STEM MATTERS

An Overview of STEM Educational Attainment, Employment and Skill Needs in Peel and Halton Regions

Science Technology Engineering Math

Contents

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Executive Summary

Skills and education relating to Science, Technology, Engineering, and Mathematics (STEM) are increasingly seen as the key facilitators of innovation and economic growth. According to OECD reports, its member countries are seeking to expand the rate of STEM education among their populations, or to attract highly qualified immigrants with these degrees. In Canada, employers are looking for numeracy skills and the ability to learn new technology rapidly in candidates for both STEM and non-STEM positions. Various research on Canadian labour market projects that the demand for STEM skills will significantly increase as automation and AI become more prevalent.

In the light of such trends, Peel Halton Local Employment Council and its community partners designed and developed this research study to facilitate a conversation about STEM education and the STEM labour market in Peel and Halton regions. This report profiles the presence of STEM-educated residents in Peel and Halton Regions, and analyzes the labour market outcomes of individuals with STEM education in the Greater Toronto Area.

This report provides a general landscape of STEM education and STEM labour market in Peel and Halton regions. According to the results of this research, there is not a shortage of STEM-educated individuals and STEM occupations, although employers cite challenges in finding qualified STEM workers. In particular, employers cite current and anticipated skill shortages relating to occupations in mechanical engineering, bioengineering, artificial intelligence and blockchain. In order to ensure an adequate supply of STEM graduates in the future, employers feel that students should be introduced earlier to STEM studies, and that more females should be recruited into STEM disciplines.

There is consensus among employers that the quality and quantity of STEM candidates has improved in the past few years; however, they note that STEM candidates often lack soft skills. One of the biggest challenges for employers is a lack of work experience among job candidates. Immigrant populations make up two-thirds of STEM graduates in the Toronto CMA, which helps to boost the area's low level of STEM graduates in comparison to international average. However, Immigrants with degrees from outside Canada are assessed by employers as having somewhat lower skills compared to individuals with Canadian degrees, particularly in soft skills.

With these findings in mind, the study proposes the following recommendations:

1. It is important to cultivate interest for STEM education at a younger age by integrating STEM into the elementary school curriculum. It is also very important to encourage more women to get into STEM fields through special incentives.
2. Integrate foreign-trained STEM professionals into the Canadian labour market with effective employment support programs that are tailored for internationally trained immigrants.
3. Fill skill gaps between the STEM education curriculum and current skills demanded by employers through regular collaboration between post-secondary institutions and various industries.
4. Promote a workplace learning experience by incorporating mandatory co-op or internship components into STEM post-secondary curriculums.

Background

An economy's strength is often determined by its ability to adjust to change, including technological change. Every era has had to manage some form of transformation, from the introduction of steam power to the computerization of almost everything. This current period of economic development is defined by a surge of innovation related to automation, Artificial Intelligence and blockchain, and the implications for future economic prosperity and social challenges. Labour markets face challenges adapting to the nature and rapid pace of technological change. The disciplines of Science, Technology, Engineering, and Mathematics (STEM) and skills acquired from them fosters critical thinking and increases science and numerical literacy, creating a galvanizing environment for innovation.[1] As a result, STEM education and skills have become pertinent in preparing for and adapting to the further implications of technological advancement and innovation.

STEM education includes disciplines in life sciences (e.g. biology, medicine), physical sciences (e.g. chemistry, physics), technology (e.g. computer science, information technology), engineering, mathematics, and statistics.[2] Likewise, STEM occupations in the workplace include scientists (e.g. chemists, physicists and biologists), engineers (e.g. civil, mechanical, electrical, industrial), mathematicians, statisticians, computer systems professionals (e.g. information systems analysts, data administrators, software engineers, computer programmers, web designers), and the broad range of technicians and technologists who perform support functions.[3] "STEM skills" often refer to the set of core knowledge, skills, competencies, and capacities acquired from STEM education, and subsequently required for STEM occupations.[4]

According to the OECD[5], enrolment in university-level STEM programs across its member countries averages around 27% (approximately 16% in engineering, construction and manufacturing technologies; 6% in natural sciences, mathematics and statistics; and 5% in information and communications technologies). In general, these graduates from STEM-related fields enjoy higher employment rates, reflecting the demands of an increasingly innovation-driven economy. The OECD notes that many countries are seeking to expand the rate of STEM education among their populations, or to attract highly qualified immigrants with these degrees.

Although there is consensus around the importance of STEM education, there are elements that generate substantial debate. Some sources argue that Canadian schools are not training enough STEM students to meet the market demand, while others argue that STEM graduates are having a difficult time entering the workforce due to over supply. A Council of Canadian Academies (CCA) report[6] found that there is no current disparity between STEM skills on either supply or demand side. Evidently, Canada's productivity problem is not due to a shortage of advanced STEM skills, the report emphasizes the importance of investing in STEM literacy to develop a skilled society that is capable of responding to an ever-changing labour market.

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[1] Darcy Hango, "Gender Differences in Science, Technology, Engineering, Mathematics and Computer Science (STEM) Programs at University." Statistics Canada (2013)

[2] "Student perspective of STEM education in Canada" Science & Policy Exchange (2016)

[3] National Occupational Classifications, Statistics Canada

[4] The Expert Panel On Stem Skills For The Future "Some Assembly Required: Stem Skills And Canada's Economic Productivity." Council of Canadian Academies (2015)

[5] The Organisation for Economic Cooperation and Development, the major data collection and analysis body for the advanced market countries, currently with 36 members. The information for this paragraph is all drawn from OECD, Education at a Glance 2017.

[6] The Expert Panel On Stem Skills For The Future "Some Assembly Required: Stem Skills And Canada's Economic Productivity." Council of Canadian Academies (2015)

Higher Education Quality of Ontario (HEQCO) published several studies that validate the findings from the CCA report. College and university graduates have the right skills for the labour market, however, employers tend to focus more on experience rather than skills.[7] Both studies point out that there are structural barriers that hinder new STEM graduates from properly displaying their skills delaying their entry to the workforce. For example, undergraduate transcripts only indicate the grades achieved, but do not convey any information to employers about students' skill levels. Moreover, students are less aware of the type of skills that they have developed while completing their degrees and are less able to communicate this to potential employers. Some characterize this as an awareness gap or skills gap.[8]

Science & Policy Exchange, a Canadian non-profit organization focused on the intersection of science and policy, conducted a Focus Group with STEM students in 2015.[9] The students felt that their STEM courses were "over-reliant on rote memorization", and did not provide enough opportunity to develop critical skills that are important for employment, such as communication and working independently. The students commented that they did not receive any information on the career options available to them once they graduate or about the skill sets they needed to obtain and retain employment in their fields of study.

Many STEM graduates often end up not working in their fields of study, and some even face underemployment. According to the 2011 National Household Survey[10], 30% of individuals in Ontario with engineering degrees worked as engineering professionals, whereas in Alberta the rate is 46%. The Ontario Society of Professional Engineers reckons that approximately two-thirds of those with engineering degrees in Ontario were not employed in engineering fields and, in some cases, were working in positions that did not require a university degree.[11]

On the demand side, researchers project that there will be a large and growing demand for STEM graduates in the labour market, especially in engineering fields, to replace baby boomers as they retire.[12] However, new technologies are demanding new skills as the economy transitions from a knowledge-based to a wisdom-based economy. Canadian employers note that while business literacy is important, candidates have poor numeracy skills. A Statistics Canada study reveals that Canadians rank below OECD average on numeracy.[13] Technological advancements, such as automation and AI, are not only increasing employers' expectations that new graduates have the ability to learn complex information rapidly, but are also putting entry-level positions at risk.[14]

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[7]Refling, E., & Borwein, S. "Bridging the Divide, Part II: What Canadian Job Ads Produced". Higher Education Quality Council of Ontario (2014).

[8]Harrison, A. "Skills, Competencies and Credentials". Higher Education Quality Council of Ontario (2017).

[9]"Student perspective of STEM education in Canada" Science & Policy Exchange (2016)

[10]Statistics Canada, 2011 National Household Survey: Data Tables, 99-012-X2011056, Ottawa, Ont.: Statistics Canada, 2013

[11]"Crisis in Ontario's Engineering Labour Market: Underemployment Among Ontario's Engineering-Degree Holders" Ontario society of Professional Engineers (2015)

[12]Prism Economics and Analysis. "Labour Market Trends and Outlooks for Regulated Professions in Ontario. Higher Education Quality Council of Ontario (2016).

[13]"Skills for an Automated Future" Canadian Chamber of Commerce (2018).

[14]"Navigating Change: 2018 Business Council Skills Survey" Business Council of Canada (2018)

Purpose

The supply of and demand for STEM graduates is a complex issue that needs to be better understood. Peel Halton Local Employment Council designed and developed this research study in partnership with other community stakeholders to facilitate a conversation about STEM education and the STEM labour market in Peel and Halton regions.

This report investigates the current and emerging supply and demand in the STEM field in Peel and Halton Regions. Additionally, the report aims to investigate the skills related to STEM occupations that are highly demanded by local employers. This project was undertaken after the Ministry of Training, Colleges and Universities announced that Ryerson University in partnership with Sheridan College is opening a campus in Brampton (Peel Region) and Wilfrid Laurier University in partnership with Conestoga College is opening a campus in Milton (Halton Region).

The main objectives of the research are:

- To develop a profile of STEM-educated residents in Peel and Halton Regions;
- To analyze the labour market outcomes of individuals with STEM education in the Greater Toronto Area;
- To survey the needs of Peel and Halton employers in relation to STEM occupations;
- To provide recommendations to improve the match between individuals with STEM education and STEM occupations in Peel and Halton.
- This research will also provide useful background information to inform the future university projects in Brampton and Milton.

Methodology

To investigate the supply and demand of STEM educated individuals in Peel and Halton, this study implemented a multi-method research approach using both secondary data analysis and the collection of primary quantitative and qualitative data from Peel, Halton, and Toronto Census Metropolitan Area (CMA).

Secondary data was collected from Statistics Canada, specifically from the 2016 Census. Raw data sets were identified based on their classifications, including age, sex, educational attainment, labour force status, major field of study, occupation, income, immigration status, period of immigration, visible minority status, and location of study. In order to illustrate obvious comparisons, most charts have the same constant variables—Geographical location (Peel, Halton, or Toronto CMA) and levels of education (Apprenticeship, College, Bachelor, and Above Bachelor). Comparisons were done by filtering the raw data by keeping the two variables constant at all times and selecting two or more classifications as factors to compare.

