associate what's important to them with STEM-related work settings?

Respondents were asked to associate specific tasks with STEM fields. The linkages students make between various work settings and what goes on there can create an impression – sometimes incomplete – of what certain careers involve.

To provide a point of comparison around Canadian teen attitudes, it's instructive to look at the results of a U.K. survey of year 9 students (Canada's Grade 9), conducted by the Engineering Technology Board (ETB)¹. This is one of the few surveys in other countries to look at youth perception of STEM careers. ETB is a national partnership between industry, the engineering profession, and education. The range of attitudes, in both countries, underscores the need to clarify the reality of the workplace.

Do we have a problem? We know that the opportunity to solve problems in a job is of high importance to students. STEM jobs are an ideal fit, as they are at the centre of discovery, innovation, and experimentation. About seven in 10 students say problem-solving goes on in science, engineering, and technology jobs. However, students are more likely to associate engineering jobs with machinery than with problem-solving.

Getting the right idea. About 70 per cent of Canadian teens say that developing new ideas happens in science, engineering, and technology jobs. That's far more than the responses in the U.K. study, which found that just 44 per cent of teens associate developing new ideas with science jobs, and 49 per cent associate it with engineering jobs.

By design. Many more Canadian teens than U.K. teens say that designing things happens in science jobs (37 per cent in Canada vs. 11 per cent in the UK), and in engineering jobs (81 per cent versus 37 per cent). In contrast, more U.K. teens than Canadian teens say that designing things happens in technology jobs (91 per cent versus 59 per cent).

Just the facts. Does discovery of new facts and information happen in STEM jobs? Absolutely in science, say 79 per cent of Canadian teens (the UK percentage is even higher, 89 per cent), but a little less so in technology (58 per cent) and engineering (44 per cent).

Office space? Here are major differences in perception about whether certain jobs involve working in an office (61 per cent of Canadian youth say this about engineering; 37 per cent about science) or working with computers (53 per cent say this about science; 89 per cent about technology jobs). These outlooks narrow the view of opportunities. For instance, technology is seen as working with computers in an office, whereas the majority of

technologists work on a variety of instruments in diverse settings, from a hospital to an oil field.

Interesting times. Students, for the most part, think that science is fun – and fun drives interest. Almost two-thirds of students (64 per cent) think that science-related jobs would offer an interesting work environment. A little less (56 per cent) say the same about technology jobs. And less still (53 per cent) say this about engineering-related jobs.

The challenge is to help more students see that STEM-related careers offer stimulating work environments, and to clarify what actually goes on in these jobs. Perhaps with a greater understanding students would see how these jobs match the values they already place on a career.

Perceptions of what goes on in STEM		 Canada	 UK
	Developing new ideas happens in science and engineering jobs	70%	44% (science) 49% (engineering)
	Designing things happens in science jobs	37%	11%
	Discovering new facts and information happens in science	79%	89%
	Working in an interesting environment happens in science	64%	69%
	Designing things happens in engineering jobs	81%	37%
	Discovering new facts and information happens in engineering	44%	24%
	Working in an interesting environment happens in engineering	54%	46%
	Designing things happens in technology jobs	59%	91%
	Discovering new facts and information happens in technology	58%	30%
	Working in an interesting environment happens in technology	56%	47%

1. Engineering Technology Board (2005) Factors Influencing Year 9 Career Choices. Accessed at www.engineeringuk.com.

DO PARENTS OR TEACHERS KNOW BEST?

Respondents say that parents (76 per cent) have had the greatest influence on students' educational direction up to the teenage years, with teachers a distant second (24 per cent). That was also true in the 2011 Angus Reid Survey for Let's Talk Science and Amgen Canada (82 per cent versus 29 per cent then).

As students try to decide what to do when they leave high school, parents remain a highly useful source of information (94 per cent), along with people who actually work in the field of interest (96 per cent). Exposure to people they know and trust, or who have firsthand job experience, is critical.

When deciding on post-secondary paths, students are more likely to find internet searches and websites about specific jobs more useful (both 89 per cent) than teachers (84 per cent) or guidance counsellors (80 per cent).

Given the high influence of parents on their children's paths, their own perceptions about STEM education are vital. As the first Spotlight on Science Learning report noted, parents recognize the importance of science in their lives, and 62 per cent believe jobs in Canada will require more training in science during the next decade.

Three-quarters of parents agree that it's very important to be involved in their children's education, yet only 23 per cent take the time to discuss their children's goals. More discussions between parents and teens about academic and career options could be a positive force for change.





STRONG PLANS FOR POST-SECONDARY STUDIES

Just over six in 10 students surveyed plan to attend university (39 per cent) or college/polytechnic (22 per cent). Another 6 per cent want to take an apprenticeship. Sixteen per cent plan to pursue at least two of these three options. Only 13 per cent are not sure about post-secondary plans, and a few (4 per cent) plan to go directly to work after high school.

