

FINANCIAL COSTS: THERE'S A BIG PRICE TO PAY

One of the major costs of students disengaging from STEM courses at the secondary school level is the financial cost (to students/parents, taxpayers, post-secondary institutions) of re-engaging, or making up, secondary school level math, science and technology courses later on.

20,000

The number of Ontario students who return each year for a fifth year of secondary school, after meeting graduation requirements⁴.

Leah, a 19 year-old living in Ontario, had enough credits to graduate from secondary school. She applied for a vet tech program at a community college and learned that she needed a senior level science course for admission. She changed her major to police services and learned that she needed senior math for admission so she returned to do a 'victory lap' and upgrade other courses as well.

Leah represents one of 20,000 Ontario students returning for a fifth year of secondary school after meeting graduation requirements. Had Leah completed secondary school with senior level science and math credits in 4 years, she could have worked full-time for one year to save money to put towards her education and living expenses or she could have started post-secondary studies sooner.

\$2,790

The average cost of one semester of undergraduate university tuition or two semesters of college courses⁵.

Andrea lives in British Columbia where she is the science and medicine manager at Canadian Cycling – but her path to get there was not an easy one. She dropped chemistry after Grade 10 and physics after Grade 11 because she felt science was only taught as 'black and white' and she wanted to be more creative than that. At university, she chose to pursue arts versus sciences for the same reason and spent her first year taking a variety of arts courses. Between first and second year Andrea discovered scuba diving and decided to pursue sciences instead of arts. Upon returning for her second year,

Andrea enrolled in all science courses trying to make up for the year she had lost. Lacking the necessary science background, Andrea struggled with some of her science courses and as a result had to attend summer school, re-take a few of her courses and was burdened with an overloaded course schedule. All of which meant additional costs. Andrea believes that if science was taught as the art that it is, rather than as facts to memorize, a lot more bright and creative students would stay in the sciences.

\$6,111 to \$10,800 per student

The institutional cost for each first-year Canadian college or university student who fails to progress to the second year⁶.

Blair from Ontario began her career as an early learning resource teacher. Even though she loved her job, Blair felt unrewarded for her efforts and that she had more to offer. After five years of teaching, Blair decided to switch her career to nursing, where she could continue working with children and be exposed to more job opportunities. Unfortunately, because Blair's high school required only one science course to graduate, she did not have all the necessary prerequisites to enroll into a nursing program.

Blair quit her job and signed up for a one-year pre-nursing college program. She was not accepted as she did not have

enough of a science background. Blair then turned to the States for a similar kind of program, but had to withdraw for the same reason. Two years and \$10,000 later, Blair begins a six-month accelerated PSW program for another \$6,000, in hopes it will give her the practical experience to get into nursing. Blair is currently on the waitlist for a nursing program, with another four years of study and a hefty tuition fee ahead of her. Blair strongly believes that science should be made mandatory in all years of high school, and wishes there was more transparency between educators, students, and community about the kinds of educational programs available.



\$12,557

The average annual expenditure per student in publically funded schools (from Kindergarten to Grade 12) in Canada from 2011 to 2012 (ranging from \$11,360 in PEI to \$22,202 in the Northwest Territories)⁷.

Education is the most important investment a nation can make to secure its future. Do we currently have the right mix of pathways and learning opportunities in place to ensure that Canadian youth will be prepared for tomorrow's economy? If not, what needs to be done and how can we achieve change? With the growing importance of STEM for Canada's future, what can—and should—we be doing to ensure better participation by Canadian youth?

While access to public school programs and adult basic education courses across Canada are free to the student, the cost covered by taxpayers at the local, provincial/territorial

and federal levels represents a significant investment in Canada's future workforce and citizenry. Further, while post-secondary education and training programs are not free to the user, taxpayer subsidies help keep access to education within reach for many Canadian secondary school graduates.