The project encountered some limitations in collecting and analysing the secondary data. Although there was some important data available at the Peel and Halton level, most of the data available through Statistics Canada is at the Toronto CMA level. This is a common challenge related to local labour market data in Ontario, it is not unique to this study or to Peel and Halton regions. Each region has its own unique workforce characteristics in terms of demographics, educational level, major industries, and geographical situation and the lack of region specific data could result in an incomplete portrait of the needs and challenges of the local labour market. In order to validate and augment the results from the secondary data analysis, an online survey was conducted with local employers in Peel and Halton to collect primary data.

The online survey was developed using Survey Monkey, and it was administered electronically through various channels such as email campaigns with support from community partners, the Peel Halton LEPC website, and social media, such as LinkedIn, Facebook, and Twitter. In total, the survey received 88 responses, and after eliminating those surveys with no substantive answers, 65 responses were eventually used for the analysis. The average number of responses per question was 49.

Despite vigorous efforts at outreach, the online survey did not generate the expected number of responses. This could be due to timing in the summer season, with many community partners and employers being on vacation. Another reason could be that the survey was targeted to employers with STEM employees; many employers may have found the focus on STEM positions irrelevant to their industry. There was a follow-up email explaining that many occupations, such as accountant and market research analysts were also considered STEM and a few more responses were received after that email. However, the sample size is still large enough to have statistical significance.

The survey asked respondents to identify their sector, geographical location, and size; at the end of the survey, the respondents were given the option to leave their contact information. Based on the information that respondents provided, their industry classifications were checked and corrected if necessary. Many respondents dropped out towards the end of the survey and did not provide contact information; however, their unanswered questions did not affect survey results significantly.

There were some other biases that may have arisen as a result of survey dissemination strategy. The survey was distributed through community partners and to employers that are connected to the Peel Halton Workforce Development Group. Although the survey was promoted on the organization's website and on social media, most of the responses came from these regular contacts and links sent out by community partners. Thus, the sample size was limited to employers that have connections with the organization and its community partners.

In order to contextualize the survey results and get an in-depth understanding of the concerns that were identified by the employers, a set of interviews were conducted with four industry experts.[15] The interviews lasted approximately 30-40 minutes and the interviewees answered a set of questions to further explore some of the research and survey results.

[15]See acknowledgement page for the full list of interviewees.

Descriptive Statistics of STEM Degrees and Occupations

This section illustrates some of the significant data regarding STEM degrees and occupations in Peel and Halton, including: number of STEM jobs, distribution of STEM occupations across industries, number of residents with STEM education, number of residents employed in STEM occupations, and average employment income. The categories in each table were strategically chosen to profile variables that generate significant contrasts. The purpose of this section is to analyze available data on Peel and Halton, and profile STEM-educated residents in the Regions.

Identifying STEM occupations

The Council of Canadian Academies (2015) has identified STEM intensive occupations by calculating STEM density for each occupation. STEM density is the proportion of workers employed in the occupation whose highest level of education is in a STEM field. Based on the STEM density, the top 12 STEM intensive occupations are listed in Table 1.1.

On the left side of the table are the formal names of each STEM occupation. On the right side is the abbreviated version of that occupation which will be used in the data tables.

Table 1.1: STEM occupations

Managers in engineering, architecture, science and information systems	STEM managers
Physical science professionals	Phy. science
Life science professionals	Life science
Civil, mechanical, electrical and chemical engineers	Civil, mech., electr. and chem. engineers
Other engineers	Other engineers
Mathematicians, statisticians and actuaries	Math., stat. and actua.
Computer and information systems professionals	Computer and IT
Technical occupations in physical sciences	Techn. in phy. sciences
Technical occupations in civil, mechanical and industrial engineering	Techn. in civil, mech. and indus. Eng.
Technical occupations in electronics and electrical engineering	Techn. in electro. and electri. Eng.
Technical occupations in architecture, drafting, surveying, geomatics and meteorology	Techn. in arch., draft., survey., geom. and mete.
Technical occupations in computer and information systems	Techn. in computer and IT

Toronto CMA residents by field of study, participation and unemployment rates

Table 1.2 compares the number of residents who have a STEM degree versus a non-STEM degree in the Toronto CMA in 2016. It also profiles the participation rate and the unemployment rate for each of the occupations in 2016 (while this is 2016 data, the relative performance by different degree categories does not change much year to year). There are total of 1,274,810 residents in Toronto CMA with a STEM degree, which represents 26% of all residents with a postsecondary education. A large number of STEM degree holders studied engineering and engineering technology (292,910 residents). This is followed by science and science technology (174,085 residents), and mathematics and computer and information (174,085 residents).

For all STEM degree holders, the participation rate is highest for mathematics and computer and information science degree holders (84%); it is also higher than the participation rates for all non-STEM degree holders. The unemployment rate is the lowest for mathematics and computer and information science field and engineering and engineering technology field, which is at 6.1% for both. Even though the participation rate of science and science technology is relatively high among all occupations, the unemployment rate is the highest for this field at 7.1%.

Table 1.2: Total residents with STEM degree, participation rate, unemployment rate, Toronto CMA, 2016

FIELD OF STUDY	Total residents	Participation rate %	Unemployment rate %
STEM	**637,405**	**79.2**	**6.4**
Science and science technology	174,085	75.0	7.1
Engineering and engineering technology	292,910	78.8	6.1
Mathematics and computer and information science	170,410	84.0	6.1
BHASE (non-STEM)	**2,184,605**	**76.9**	**6.2**
Business and administration	644,535	79.8	6.3
Arts and humanities	325,625	74.9	6.9
Social and behavioural sciences	331,050	79.4	6.8
Legal professions and studies	69,370	81.4	5.8
Health care	288,445	74.2	5.5
Education and teaching	143,560	68.1	4.0
Trades, services, natural resources and conservation	382,015	75.8	6.0
Mechanics, architecture, construction, production	191,340	74.5	5.6
Other Trades, services, natural resources and conservation	190,675	77.1	6.4
ALL RESIDENTS (all levels of education)	**4,879,095**	**66.3**	**7.7**

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016263.

Toronto CMA residents by field of study by gender

Table 1.3 displays the field of study of Toronto CMA population by gender. Twice as many men (435,725) have graduated in STEM fields than women (201,685), even though the total number of women with post secondary degrees surpasses that of men (male: 1,346,255; female: 1,475,760), as considerably more women graduate from non-STEM fields.

Table 1.3: Field of study in STEM and BHASE, by gender, Toronto CMA, 2016

FIELD OF STUDY	Male	Female
STEM	**435,725**	**201,685**
Science and science technology	80,165	93,920
Engineering and engineering technology	241,705	51,210
Mathematics and computer and information science	113,855	56,550
BHASE (non-STEM)	**910,530**	**1,274,075**
Business and administration	297,450	347,085
Arts and humanities	126,760	198,860
Social and behavioural sciences	111,990	219,055
Legal professions and studies	26,940	42,430
Health care	60,055	228,390
Education and teaching	29,255	114,305
Trades, services, natural resources and conservation	258,075	123,945
Mechanics, architecture, construction, production	176,005	15,335
Other Trades, services, natural resources and conservation	82,070	108,615
Total - STEM and BHASE (non-STEM)	**1,346,255**	**1,475,760**

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016272.

Toronto CMA residents by field of study and by level of post-secondary attainment

Table 1.4 profiles the level of post-secondary attainment in Toronto CMA for various STEM and non-STEM fields of study. There is a significantly larger number of people studying in non-STEM fields, especially at the apprenticeship and college levels. For example, 14,345 persons completed STEM apprenticeship studies compared to 202,135 persons who completed non-STEM apprenticeship programs. Moreover, 138,180 people studied STEM at the college level versus 706,495 people who studied non-STEM fields at the college level.

Table 1.4: Field of study in STEM and BHASE, by level of post-secondary attainment, Toronto CMA, 2016

FIELD OF STUDY	Apprenticeship	College	Bachelor	Above Bachelor
STEM	**14,345**	**138,180**	**302,975**	**148,495**
Science and science technology	1,325	14,730	99,830	52,080
Engineering and engineering technology	9,890	72,635	129,425	61,790
Mathematics and computer and information science	3,125	50,815	73,715	34,625
BHASE (non-STEM)	**202,135**	**706,495**	**772,785**	**401,905**
Business and administration	19,140	243,085	220,440	124,510
Arts and humanities	9,385	79,435	169,280	50,950
Social and behavioural sciences	6,030	60,330	197,045	55,185
Legal professions and studies	585	23,880	23,895	18,780
Health care	16,540	121,320	60,775	74,050
Education and teaching	1,430	20,125	63,370	49,425
Trades, services, natural resources and conservation	149,025	158,315	37,980	28,995
Mechanics, architecture, construction, production	97,370	69,655	13,485	9,010
Other Trades, services, natural resources and conservation	51,655	88,665	24,495	19,980
Total - STEM and BHASE (non-STEM)	**216,480**	**844,675**	**1,075,760**	**550,400**

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016272.

Toronto CMA residents by field of study and by immigration status

Table 1.5 compares the immigrant and Canadian-born populations by fields of study in both STEM and non-STEM. According to Statistics Canada definitions, immigrant refers to a person who is or has ever been a landed immigrant/permanent resident; and immigration status refers to whether a person is a non-immigrant (Canadian-born), an immigrant or a non-permanent resident.

It is apparent from the numbers that the immigrant population tends to choose STEM fields more often than the Canadian-born population. For example, according to the 2016 data, in the Toronto CMA 425,975 immigrants graduated from STEM fields in comparison to 187,960 Canadian-born.

Table 1.5: Field of study in STEM and BHASE, by immigration status, Toronto CMA, 2016

FIELD OF STUDY	Canadian-born	Immigrants
STEM	**187,960**	**425,975**
Science and science technology	68,545	101,295
Engineering and engineering technology	69,380	212,155
Mathematics and computer and information science	50,030	112,525
BHASE (non-STEM)	**1,043,930**	**1,088,505**
Business and administration	261,950	359,950
Arts and humanities	176,540	142,070
Social and behavioural sciences	186,235	137,910
Legal professions and studies	42,275	25,830
Health care	109,335	172,255
Education and teaching	77,935	63,530
Trades, services, natural resources and conservation	189,655	186,965
Mechanics, architecture, construction, production	85,795	103,055
Other Trades, services, natural resources and conservation	103,865	83,900
Total - STEM and BHASE (non-STEM)	**1,231,890**	**1,514,480**

Statistics Canada - 2016 Census. Catalogue Number 98-400-X2016272.