A strong majority of youth (92 per cent) are thinking about their career a lot (37 per cent) or sometimes (55 per cent). These percentages rise with age, but even 85 per cent of 13-year-olds are thinking about what they will do after school. With this high level of thinking for post-secondary life, it's important to pique interests and plan at a young age. Students need to be aware of all opportunities, and be clear about the path required, at the time when they are making these major decisions.

This awareness is sometimes lacking. For example, 60 per cent of students believe they need a university degree for STEM careers. This is true in many cases, but hardly all. Students require more education about the vast number of STEM-related careers that require a college certificate or diploma, and about the skilled trades.



THE GENDER GAP

Measuring the attitudes and interests of Canadian teens reveals frequent and significant differences between male and female students. When asked about what they want to do, what they're looking for from a job, and their post-secondary path, we see variations in responses:

Satisfaction guaranteed ... sort of.

Can women find great satisfaction in a science, technology, engineering or math-related career? Eighty-four per cent of all respondents said yes; however, there is a nine-point gap between men (79 per cent) and women (88 per cent) who agreed.

It's a man's world.

Overall, almost one in five Canadian teens (19 per cent) still feel that careers in engineering and/or technology are best suited to men.

Do job prospects matter?

While almost one-third of male students (31 per cent) would be more likely to choose a STEM-related field if most jobs were there, only 25 per cent of female students said the same.

Focus on the future.

Slightly more female students (94 per cent) than male students (89 per cent) think about the work they would like to do when they finish their schooling. The gap is wider (10 percentage points) among students who think about it a lot – 42 per cent of female students and 32 per cent of male students. More female students than male (76 per cent versus 70 per cent) also agree that a good understanding of science will improve their prospects, regardless of their career.

Within STEM itself, male and female students are also drawn in very different degrees to certain sectors, in some cases reinforcing stereotypes (e.g. women in science, men in engineering). These preferences are evident too in high school optional course selections. Interest in the university track also shows a gender difference – while almost half of female students say they’re headed to university, only one-third of male students say the same. The following charts highlight the responses according to gender:

1. Work activities

What type of work would you like to do?	Male students	Female students
Help people	74%	85%
Use communication skills	65%	75%
Work with hands	69%	60%
Be responsible for other people	47%	61%
Create new products	57%	42%
Use math/calculate things	51%	38%
Work with animals	33%	54%
Work with machinery	54%	14%
Design buildings/bridges/cars	40%	18%

2. Work settings

How interested are you in the following?	Male students	Female students
Professional job (e.g. lawyer, doctor, teacher)	52%	67%
Work on my own	70%	61%
Own my own business	51%	44%
Be an entrepreneur	44%	35%
Technology	61%	29%
Science	37%	44%
Skilled trades	41%	32%
Engineering	38%	16%
Mathematics	25%	19%
Work in a lab	28%	38%
Care for sick people	17%	40%

3. Optional high school courses

In my last year of high school, I really want to study:	Male students	Female students
Math	34%	30%
Biology	24%	40%
Chemistry	24%	31%
Physics	26%	25%
Environmental sciences	22%	27%
ICT/information technology	40%	19%
Arts – music, dance, visual or graphic arts	21%	48%
Humanities – history, geography	21%	28%
English	30%	51%

4. Post-secondary plans

After graduating high school, I intend to:	Male students	Female students
Attend university	33%	46%
Attend college/polytechnic	22%	22%
Take an apprenticeship	9%	3%
At least two of the above	17%	15%
Go directly to work	5%	3%

I (USED TO) LOVE SCIENCE

At age 13, 79 per cent of students say they have a good understanding that STEM is important for adult life. At 17 years of age, 66 per cent agree with this. Interest in taking optional STEM-related courses actually rises in high school, peaking at age 15...and then it falls as the decision time to adopt or abandon courses approaches.

1. Does the fun have to end?

Question	13	14	15	16	17
Science is fun	79%	70%	77%	68%	68%
Science is boring	30%	36%	31%	34%	39%
I enjoy science courses	74%	70%	72%	68%	63%
I don't understand where science leads, so it's of little interest	29%	28%	31%	28%	36%
No obstacles would prevent me from studying STEM	30%	20%	23%	19%	19%

Age variations in responses are also revealing. Most students have a natural love of science. At 13 years of age, 79 per cent call science fun and three-quarters enjoy science courses. By the end of high school, far fewer students describe science as fun, and more than one in three say they have little interest in it because they don't know where science can lead.

2. Closing the door on post-secondary plans

Interest in taking science at a post-secondary level	13	14	15	16	17
A lot	24%	23%	23%	20%	23%
Some	35%	34%	36%	36%	24%
Not much	32%	31%	26%	29%	28%
No interest at all	9%	12%	14%	15%	25%

With students drawing less enjoyment from science, and many failing to see how it connects to a future career, it's no surprise that a growing percentage of students become definitive about their lack of interest. At age 13, only one in 10 students say they have no interest at all in taking science at a post-secondary level. By age 17, one in four says the same.