In 2012, Canada committed 5.5 per cent of GDP towards education at the primary, secondary and post-secondary levels. In 2008/2009, total expenditures for Canada's public elementary and secondary schools amounted to more than \$50 billion and post-secondary education to more than \$39 billion.

Kevin Lynch

"The three customers [of the public education system] are employers, the students themselves and society in general. And, actually, those are the three we don't engage well in planning. And then we wonder why we're not getting the right outcomes."

Daniel Muzyka

"Are we selling the younger generation on the importance of the knowledge, aptitude, skills and attitudes inherent in science and math education? For instance, I believe that our math curriculum and teaching has often failed students at an early stage—not impressing upon them the value and need for ongoing mathematics education. The consequence is that they reduce their options for learning and employment in areas related to science, engineering, technology and some trades."

BOX COLOUR KEY:

- STEM career
- Skilled Trade
- Requires STEM literacy/skills
- STEM background not required, but skills may be beneficial

Table 1:
CAREER OPPORTUNITY MATRIX

1. Top-paying jobs in Canada	2. Top starting salaries	3. Canada's top jobs	4. U.S. top jobs	5. Jobs of the future	6. Career satisfaction	7. Recession-proof careers	8. Most respected occupations
Specialist physicians \$179,514	Doctor \$100,000	Oil and gas drilling supervisor	Dentist	Mining, oil & gas supervisor	Real estate agent	Computer software engineer	Nurses/doctors (tied)
Judge \$178,053	Dentist \$90,000	Head nurse and health care manager	Registered nurse	Pilot	Senior quality assurance engineer	Veterinarian	Farmers
Senior managers – communications, financial and other business services \$162,376	Petroleum engineer \$86,200	Petroleum engineer	Pharmacist	College instructor	Senior sales representative	Financial analyst	Scientists
Senior managers of goods production, construction, utilities, transportation \$160,947	Data security analyst \$83,250	Electrical and telecommunications contractor	Computer systems analyst	Railway & transportation supervisor	Construction superintendent	Database administrator	Veterinarians
General practitioner and family physician \$132,615	Lawyer (first-year associate, large firm) \$81,750	School principal and administrator	Physician	Power systems operator	Senior application developer	Dental hygienist	Dentists
Dentist \$131,552	Website developer/user experience designer \$80,000	Lawyer	Database administrator	Health care managers	Logistics manager	Forensic science technician	Teachers
Senior managers of trade, broadcasting and other services \$124,080	Mobile applications developer \$72,500	Real estate and financial manager	Software developer	Education administrator	Construction manager	Mental health counsellor	Engineers
Lawyer \$123,632	Chemical engineer \$72,407	Senior government manager	Physical therapist	Head nurse	Executive administration assistant	Performance makeup artist	Military officers
Engineering manager \$113,403	Financial controller \$70,000	Chemical engineer	Web Developer	Railway conductor & brakemen/women	Network engineer	Skin care Specialist	Architects
Credit, investment, banking manager \$101,845	Lawyer (first-year associate, midsize firm) \$64,000	Aerospace engineer	Dental hygienist	Dental hygienist	Assistant controller	Personal and home care aide	Police officers

- www.cric.ca "The Top Highest-Paying Jobs in Canada." 2012 Statistics Canada data of top 10 occupations that earn average salaries amounting to more than \$100,000.
- www.globeandmail.com "Top 20 starting salaries" August, 2012. Average starting salaries for some of the top-paying jobs in Canada, based on figures from jobsites, Canadian Association of Career Educators and Employers, and industry groups.
- www.canadianbusiness.com "Canada's top 50 jobs. 2013 edition." Statistics Canada and Human Resources and Skills Development Canada data and ranked on job growth, projected job demand, median wage and change in compensation.
- www.money.usnews.com "The 100 Best Jobs. 2013." Data from overall best jobs lists and ranked on projected job growth over next 10 years, median salary, job prospects, employment rate, stress level and work-life balance.
- www.canadianbusiness.com "Canada's top 50 jobs. 2013 edition." Statistics