Toronto CMA residents by field of study, by gender, by immigration status and by location of study

Table 1.6 provides detailed information on gender, immigration status and the location of study for persons with STEM degrees. There are significant differences between Canadian-born and immigrants, and between males and females within the same category. There are also significant differences for immigrants depending on whether their degree is obtained inside or outside Canada. Canadian-born persons with a degree from outside Canada is a small percentage and have been combined with Canadian-born persons with a degree inside Canada.

Table 1.6: Distribution of post-secondary degree holders by field of study, males and females, Canadian-born and immigrants, location of degree, Toronto CMA, 2016

FIELD OF STUDY	Canadian-born		Immigrants				TOTAL
	Degree from anywhere		Degree from inside Canada		Degree from outside Canada		
	Male	Female	Male	Female	Male	Female	
STEM	**4.7%**	**2.1%**	**4.1%**	**1.8%**	**6.4%**	**3.2%**	**22.3%**
Science and science technology	1.1%	1.3%	0.6%	0.8%	1.1%	1.2%	**6.1%**
Engineering and engineering technology	2.2%	0.3%	2.1%	0.3%	4.1%	1.1%	**10.1%**
Mathematics and computer and information science	1.4%	0.5%	1.4%	0.7%	1.2%	0.8%	**6.0%**
BHASE (non-STEM)	**16.5%**	**21.5%**	**7.9%**	**11.8%**	**7.9%**	**12.0%**	**77.6%**
Business and administration	4.9%	4.7%	2.7%	3.8%	2.9%	3.7%	**22.7%**
Arts and humanities	2.7%	3.7%	0.8%	1.2%	1.0%	2.2%	**11.6%**
Social and behavioural sciences	2.4%	4.4%	0.8%	1.8%	0.8%	1.6%	**11.8%**
Legal professions and studies	0.6%	0.9%	0.2%	0.3%	0.2%	0.2%	**2.4%**
Health care	0.8%	3.2%	0.6%	2.7%	0.8%	2.2%	**10.3%**
Education and teaching	0.6%	2.2%	0.2%	0.6%	0.3%	1.2%	**5.1%**
Trades, services, natural resources and conservation	4.5%	2.4%	2.7%	1.3%	2.0%	0.8%	**13.7%**
Mechanics, architecture, construction, production	2.9%	0.2%	2.0%	0.1%	1.4%	0.2%	**6.8%**
Other trades, services, natural resources and conservation	1.6%	2.1%	0.7%	1.2%	0.6%	0.6%	**6.8%**
TOTAL	**21.2%**	**23.6%**	**12.0%**	**13.6%**	**14.3%**	**15.2%**	**99.9%**

Statistics Canada - 2016 Census. Catalogue Number 98-400-X2016272.

As mentioned earlier, immigrants have a far greater propensity to choose STEM fields of study, whether their degrees are obtained in Canada or not. To illustrate this point, Table 1.7 shows the percentage in each demographic group choosing a STEM discipline versus the percentage choosing to study in business and administration, the largest single category of all fields of study in Toronto CMA. Table 1.7 is calculated by using the total number of people with STEM or business and administration educational background in Toronto CMA, and dividing them by the number of each demographic group in these fields, and getting a percentage proportion.

Immigrants obtaining their degrees in Canada are one and a half times more likely to choose a STEM discipline than Canadian-born, and immigrants obtaining their degrees outside Canada are twice as likely to choose a STEM field of study. The results are narrower for these diverse groups in terms of choosing business and administration at 20% to 28%.

Table 1.7: Percentage of each demographic group choosing STEM or business and administration fields of study, Toronto CMA, 2016

Percentage of each demographic group choosing a field of study	Canadian-born		Immigrants			
	Degree from anywhere		Degree from inside Canada		Degree from outside Canada	
	Male	Female	Male	Female	Male	Female
Any STEM discipline	22%	9%	34%	13%	45%	21%
Business and administration	23%	20%	23%	28%	20%	24%

Statistics Canada - 2016 Census. Catalogue Number 98-400-X2016272.

Participation in the labour force, by gender, immigration status, location of study and educational attainment

Table 1.8 provides a measure of the extent to which different population groups are participating in the labour market. The percentage figure shows the proportion of each group who, at the time of the Census reporting in May 2016, had not worked since January 1, 2015. These individuals had either not entered the labour market or, having been in the labour market, had dropped out for almost 18 months. The data focuses on persons 25 to 54 years of age, which is the prime working age, and for different levels of post-secondary educational attainment.

Table 1.8: Percentage of each demographic group who had not worked since January 1st 2015, residents aged 25-54 years old, Toronto CMA, 2016

	Immigration status	Location of educational attainment	Apprenticeship	College	Bachelor	Above Bachelor
Males	**Canadian-born**	Canada	6%	6%	4%	4%
	Immigrants	Canada	6%	7%	6%	5%
		Outside	9%	7%	6%	7%
Females	**Canadian-born**	Canada	16%	10%	7%	5%
	Immigrants	Canada	16%	14%	10%	8%
		Outside	28%	24%	21%	21%

Statistics Canada - 2016 Census. Catalogue Number 98-400-X2016272.

There is a very slight difference between Canadian-born and immigrant men who have obtained their degrees in Canada, with immigrants having an extra percentage or two higher non-participation rates. Immigrant males, who received their degrees outside of

Canada, have slightly higher rates of non-participation than immigrants with Canadian degrees, but only among those with apprenticeship certificates or university degrees above the Bachelor level.

The differences are more significant for females with STEM education. Canadian-born women have somewhat higher levels of non-participation than men, particularly among those with lower level of educational attainment (apprenticeship and college). Female immigrants who earned their degrees in Canada have slightly higher levels of non-participation at higher levels of education attainment. Immigrant women who earned their degrees outside of Canada have the highest levels of non-participation across all degree levels.

Residents employed in STEM occupations, by female and visible minority status, Peel and Halton regions

Table 1.9 displays that a large number of residents work as computer and information system professionals (22,505 people) in Peel, and they account for 38% of the total residents employed in STEM occupations. Residents employed as civil, mechanical, electrical and chemical engineers also a large group, and account for about 14% of all persons employed in STEM occupations. As shown in Table 1.10, the proportions in Halton are similar to those in Peel with a large number of residents working as computer and information system professionals and civil, mechanical, electrical and chemical engineers.

Tables 1.9 and 1.10 provide the total number of residents employed in STEM occupations by female and visible minority status in Peel and Halton. In both Peel and Halton, there is an underrepresentation of females in STEM occupations. The greatest disparities between the number of male and female employees are found in technical occupations in civil, mechanical and industrial engineering and technical occupations in electronics and electrical engineering. Only 12% of Peel residents and 12% of Halton residents working in technical

Table 1.9: Number of residents employed in STEM occupation, female, visible minority, Region of Peel, 2016

Peel - occupation	Total	Female	Visible minority population
Mgrs. in eng., arch., science and IT	5,170	1,160	3,085
Phy. science	1,560	610	1,105
Life science	630	335	425
Civil, mech., electr. and chem. engineers	8,170	1,025	5,475
Other engineers	3,360	460	2,345
Math., stat. and actua.	385	145	260
Computer and IT	22,505	5,610	16,585
Techn. in phy. sciences	1,355	685	1,005
Techn. in civil, mech. and indus. Eng.	3,285	400	2,050
Techn. in electro. and electri. Eng.	4,945	530	3,035
Techn. in arch., draft., survey., geom. and mete.	1,825	510	1,070
Techn. in computer and IT	6,420	1,375	4,520

Statistics Canada, 2016 Census Customized Tabulation.

occupations in civil, mechanical and industrial engineering are female and only 11% of Peel residents and 8% Halton residents working in technical occupations in electronics and electrical engineering are female. On the other hand, in Peel, life science field and technical occupations in physical sciences have a balanced number of male and female employees. In Halton, life science and mathematicians, statisticians and actuaries are the STEM occupational fields with a balanced number of males and females.

In general, a large number of visible minorities in Peel work in STEM occupations, especially in computer and information systems professionals and technical occupations in physical sciences. Up to 75% of Peel residents working in each of these two occupations are visible minorities. Whereas in Halton, visible minorities working in STEM occupations make up a smaller proportion than Peel.

Table 1.10: Number of residents employed in STEM occupation, female, visible minority, Halton Region, 2016

Halton - occupation	Total	Female	Visible minority population
Mgrs. in eng., arch., science and IT	3,240	710	955
Phy. science	575	220	180
Life science	395	210	105
Civil, mech., electr. and chem. engineers	4,175	550	1,650
Other engineers	1,520	210	690
Math., stat. and actua.	275	140	125
Computer and IT	9,325	2,140	4,080
Techn. in phy. sciences	415	200	165
Techn. in civil, mech. and indus. Eng.	1,490	185	390
Techn. in electro. and electri. Eng.	1,535	130	340
Techn. in arch., draft., survey., geom. and mete.	770	225	225
Techn. in computer and IT	2,130	570	725

Statistics Canada, 2016 Census Customized Tabulation.

Residents employed in STEM occupations, by immigration status

Table 1.11 profiles the number of Ontario, Peel and Halton residents employed in STEM occupations by their immigration status. In Ontario in 2016, up to 54% of physical science professionals, and 52% of computer and information systems professionals are immigrants.

Those are the top two STEM occupations in Ontario that employ the largest proportions of immigrants. Relatively smaller proportions of immigrants work in technical occupations in civil, mechanical and industrial engineering (34%) and technical occupations in electronics and electrical engineering (33%) compared to their Canadian-born counterparts. Computer and IT professionals and civil, mechanical, electrical and chemical engineers are the top two STEM occupations in Peel. The situation is similar in Halton, where 36% of civil, mechanical, electrical and chemical engineers and 38% of other engineers are immigrants.