3. Falling interest in STEM careers

Interest levels in the following careers	13	14	15	16	17
Mathematics	24%	20%	22%	23%	21%
Science	41%	42%	45%	39%	31%
Technology	50%	45%	46%	45%	43%
Engineering	30%	25%	31%	28%	23%
Skilled trades	37%	41%	31%	33%	43%

As previous surveys have also shown, the interest levels that students have in various STEM fields drops in the last year of high school compared to the first. One exception – interest in the skilled trades remains relatively stable.





TAKING ACTION

Students who have a quality STEM education will be highly employable – in STEM-related jobs and sectors, in fields that might not be directly or obviously STEM-related, and in occupations they might not envision or that may not even exist yet.

Canada has a high percentage of teens who want to make a difference, help people, make a contribution, solve problems, and build their own ventures. Yet students don't always understand what this work looks like, and how STEM learning supports the types of roles and careers they value.

Today's generation is one that can be innovators. The challenge is helping students – boys and girls alike, and all ages – realize that STEM offers an avenue to build the skills that they already want to use, and that they can apply in any field they pursue.

Much of the foundation is there – a belief that science is fun, and a high awareness of the importance of STEM for the future. If these beliefs can be nurtured by educators, parents and other societal influences, then students will find a bigger world of opportunities ahead, for their well-being and for Canada's.

MOVING THE NEEDLE

What can we do to move the needle on science learning, and ultimately have more students pursuing STEM courses in high school and beyond? We return to a set of eight recommendations from the initial *Spotlight on Science Learning (2012)* report, which remain valid.

1. Establish a national forum for ongoing multi-stakeholder discussion related to STEM talent development.
2. Support and scale effective STEM teaching and learning programs, in and outside of school, to: revitalize young people's love of science with compelling programming; and help youth see how science education is relevant, i.e. it will serve them well no matter what career they envision (and in life, too).
3. Establish or improve tracking and reporting systems required for effective data collection, around participation in high-school STEM programs, and post-secondary applications, registrations and graduation in STEM programs.
4. Build better connections between job forecasts and STEM learning demands – and make this information available to schools in a relevant way – so youth and parents are more aware of future employment opportunities.
5. Build awareness about the breadth of career opportunities that are available with STEM learning.
6. Conduct a system-wide review of STEM curricula across Canada to develop programs that increase interest and participation in STEM studies (optional high-school courses and post-secondary programs).
7. Assess the factors that affect the capacity of universities and colleges to support and maintain STEM studies.
8. Determine a suite of benchmarks, with public input, that can be used to monitor the state of the science culture in Canada. This would augment the 2014 report on the topic published by the Council of Canadian Academies (*Science Culture: Where Canada Stands*).



Achieving greater success in STEM learning is a shared responsibility, requiring a collective call to action.

Youth

Take responsibility for your learning and actively seek connections between science taught in school and everyday life. Ask your teachers and school leadership for the resources needed to do science effectively. Seek information about jobs that benefit from STEM learning.

Parents

Participate in STEM activities with your children. Talk to them about the importance of pursuing STEM courses to the end of high school to keep their options open, and support them in those studies. Seek out information to help them realize the breadth of jobs that are available to people with STEM backgrounds.

K-12 educators

Make STEM learning relevant to students by providing contexts that are meaningful to them. Increase the focus on the nature and processes of science to help students develop competencies needed for 21st-century academic and workplace success.

Post-secondary educators

Make STEM learning more relevant for your students and offer more interdisciplinary programs that link that learning with other non-STEM fields (e.g. business and public policy studies). Help students make the connection between STEM learning and jobs. Support elementary and high school educators as they prepare students for post-secondary success.

Non-profit STEM learning and outreach organizations

Offer engaging programs for all ages. Ensure that programs are available outside formal education systems, as well as in partnership with schools. Provide ample opportunities for volunteer role models to participate.

Industry

Clarify the connection between the outcomes of STEM learning and jobs. Support STEM learning throughout the full learning continuum. Offer co-op positions and support apprenticeships. As an investment in our future, support employees (with resources and time) who are making a difference to STEM learning.

Governments

Support and scale effective STEM-learning practices. Review school curricula to ensure that programs match desired outcomes. Resource schools, universities, colleges and non-profit organizations appropriately to support STEM learning and outreach efforts.

MISSION

Let's Talk Science motivates and empowers youth to fulfill their potential and prepare for their future careers and roles as citizens. Let's Talk Science supports learning and skill development using science, technology, engineering and mathematics (STEM). Spotlight on Science Learning: Shaping Tomorrow's Workforce is the latest research report from Let's Talk Science, made possible by Amgen Canada.

For more information about Let's Talk Science, please visit www.letstalkscience.ca.

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