- Canada and Human Resources and Skills Development Canada data and ranked on projected demand in 2020.
- www.forbes.com "The Happiest and Unhappiest Jobs in America." On-line job site Careerbliss.com analysis of employee-generated reviews evaluating 10 factors contributing to workplace happiness: relationship with boss/co-workers, work environment, job resources, compensation, growth opportunities, company culture, company reputation, daily tasks and control over the work on a daily basis.
- www.businessinsider.com "The Top 10 Recession-Proof Jobs. 2011." Based on US labour market trends, all careers are high-projected growth rates (28-51%) from 2010-2016, ranked here by median pay.
- www.angus-reid.com "Nurses, Doctors Are Most Respected Jobs in Canada, U.S. and Britain." Public opinion poll of 25 professions conducted in August 2012.

People in STEM fields can earn 26 per cent more money on average and be less likely to experience job loss. The STEM degree-holders also tend to enjoy higher earnings overall, regardless of whether they work in STEM or non-STEM occupations.

US Commerce Department, 2011.

Increased awareness of career options along with experience, skill set and required education and training must start early in a student's educational path. Science, technology and innovation are rapidly changing the employment landscape in Canada and internationally; there will be jobs and careers in high demand 10 years from now that don't even exist today—but you can bet they will likely require a strong foundation in STEM learning!

Jobs of the future will require a balance of analytical skills, an understanding of science and technology and a great deal of creativity. Encouraging students to graduate with a broad, balanced secondary school education—which includes science, math and technology courses—will keep their options open, increase their opportunities in the job markets of the future (in Canada and internationally) and optimally prepare them for the life-long learning required in a changing society.

“Involvement in STEM gives people literacy, empowerment and economic freedom to shape their world and everyday life.”⁹

Many teenagers choose their post-secondary path without realizing the magnitude of the decision they're making until they are in their mid-20s. Saying “no” to non-compulsory math, science and technology courses in secondary school limits options and the flexibility to change career paths later on. While it is easy to see that you need science to be a research scientist, math to be a mathematician or engineer, or technology to be a technologist, there are a number of surprising training and education programs that not only require senior secondary school STEM credits as prerequisites for admission but also include STEM learning and skill development in their course of study (see Table 2).

Table 2:
SURPRISING STEM REQUIREMENTS FOR PROGRAMS AND CAREERS¹⁰

Program/Career	Course Requirements/ Prerequisites	Also Known As...
Acting for film and television	Introduction to arts and science	Science
	Electronic media	Computer technology
Dance	Anatomy	Biology
Chef/baker	Nutrition	Biology and chemistry
	Math foundations and hospitality math	Mathematics
	Fermentation theory and application	Chemistry
Carpenter	Estimating and planning	Mathematics
Welder	Trade math	Mathematics
	Production and properties of metals	Chemistry
Esthetician	Anatomy and physiology	Biology
	Diseases/pharmacology	Biology and chemistry
	Epidemiology	Mathematics
	Nutrition	Biology and chemistry
Journalism	Quantitative research methods	Science and mathematics
	Digital design	Computer technology
Fitness/health promotion	Anatomy and physiology	Biology
	Nutrition	Biology and chemistry
	Business management	Mathematics and computer technology
Industrial design	2D/3D modeling	Mathematics
	Quantitative research methods	Science and mathematics
	Computer aided design	Computer technology
Crime scene investigator	DNA analysis	Biology and chemistry
Agriculture/agribusiness	Genetics	Biology
	Nutrition	Biology and chemistry
	Plant and soil science	Biology and chemistry
	Farm management	Science, mathematics and computer technology
Computer animation	Anatomy and biomechanics	Biology and physics
	Computer science	Computer technology
Early childhood education	Health, safety and nutrition	Science
Business administration/ retail management	Mathematics of finance	Mathematics
	Accounting	Mathematics
	Business economics	Mathematics
Weather forecaster	Understanding weather	Science
	Climate change	Science
	Atmospheric chemistry	Chemistry
	Cloud physics	Physics