Table 1.11. Number of residents employed in STEM occupations by immigration status, Ontario, 2016

	Ontario		Peel		Halton	
	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
Mgrs. in eng., arch., science and IT	21,125	13,460	5,170	3,250	3,240	1,465
Phy. science	3,460	4,115	1,555	1,205	570	280
Life science	3,980	2,045	630	435	390	125
Civil, mech., electr. and chem. engineers	24,620	24,065	8,175	6,355	4,175	2,380
Other engineers	8,995	9,800	3,355	2,550	1,520	945
Math., stat. and actua.	2,525	2,035	385	220	275	135
Computer and IT	58,250	64,040	22,505	16,400	9,325	5,065
Techn. in phy. sciences	4,540	2,675	1,355	970	415	180
Techn. in civil, mech. and indus. Eng.	14,300	7,260	3,285	2,160	1,490	670
Techn. in electro. and electri. Eng.	18,540	9,315	4,945	3,160	1,535	585
Techn. in arch., draft., survey., geom. and mete.	7,875	4,170	1,820	1,080	765	340
Techn. in computer and IT	20,325	13,970	6,420	4,320	2,135	940

Statistics Canada, 2016 Census Customized Tabulation.

Employment income by STEM occupations for Toronto CMA residents

Table 1.12 displays the median employment income for residents who work full year full time in STEM occupations in Toronto CMA in 2016. In Ontario, the median income for persons employed in STEM occupations is $77,735, which is higher than the average for all occupations ($55,121). Managers in engineering, architecture, science and information systems have the highest employment income (median of $109,473). This is followed by engineers other than civil, mechanical, electrical and chemical engineers (median of $92,075). Technical occupations have comparatively lower income than other STEM occupations, with median earnings between $58,509 and $68,321. The average median income for STEM occupations among Peel residents is $2,283 lower than that for Ontario. The Halton residents in STEM occupations generally earning higher than Ontario and Peel levels. This might be because Halton is an attractive location to move for people with higher incomes.

Table 1.12. Median annual employment income for residents worked full year, full time, Toronto CMA, 2016

	Ontario	Peel	Halton
Mgrs. in eng., arch., science and IT	109,473	107,244	122,682
Physical science	77,942	68,332	87,745
Life science	74,126	66,542	77,964
Civil, mech., electr. and chem. engineers	91,278	87,364	102,704
Other engineers	92,075	87,077	98,080
Math., stat. and actua.	89,737	105,993	109,040
Computer and IT	82,456	79,623	88,992
Techn. in phy. sciences	62,287	58,416	64,055
Techn. in civil, mech. and indus. Eng.	68,321	64,851	77,011
Techn. in electro. and electri. Eng.	58,509	55,308	64,333
Techn. in arch., draft., survey., geom. and mete.	59,918	59,118	59,212
Techn. in computer and IT	66,703	65,557	73,235
Average of STEM occupation	**77,735**	**75,452**	**85,421**
All occupations	**55,121**	**52,426**	**68,481**

Statistics Canada, 2016 Census Customized Tabulation.

STEM Occupation jobs by industry in Peel and Halton

Table 1.13 and Table 1.14 provide cross-tabulated data for the distribution of jobs in Peel and Halton by occupation for each industry. STEM occupations exist in every industry, but are especially high in manufacturing and professional, scientific and technical services industries. Overall, computer and IT have the highest proportion of jobs in Peel (38%) and Halton (36%). Civil, mechanical, electrical and chemical engineering jobs are the second highest (13% in Peel and 16% in Halton).

Some industries have a high concentration of a particular type of job. For example, 45% of jobs in the utilities industry are civil, mechanical, electrical and chemical engineers in Peel, and that proportion is even higher in Halton (48%). In Peel, 45% (40% in Halton) of jobs are in information and culture, 66% (64% in Halton) of jobs are in finance and insurance, 48% (43% in Halton) of jobs are in professional, scientific and technical services, and 57% (48% in Halton) of jobs are in management for computer and IT companies.

Table 1.13 and Table 1.14 on pages 18, 19

Table 1.13. Industry cross-tabulated by occupations, number of jobs located in Region of Peel, 2016

Peel Region	All STEM OCCUPATIONS	Mgrs. in eng., arch., science and IT	Phy. science	Life science	Civil, mech., electr. and chem. Eng.	Other eng..	Math., stat. and actua.	Computer and IT	Techn. in phy. sciences	Techn. in civil, mech. and indus. Eng.	Techn. in electro. and electri. Eng.	Techn. in arch., draft., survey., geom. and mete.	Techn. in computer and IT	% OF ALL INDUSTRIES
% OF ALL OCCUPATIONS	100%	9.0%	2.8%	1.2%	13.4%	5.8%	0.7%	38.0%	2.4%	5.5%	7.0%	3.2%	11.1%	
ALL INDUSTRIES	54425	4885	1500	630	7295	3140	395	20695	1300	2995	3835	1715	6040	100.0%
Agriculture, forestry	55	10	0	15	10	0	0	10	0	0	10	0	0	0.1%
Mining, oil and gas	145	10	30	0	35	15	0	30	15	10	0	0	0	0.3%
Utilities	870	65	10	10	395	15	10	120	0	60	85	55	45	1.6%
Construction	2080	75	10	0	610	50	0	110	15	620	330	160	100	3.8%
Manufacturing	9345	570	720	145	2115	1060	15	1070	725	1305	825	405	390	17.2%
Wholesale trade	3440	365	110	40	255	175	0	1140	125	145	510	50	525	6.3%
Retail trade	1760	185	30	20	100	40	0	730	35	30	290	25	275	3.2%
Transportation/ warehousing	1270	110	0	10	165	80	10	420	10	55	215	25	170	2.3%
Information and cultural	4030	410	0	0	145	535	15	1805	0	20	165	30	905	7.4%
Finance and insurance	5565	695	0	0	50	115	175	3660	0	10	60	15	785	10.2%
Real estate and rental	295	50	0	10	25	0	0	95	0	10	50	10	45	0.5%
Prof., scientific, technical	18845	1765	430	180	2755	835	95	9060	295	460	440	810	1720	34.6%
Management of companies	220	25	0	0	20	10	0	125	10	0	15	0	15	0.4%
Administrative and support	1125	70	15	10	90	50	10	375	25	60	185	20	215	2.1%
Educational services	885	85	20	20	55	25	15	370	0	10	50	10	225	1.6%
Health and social assist	1085	105	70	100	40	45	35	370	0	25	80	0	215	2.0%
Arts, entertain and recreation	95	15	0	10	10	0	0	25	0	0	25	0	10	0.2%
Accommodation and food	165	30	0	0	30	15	0	45	0	0	10	0	35	0.3%
Other services	1045	65	0	10	90	30	0	250	0	55	450	10	85	1.9%
Public administration	2105	180	55	50	300	45	15	885	45	120	40	90	280	3.9%

Statistics Canada, 2016 Census Customized Tabulation.

Table 1.14. **Industry cross-tabulated by occupations, number of jobs located in Halton Region, 2016**

Halton Region	All STEM OCCUPATIONS	Mgrs. in eng., arch., science and IT	Phy. science	Life science	Civil, mech., electr. and chem. Eng.	Other eng.	Math., stat. and actua.	Computer and IT	Techn. in phy. sciences	Techn. in civil, mech. and indus. Eng.	Techn. in electro. and electri. Eng.	Techn. in arch., draft., survey., geom. and mete.	Techn. in computer and IT	% OF ALL INDUSTRIES
% OF ALL OCCUPATIONS	100%	13.1%	2.3%	1.4%	16.1%	5.9%	1.1%	36.4%	1.6%	5.9%	4.8%	3.0%	8.5%	
ALL INDUSTRIES	24060	3145	550	345	3870	1415	270	8755	390	1415	1145	725	2035	100.0%
Agriculture, forestry	45	0	0	10	10	0	0	15	0	10	0	0	0	0.2%
Mining, oil and gas	140	15	45	0	15	30	0	15	10	0	0	10	0	0.6%
Utilities	535	65	10	0	255	20	0	45	0	25	60	25	30	2.2%
Construction	855	85	0	0	265	0	0	40	0	280	115	45	25	3.6%
Manufacturing	3910	435	175	60	1060	445	10	465	200	570	250	145	95	16.3%
Wholesale trade	1515	220	35	0	170	100	0	505	75	70	130	15	195	6.3%
Retail trade	660	115	10	0	35	35	0	285	15	15	50	35	65	2.7%
Transportation/ warehousing	375	70	0	0	45	30	0	120	0	15	55	10	30	1.6%
Information and cultural	1610	210	10	0	80	110	0	805	0	15	65	15	300	6.7%
Finance and insurance	2630	415	0	0	10	95	145	1675	0	0	15	10	265	10.9%
Real estate and rental	155	20	0	0	25	10	0	35	0	10	15	10	30	0.6%
Prof., scientific, technical	8675	1120	175	140	1605	440	70	3760	35	265	135	340	590	36.1%
Management of companies	145	35	0	0	10	20	0	70	0	10	0	0	0	0.6%
Administrative and support	360	50	10	0	35	10	0	130	10	0	65	0	50	1.5%
Educational services	440	30	0	15	25	10	10	165	0	10	45	10	120	1.8%
Health and social assist	510	95	15	55	25	20	10	150	10	15	30	10	75	2.1%
Arts, entertain and recreation	35	0	0	10	0	0	0	10	0	0	0	0	15	0.1%
Accommodation and food	70	15	0	0	10	0	0	15	0	0	10	10	10	0.3%
Other services	255	40	10	0	20	15	0	60	10	20	60	0	20	1.1%
Public administration	1140	110	55	55	170	25	25	390	25	85	45	35	120	4.7%

Statistics Canada, 2016 Census Customized Tabulation.

Labour Market Outcomes of STEM Degree Holders

There are many ways to compare labour market outcomes, including levels of employment or employment income. This section of the study has chosen to focus on the distribution of employment by skill level and, further on, the non-participation rate by various characteristics.

Assessing labour market outcomes by the skill level of the resulting employment

Taking any given level of post-secondary degree and any given field of study, one can compare the distribution of the resulting employment by the skill level required for that occupation. The National Occupational Classification assigns a numerical code to each occupation (up to 4-digits). Apart from managers, the second-digit of the code identifies the skill level designation. Statistics Canada classifies jobs according to the following skill levels:

SKILL LEVEL	EDUCATION USUALLY REQUIRED
Skill Level A – Manager: NOC first digit "0"	University degree
Skill Level A – Professional: NOC second digit "0" or "1"	University degree
Skill Level B – NOC second digit "2" or "3"	College or Apprenticeship training
Skill Level C – NOC second digit "4" or "5"	High school diploma
Skill Level D – NOC second digit "6" or "7"	None/on-the-job training

By focusing on the skill-level of the occupation, one can surmise the extent to which the labour market outcome matches the individual's level of education and can predict the level of employment income. Table 2.1 illustrates the distribution of persons employed in the Toronto CMA by the skill level of the occupation in which they are employed.

Table 2.1: Percentage distribution by occupational skill level of all employed residents, Toronto CMA, 2016

Skill Level A Manager	Skill Level A Professional	Skill Level B	Skill Level C	Skill Level D
11.6%	22.4%	27.5%	27.2%	11.3%

While this is useful, it is also important to look at the overall occupational skill level for employed persons in the Toronto CMA or to look at overall occupational skill levels for different industries or sectors. To simplify these complex calculations involving educational attainment and other factors, a composite score approach is used.

For each percentage point in the Skills Level A Manager and Skills Level A Professional categories, a value of "4" is assigned; a value of "3" is assigned for Skill Level B; will be given a value of "2" for each percentage point in Skill Level C; and a value of a "1" for each point in Skill Level D. The numbers are totalled and divided by 100, to get an average score.

The equation for Table 2.1 would look like this:

$$\frac{(11.6 \times 4) + (22.4 \times 4) + (27.5 \times 3) + (27.2 \times 2) + (11.3 \times 1)}{100} = 2.84$$

The average value for all employed Toronto CMA residents is 2.84, a value that sits between Skill Level C (+2) and Skill Level B (+3), but much closer to Skill Level B.

Table 2.2 provides the composite scores for the four post-secondary educational attainment for select population groups for the Toronto CMA, for all fields of study, to compare their overall occupational skills outcomes.

Table 2.2: Composite score for distribution by occupational skill level of all employed residents with a post-secondary degree, by select population characteristics, Toronto CMA, 2016

Gender	Immigration status	Location of educational attainment	Apprenticeship	College diploma	Bachelor's degree	Above Bachelor
Males	Canadian-born	Canada	2.76	2.90	3.44	3.79
	Immigrants	Canada	2.68	2.84	3.45	3.75
		Outside	2.56	2.67	3.09	3.39
Females	Canadian-born	Canada	2.57	2.82	3.36	3.75
	Immigrants	Canada	2.38	2.69	3.34	3.68
		Outside	2.26	2.50	2.84	3.21

Statistics Canada, 2016 Census, Cat. No. 98-400-X2016272

The composite scores in Table 2.2 shows that Canadian-born males score highest in almost all categories (except for immigrant males with a Bachelor's degree earned in Canada). Followed by immigrant males who earned their degrees in Canada (except for a tie with Canadian-born females with a degree higher than a Bachelor). Third are Canadian-born females, who especially at the Bachelor and above Bachelor levels out-perform immigrant males who earned their degrees outside Canada. Only slightly behind Canadian-born females are immigrant females who earned their degrees in Canada. Fifth are immigrant males who earned their degrees outside Canada, and a distant sixth are immigrant females who earned their degrees outside Canada.

Moreover, a degree higher than a bachelor's results in roughly the same outcome for Canadian-born and immigrant males and females who earn their degree in Canada, with a slightly lower score for female immigrants. However, the same degree earned outside Canada by immigrants results in considerably lower outcomes, even lower than those of the same gender earning a bachelor's degree in Canada (3.21 compared to 3.34).

Tables 2.3 and 2.4 present detailed outcomes by field of study for two distinct demographic groups: Canadian-born males earning their degrees in Canada, and immigrant females earning their degrees in Canada. The tables present the composite occupational skills outcome score for each field of study by post-secondary level of education. Because of the large volume of numerals, the cells are colour-coded to highlight the variations. The following legend assigns values to the colours (these figures are all in relation to the average composite score of 2.84 for all employed residents):

1.99 – 2.18	2.90 – 3.09
2.19 - 2.38	3.10 – 3.29
2.39 - 2.58	3.30 – 3.49
2.59 – 2.78	3.50 – 3.69
2.79 – 2.89	3.70 and higher

The darker the green, the greater the proportion of higher-skilled occupations, and the darker the pink/red, the greater the proportion of lower-skilled jobs. Absence of colour means the value close to the average of 2.84.

In Table 2.3, numbers for all STEM and BHASE (non-STEM) are exactly same at 2.76 at apprenticeship level. The scores are significantly higher for STEM at the college and university level, and the scores become similar again at the beyond bachelor level. In STEM fields, Mathematics, Computer & IT Science has higher scores at the apprenticeship and college level, followed by Engineering & Engineering Technology. Whereas Science & Science Technology occupational skills level scores lower at apprenticeship and college level than bachelor and above. Among BHASE fields of study, Business & Administration have generally highest score in occupational skills outcome across all four degree levels, although the highest score for occupational skills outcome at the Bachelor's level and beyond are overtaken by Legal Professions & Studies as well as Education & Training. In general, most fields of study show considerable improvement in their occupational skills outcomes at bachelor and above bachelor level. However, Arts & Humanities have lower occupational skills level outcomes, especially at the bachelor level in comparison to other fields.

Table 2.3: Composite score for distribution by occupational skill level of all employed Canadian-born males who earned their post-secondary degree in Canada, field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	Above Bachelor
ALL POST-SECONDARY	**2.76**	**2.90**	**3.44**	**3.79**
ALL STEM	**2.72**	**3.12**	**3.56**	**3.79**
Science and science technology	2.41	2.77	3.26	3.74
Engineering and engineering technology	2.66	3.05	3.72	3.83
Mathematics, computer and IT science	3.03	3.26	3.69	3.81
BHASE (non-STEM)	**2.76**	**2.83**	**3.40**	**3.78**
Business and administration	2.89	2.97	3.48	3.77
Arts and humanities	2.73	2.87	3.25	3.65
Social and behavioural sciences	2.10	2.97	3.30	3.69
Legal professions and studies	2.00	2.58	3.76	3.91
Health care	2.57	2.82	3.40	3.93
Education and teaching	2.57	2.88	3.71	3.82
Trades, services, natural resources	2.76	2.70	3.33	3.71
Mechanics, construction, production	2.82	2.78	3.55	3.76
Other trades, services, natural resources	2.49	2.61	3.18	3.66

StatisticStatistics Canada, 2016 Census, Cat. No. 98-400-X2016272

In Table 2.4, there are a few instances where the results for women are higher than those for men. The most notable one is in the case of those holding a Bachelor's degree in health care – this is likely the consequence of many females in nursing scoring better than males who may have a nursing degree or, more likely, some other health care Bachelor degree. Comparing ALL STEM results to all BHASE results, STEM degree scores exceed BHASE degree scores at the apprentice and college level, while at the Bachelor and above Bachelor levels the results are similar.

Table 2.4: Composite score for distribution by occupational skill level of all employed immigrant females who earned their post-secondary degree in Canada, field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	Above Bachelor
ALL POST-SECONDARY	**2.38**	**2.69**	**3.34**	**3.68**
ALL STEM	**2.53**	**2.86**	**3.35**	**3.68**
Science and science technology	2.35	2.66	3.15	3.61
Engineering and engineering technology	2.57	2.81	3.60	3.71
Mathematics, computer and IT science	2.63	2.97	3.54	3.78
BHASE (non-STEM)	**2.38**	**2.68**	**3.33**	**3.69**
Business and administration	2.60	2.75	3.38	3.65
Arts and humanities	2.58	2.75	3.16	3.58
Social and behavioural sciences	2.43	2.77	3.18	3.59
Legal professions and studies	2.71	2.82	3.49	3.75
Health care	2.15	2.56	3.63	3.82
Education and teaching	3.00	2.88	3.68	3.74
Trades, services, natural resources	2.44	2.55	3.24	3.67
Mechanics, construction, production	2.25	2.71	3.29	3.66
Other trades, services, natural resources	2.44	2.54	3.21	3.67

Statistics Canada, 2016 Census, Cat. No. 98-400-X2016272

Assessing labour market outcomes by non-participation rates

The non-participation rate was referred to earlier: it represents the percentage of each group who, at the time of the Census reporting in May 2016, had not worked since January 1 2015. Table 2.5 shows a comparison of STEM and non-STEM degree holders aged 15 years and older, who have studied inside and outside of Canada based on non-participation rate by period of arrival.

In general, immigrants who earned their degrees from outside Canada have lower participation rates than all persons with Canadian degrees. Such discrepancies are even more evident among women. Newly arrived Immigrant women who have earned their degree outside Canada have the lowest participation rate at all education levels. For example, women who immigrated to Canada between 2011 and 2016 with an Above Bachelor degree earned from outside Canada had a non-participation rate of 32%, compared to immigrant women that arrived during the same period but earned their degree in Canada, who had an 8% non-participation rate. The non-participation rate of both male and female immigrants edges closer to or even lower than that of Canadian-born residents the earlier their immigration period.

Table 2.5: STEM Degree non-participation rate compared by period of arrival, aged 15 years and older, Toronto CMA, 1991-2016

		Male					
		College		Bachelor		Above Bachelor	
		Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside
	Canadian-born	13%	13%	12%	19%	15%	20%
	Immigrants	16%	30%	14%	17%	15%	17%
Period of Immigration	1991-2000	8%	21%	9%	14%	7%	12%
	2001-2005	10%	13%	12%	9%	7%	9%
	2006-2010	11%	12%	13%	12%	6%	11%
	2011-2016	10%	23%	9%	17%	3%	14%

		Female					
		College		Bachelor		Above Bachelor	
		Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside
	Canadian-born	20%	43%	13%	24%	12%	19%
	Immigrants	23%	38%	16%	27%	12%	25%
Period of Immigration	1991-2000	14%	30%	12%	18%	10%	19%
	2001-2005	19%	35%	17%	19%	11%	18%
	2006-2010	17%	34%	21%	28%	12%	24%
	2011-2016	15%	40%	18%	36%	8%	32%

Statistics Canada, 2016 Census Customized Tabulation.

Table 2.6 compares non-participation rates by immigration status and period of arrival. The trends are consistent with the findings related to STEM degree holders in Table 2.5. However, recent immigrant women who earned BHASE degree outside of Canada generally have higher non-participation rates compared to their STEM educated counterparts.

Table 2.6: BHASE Degree Non-Participation Rate Compared by period of arrival, aged 15 years and older, Toronto CMA, 1991-2016

		Male					
		College		Bachelor		Above Bachelor	
		Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside
	Canadian-born	12%	19%	10%	13%	14%	14%
	Immigrants	16%	30%	13%	21%	15%	19%
Period of Immigration	1991-2000	8%	22%	8%	20%	8%	19%
	2001-2005	8%	15%	10%	13%	7%	12%
	2006-2010	9%	15%	10%	12%	7%	12%
	2011-2016	12%	23%	12%	17%	9%	17%

		Male					
		College		Bachelor		Above Bachelor	
		Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside
	Canadian-born	19%	26%	13%	16%	13%	12%
	Immigrants	22%	44%	15%	30%	15%	29%
Period of Immigration	1991-2000	15%	33%	10%	25%	9%	23%
	2001-2005	15%	35%	11%	23%	9%	22%
	2006-2010	16%	34%	12%	25%	9%	26%
	2011-2016	19%	42%	13%	33%	10%	34%

Statistics Canada, 2016 Census Customized Tabulation.

The non-participation rates among STEM educated immigrants arriving between 2001 and 2010 were cross-tabulated based on their age and where they earned their degrees in Table 2.7. Non-participation rates almost doubled for the age group 55-64 years regardless of where they have earned their degree, in comparison to age groups 45-54 years and 35-44 years. Non-participation rates are slightly lower for individuals in age groups 35-44 years and 45-54 years with Bachelor and Above Bachelor degrees, and especially for those who have earned their degree in Canada. In general, immigrants who completed their STEM education

Table 2.7: STEM degree non-participation rate compared by age, immigrants arrived between 2001-2010, Toronto CMA

	College		Bachelor		Above Bachelor	
Age Groups	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside	Degree from Canada	Degree from Outside
25-34	9%	15%	11%	15%	10%	15%
35-44	8%	13%	5%	9%	5%	8%
45-54	13%	9%	2%	9%	6%	8%
55-64	30%	18%	12%	18%	16%	16%

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016272

outside of Canada have higher non-participation rate than immigrants who have completed their degrees in Canada.

Occupational skills outcome were also cross-tabulated for STEM educated immigrants who arrived between 2001 and 2010 based on their age group and the location of their degrees. The occupational outcome is higher for those with degrees earned in Canada. As is evident from Table 2.8, age group 35-44 does relatively better than any other age groups across all educational levels.

Table 2.8: STEM degree occupational skill level outcome compared by age: immigrants arrived between 2001-2010, Toronto CMA

	College		Bachelor		Above Bachelor	
Age Groups	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**
Aged 25-34	2.89	2.54	3.44	3.10	3.70	3.31
Aged 35-44	2.92	2.68	3.50	3.24	3.80	3.49
Aged 45-54	2.58	2.62	3.41	3.05	3.69	3.37
Aged 55-64	3.17	2.54	2.38	2.85	3.36	3.15

Statistics Canada, 2016 Census Customized Tabulation.

Similar comparisons were done for the BHASE (or non-STEM) educated immigrants who arrived in Canada between 2001 and 2010 in Table 2.9. In general, immigrants with BHASE degree have higher levels of non-participation compared to their STEM educated counterparts. However, the levels of non-participation are more significant for BHASE degree holders who have earned their degree outside of Canada.

Table 2.9: BHASE degree non-participation rate compared by age, immigrants arrived between 2001-2010, Toronto CMA

	College		Bachelor		Above Bachelor	
Age Groups	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**
25-34	14%	24%	9%	20%	8%	23%
35-44	13%	19%	10%	15%	6%	14%
45-54	10%	19%	9%	13%	7%	12%
55-64	13%	28%	9%	26%	13%	22%

Statistics Canada, 2016 Census Customized Tabulation.

Table 2.10 profiles immigrants with BHASE degrees who have arrived between 2001 and 2010, and cross-tabulates their occupational skills outcome based on different age groups and whether they have earned their degrees in Canada or outside of Canada. The trends are consistent with Table 2.5, however, immigrants with BHASE degree from outside of Canada have worse occupational skills outcome than their STEM counterparts.

Table 2.10: BHASE degree occupational skill level outcome compared by age, immigrants arrived between 2001-2010, Toronto CMA

	College		Bachelor		Above Bachelor	
Age Groups	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**	**Degree from Canada**	**Degree from Outside**
25-34	2.62	2.44	3.29	2.81	3.63	3.13
35-44	2.61	2.57	3.40	2.87	3.69	3.24
45-54	2.57	2.50	3.42	2.83	3.67	3.17
55-64	2.39	2.46	3.27	2.69	3.43	3.04

Statistics Canada, 2016 Census Customized Tabulation.

In Table 2.11, the non-participation rate of the STEM educated immigrant population of working age (25 to 54 years) was cross-tabulated based on the location where they have completed their degrees. In the male population, graduates from STEM colleges in China (14%), bachelor degree holders from universities in Iran (13%), and above bachelor degree holders from universities in Iran (19%) have the highest non-participation rates. The non-participation rate for women is significantly higher than that for the male counterparts. Women with bachelor and above bachelor degrees from Pakistan universities (over 40%), women with college (53%), and above bachelor (33%) degrees from Iran colleges and universities have the highest non-participation rates. Women with college, bachelor, and above bachelor degrees from Philippines institutions have the lowest non-participation rates.

Table 2.11: STEM degrees non-participation rate compared by location of study, aged 25 to 54 years old, Toronto CMA, 2016

Male						
	College		Bachelor		Above Bachelor	
Country	**Canadian-born**	**Immigrants**	**Canadian-born**	**Immigrants**	**Canadian-born**	**Immigrants**
United States	11%	7%	6%	7%	7%	6%
United Kingdom	0%	4%	0%	3%	7%	5%
Philippines		5%		3%		6%
India		4%		2%		2%
China		14%		8%		7%
Pakistan		6%		7%		6%
Iran		8%		13%		19%

Female						
	College		Bachelor		Above Bachelor	
Country	**Canadian-born**	**Immigrants**	**Canadian-born**	**Immigrants**	**Canadian-born**	**Immigrants**
United States	67%	36%	17%	18%	9%	15%
United Kingdom	0%	26%	0%	22%	13%	15%
Philippines		7%		8%		12%
India		23%		19%		21%
China		19%		15%		14%
Pakistan		59%		45%		42%
Iran		53%		29%		33%

Statistics Canada, 2016 Census Customized Tabulation.

A similar analysis was conducted for the BHASE educated Immigrant population in Table 2.12. In the male population, college, bachelor, and above bachelor BHASE educated immigrants who have studied in China (16-17%) and above bachelor degree holders that studied in universities in Iran (27%) have the highest non-participation rates. In terms of the female population, the non-participation rate is significantly higher compared to their male counterparts. Women with college (57%), bachelor (46%), and above bachelor (46%) degrees from institutions in Pakistan and women with college (39%), bachelor (33%), and above bachelor (38%) degrees from institutions in Iran have the highest non-participation rate. Similar to their STEM counterparts, women with college, bachelor, and above bachelor degrees from institutions in the Philippines have the lowest non-participation rate.

Table 2.12: BHASE degrees non-participation rate compared by location of study, aged 25 to 54 years old, Toronto CMA, 2016

	Male					
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	7%	8%	5%	6%	6%	8%
United Kingdom	0%	3%	8%	6%	7%	7%
Philippines		5%		4%		7%
India		4%		4%		4%
China		17%		16%		16%
Pakistan		10%		6%		7%
Iran		15%		11%		27%

	Female					
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	8%	19%	10%	17%	6%	12%
United Kingdom	14%	15%	9%	16%	8%	14%
Philippines		9%		8%		8%
India		20%		18%		20%
China		34%		23%		25%
Pakistan		57%		46%		46%
Iran		39%		33%		38%

Statistics Canada, 2016 Census Customized Tabulation.

The occupation skills outcome of Immigrants with STEM education and in the ages between 25 to 54 were cross-tabulated based on their location of study in Table 2.13. Males, holding bachelor and above bachelor degree from Iran universities have the highest occupational skill outcomes, followed by those with degrees from universities in India and China. The male immigrants that studied in the Philippines have relatively lower skills outcomes at all educational levels. In terms of the female population, bachelor and above bachelor degree holders from universities in China have the highest occupational skill outcomes, followed by those with degrees from Iran and India. STEM women educated in Pakistan have relatively lower skills outcomes across all educational levels. However, STEM women educated in the Philippines have extremely low skills outcomes at all educational levels compared to their counterparts studied in Iran, China and India.

Table 2.13: STEM degree occupational skill level outcome compared by location of study, aged 25 to 54 years old, Toronto CMA, 2016

Male						
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	3.22	3.30	3.42	3.53	3.89	3.71
United Kingdom	0.00	3.10	3.07	3.61	3.85	3.70
Philippines		2.14		2.61		2.63
India		2.62		3.29		3.48
China		2.81		3.28		3.58
Pakistan		2.80		3.11		3.23
Iran		2.86		3.34		3.59

Female						
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	N/A	2.50	3.33	3.50	3.81	3.72
United Kingdom	N/A	3.17	2.40	3.46	3.53	3.70
Philippines		1.95		2.65		2.50
India		2.28		3.04		3.22
China		2.47		3.20		3.46
Pakistan		2.05		2.77		2.86
Iran		3.57		3.08		3.28

Statistics Canada, 2016 Census Customized Tabulation.

A similar analysis was performed of the occupational skill outcomes of Immigrants with BHASE education in Table 2.14. Among the men, bachelor and above bachelor degree holders that studied in China and Iran have the highest occupational skills outcomes, followed by those who studies in India and Pakistan. The male population that studied in the Philippines have relatively lower skills outcomes at all educational levels. A similar pattern is evident for female BHASE immigrants.

Table 2.14: BHASE degree occupational skill level outcome compared by location of study, aged 25 to 54 years old, Toronto CMA, 2016

Male						
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	3.00	2.87	3.33	3.41	3.82	3.68
United Kingdom	3.08	3.13	3.44	3.49	3.81	3.59
Philippines		1.98		2.49		2.76
India		2.57		2.84		3.11
China		2.72		3.16		3.35
Pakistan		2.35		2.85		3.05
Iran		2.88		3.07		3.40

Female						
	College		Bachelor		Above Bachelor	
Country	Canadian-born	Immigrants	Canadian-born	Immigrants	Canadian-born	Immigrants
United States	2.89	2.75	3.40	3.27	3.79	3.72
United Kingdom	3.00	2.84	3.44	3.42	3.67	3.57
Philippines		2.02		2.45		2.60
India		2.28		2.60		2.87
China		2.59		3.03		3.20
Pakistan		2.36		2.58		2.85
Iran		2.75		2.85		3.31

Statistics Canada, 2016 Census Customized Tabulation.

The available data on employment income by field of study does not identify where the education was obtained, but it does distinguish between Canadian-born and immigrants. Tables 2.15 and Table 2.16 provide the average employment income results for the broad STEM category and the broad BHASE category, for employees who worked full-time full-year in 2015. These tables report average income and are not directly comparable to the median income figures used in Table 1.12.

Table 2.15: Average employment income of full-time full-year workers, all STEM fields of study, by level of post-secondary attainment, by gender and by immigration status, Toronto CMA, 2015

	Apprentice	College	Bachelor	Above Bachelor
Canadian-born male	$ 67,051	$ 83,785	$ 118,363	$ 139,197
Canadian-born female	$ 52,514	$ 67,876	$ 84,075	$ 98,192
Immigrant male	$ 58,223	$ 68,119	$ 81,614	$ 93,308
Immigrant female	$ 43,360	$ 53,833	$ 67,700	$ 77,300

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016280

Table 2.16: Average employment income of full-time full-year workers, BHASE fields of study, by level of post-secondary attainment, by gender and by immigration status, Toronto CMA, 2015

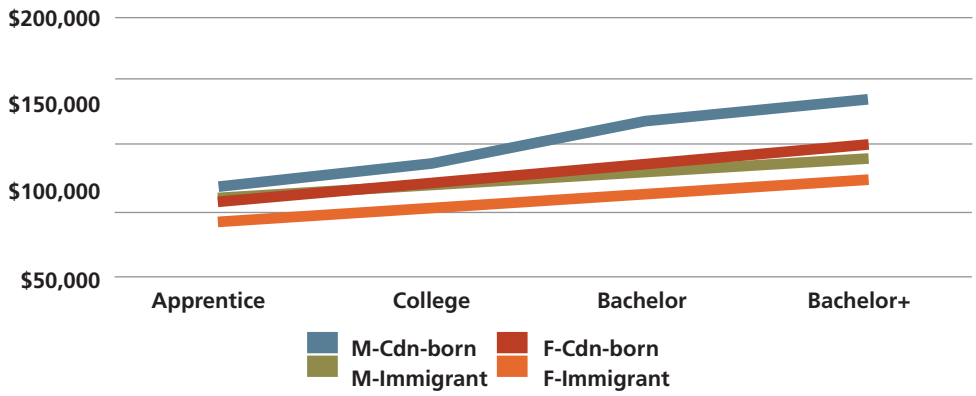
	Apprentice	College	Bachelor	Above Bachelor
Canadian-born male	$ 70,390	$ 71,831	$ 132,344	$ 191,601
Canadian-born female	$ 42,468	$ 57,529	$ 81,347	$ 102,689
Immigrant male	$ 55,749	$ 59,580	$ 77,004	$ 112,705
Immigrant female	$ 39,904	$ 50,082	$ 61,407	$ 79,943

Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016280

The average employment income of STEM graduates of apprentice and college programs is almost always greater than the average employment income for BHASE graduates (the one exception is in the case of Canadian-born males with an apprenticeship certificate). For graduates with a degree higher than a Bachelor, the opposite is true: BHASE graduates on average earn more than STEM graduates. This difference is largely driven by higher incomes among graduates in Legal Professions & Studies and in Business & Administration. There is a similar trend for individuals with a Bachelor's degree, where STEM graduates earn more than BHASE graduates, except for Canadian-born males BHASE graduates.

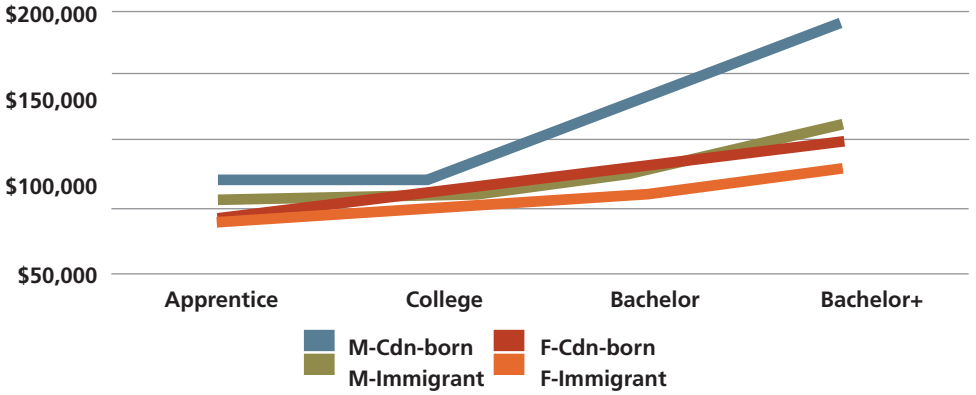
The relationships between the various categories and the trends are far easier to observe when these figures are expressed in a chart. Chart 2.1 shows the data for the STEM degrees and Chart 2.2 shows the data for the BHASE degrees. What becomes apparent is that Canadian-born females and immigrant males have roughly the same employment income outcomes, while Canadian-born males have higher incomes and immigrant females have lower levels.

Chart 2.1: Average employment income of full-time full-year workers, all STEM fields of study, by level of post-secondary attainment, by gender and by immigration status, Toronto CMA, 2015



Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016280.

Chart 2.2: Average employment income of full-time full-year workers, all BHASE fields of study, by level of post-secondary attainment, by gender and by immigration status, Toronto CMA, 2015



Statistics Canada, 2016 Census. Catalogue Number 98-400-X2016280.

Survey and Interview Findings

The employer survey was designed specifically for employers with STEM employees and consisted of 20 questions (see Appendix B). This section reports on the findings from the survey and the interviews conducted with industry experts.

Profile of survey respondents

Table 3.1 compares the distribution of the survey responses by industry. The actual number of survey responses by industry and the percentage share of the total survey population by industry is presented, which is compared to the actual percentage distribution by industry of all establishments with employees in Peel and Halton. There are a few discrepancies between the survey distribution of employers and the actual distribution, such as Manufacturing (Survey: 45%; Actual: 5%), and Transportation & Warehousing (Survey: 9%; Actual: 20%). The majority of the survey respondents were from Manufacturing, with Professional, Scientific & Technical Services (13%) and Health Care & Social Assistance (13%).

Table 3.1: Distribution of survey responses by industry

Industry	Survey number	Survey Percent	Actual Percent
Arts, Entertainment & Recreation	1	2%	1%
Construction	2	4%	9%
Educational Services	3	5%	1%
Health Care & Social Assistance	7	13%	8%
Manufacturing	25	45%	5%
Other Services (except Public Administration)	3	5%	7%
Professional, Scientific & Technical Services	7	13%	15%
Public Administration	1	2%	0%
Real Estate, Rental & Leasing	1	2%	3%
Transportation & Warehousing	5	9%	20%

Table 3.2 compares the distribution of survey responses by geography to the distribution of employers in the seven municipalities of Peel and Halton regions. The majority of survey respondents are from Mississauga (37%), with Brampton (20%) and Oakville (12%) being second and third, respectively.

Table 3.2: Distribution of survey responses by geography

Region	Municipality	Share of survey responses	Actual share of employers in Peel and Halton
Peel	Mississauga	37%	39%
	Brampton	20%	10%
	Caledon	0%	1%
Halton	Burlington	9%	3%
	Oakville	12%	4%
	Milton	5%	1%
	Halton Hills	2%	1%

Table 3.3 shows the responses from employers in Peel and Halton by the size of the establishment (number of employees) and the distribution by size of employers in Peel and Halton regions. The survey percentage seems fairly distributed among the different sizes of employers ranging from 20 to 31%. However, in comparison to the actual percentage of distribution by industry size, the survey is over-represented by employers with 50 or more employees.

Table 3.3: Distribution of survey respondents by number of employees

	1-19	20-49	50-99	100+
Actual number of employers	17,681	4,828	1,897	1,659
Actual percent	24%	7%	3%	2%
Number of survey responses	20	13	16	16
Proportion of survey responses	31%	20%	25%	25%
Survey as percent of actual	0.1%	0.3%	0.8%	1.0%

Proportion of STEM employees

After the standard questions to profile survey respondents about their location, industry, and size, employers were asked what percentage of their employers worked in STEM occupations. The majority of respondents (43%) indicated that over 40% of their full-time staff work in STEM occupations; 31% of respondents have 15-40% of their full-time staff work in STEM occupations, and 26% of respondents employ 15% or less in STEM occupations. None of the 65 respondents to this question indicated that they do not employ in STEM occupations.

Employer Assessment of STEM Candidates by location of degree

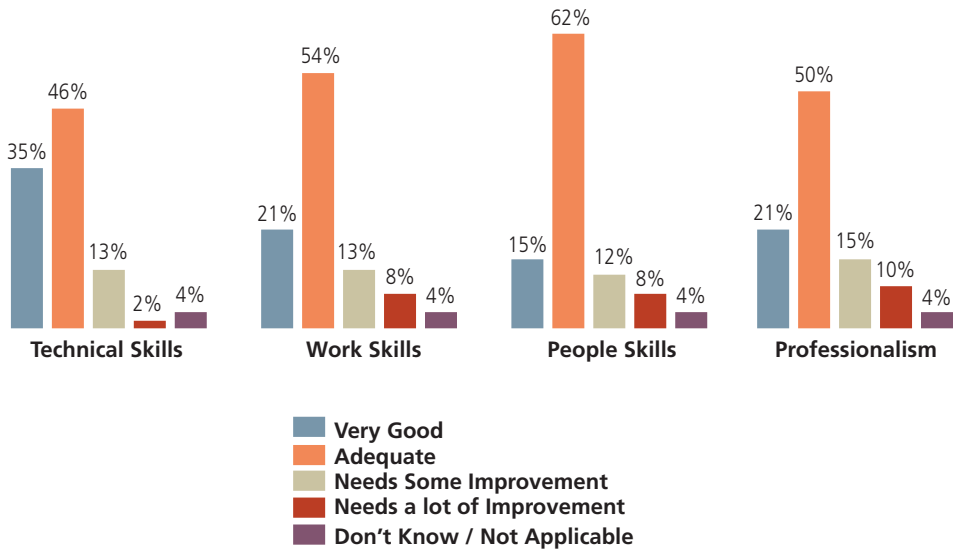
Charts 3.1 and 3.2 illustrate employer's ratings of job candidates along a series of measures, comparing those who earned their STEM degree in Canada with those who earned it outside Canada. Chart 3.3 provides a side-by-side comparison of those scores.

Each measure was scored using the following rating:

- Very Good: 2
- Adequate: 1
- Needs some improvement: -1
- Needs a lot of improvement: -2
- Don't know/Not Applicable: 0

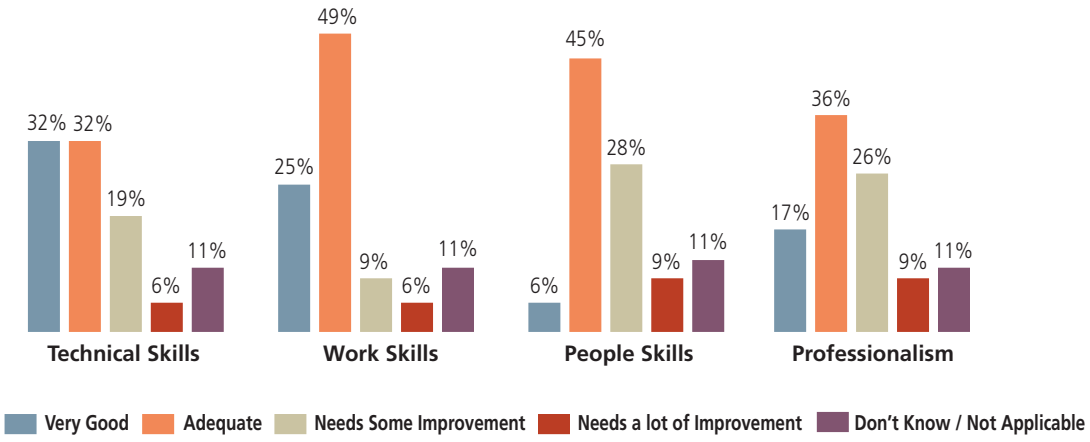
The score for all answers was totalled and divided by the number of respondents for each statement.

Chart 3.1: Score for Candidates with Canadian Degrees



It is evident from the responses that the candidates who received their education in Canada scored considerably better than candidates who received their education outside Canada in terms of people skills and professionalism. Survey respondents also felt that individuals who studied outside of Canada have somewhat lower technical skills compared to their Canadian counterparts.

Chart 3.2: Score for Candidates with Degrees from Outside Canada



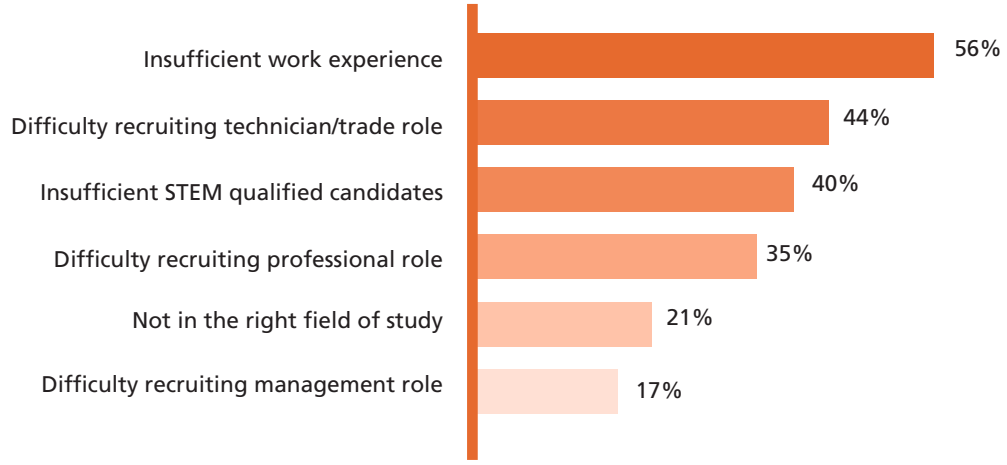
Industry experts, interviewed as part of this research, were asked a similar question and their answers echoed the survey results. Industry experts reported that internationally trained individuals that they employed often have great technical education, but lack soft skills. The experts believe that the lack of soft skills could be a result of differences in work culture and job responsibilities in different countries. Despite such challenges, they commented that internationally educated and trained individuals learn the soft skills as they integrate into the Canadian workforce. Some companies have mentoring programs in place to guide new employees and help them settle into their new roles.

Chart 3.3: Comparison of rating scores of Job Candidates with Canadian degrees and degrees from outside Canada

The hiring experience

Only 4% of the employer respondents stated that they had not hired any STEM qualified candidates in the past 12 months. Among those who did hire STEM qualified individuals, 58% had hired STEM Technicians and Trade Workers, 54% have hired STEM professionals, and 19% had hired for managerial positions. The employers were asked to identify some of the challenges that they have encountered while hiring STEM qualified candidates. As is illustrated in Chart 3.4, the top three challenges identified were: insufficient work experience (56%), difficulty recruiting technician/trade role (44%) and insufficient STEM qualified candidates (40%).

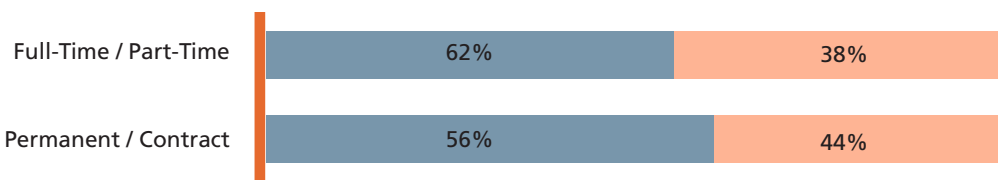
Chart 3.4: Challenges in recruiting STEM qualified candidates



The industry interviewees were asked if insufficient work experience was a major challenge in hiring. Almost all agreed, especially when hiring for entry-level STEM positions. Soft skills is another area of challenge when it comes to recruiting. However, lack of soft skills was often easier to solve in STEM occupations, with mentorship programs and other related trainings. In a few cases, the employers preferred to hire individuals with excellent soft skills and a great passion for learning than those with great technical skills. Passionate individuals, the interviewees said, often learn new knowledge/technology at a faster rate.

The survey asked employers about the type of employment that was offered to new STEM hires in the last 12 months. As is illustrated in Chart 3.5, while the majority of positions were full-time, almost half (at 44%) were contract positions

Chart 3.5: Type of Employment for Recent Hires



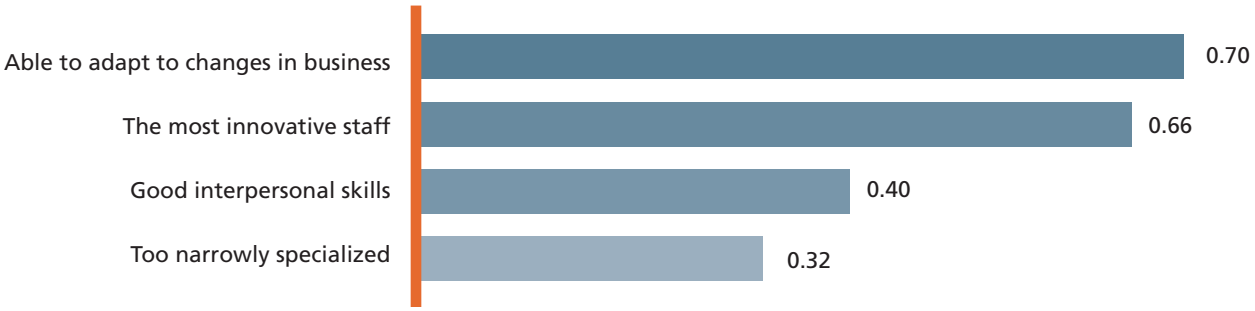
Rating the capacities of job candidates

The survey asked employers to rate the quality of STEM educated individuals based on their recruitment experience. Each level of agreement was scored using the following rating:

- Strongly Agree : 2
- Somewhat Agree: 1
- Somewhat disagree: -1
- Strongly Disagree: -2
- Don't know/Not Applicable: 0

The score for all answers was totaled and divided by the number of respondents for each statement. Chart 3.6 illustrates the scoring for each skill or attribute. The aggregated score suggests that employers somewhat agree that STEM qualified individuals were able to adapt to changes in business and were among the most innovative staff members (scoring 0.7 out of 1).

Chart 3.6: Skills and Attributes of STEM qualified individuals



The employers were asked to identify any specific skills or functions among STEM workers that are already in short supply or will be very soon, and they identified the following:

Technical Skills	Soft skills
Mechanical Engineering	Oral and written communication
Bio Engineering	Cultural diversity awareness
Artificial Intelligence	Customer service
Blockchain	Team work
Robotics	Analytical
Software Development	Creative thinking
Coding	Problem solving
Basic Math	Project Management
Computer	
Trouble shooting	

Industry experts were asked to identify gaps they have seen in the education of STEM degree holders and the skills demand for STEM occupations in their industries. The interviewees noted that most new graduates have solid knowledge of their respective STEM fields, however, many of them lack the necessary soft skills. In addition, there was a consensus among the industry experts that it is extremely difficult to hire for positions that require a solid knowledge of a new emerging technology. For example, although companies want to hire an expert in a new and recently developed software, it often takes individuals some time to learn and master that specific software, and the positions cannot be filled. Individuals who have received their education outside of Canada may qualify for these hard-to-fill positions, however, it was noted that many employers feel reluctant to hire these individuals.

Assessing the quantity and quality of STEM job candidates over the last three years

To explore the trends in STEM skills, the employers were asked to identify the quantity and quality of STEM job candidates over the last three years. The majority (42%) of the respondents agreed that there is a wider pool of STEM job candidates now than before. 30% of respondents believe that the number of STEM candidates has remained the same and 14% believe the numbers have declined over the years. In terms of the quality of candidates, 61% of employers reported that it has stayed the same, 19% reported that it has improved, 12% reported that it has declined, and the rest answered "don't know/not applicable".

The industry experts had similar opinions about the increase in quantity of STEM educated candidates. They commented that the quality of STEM educated individuals has been improving, and that new graduates have a more comprehensive STEM knowledge base than in the past. New generations of STEM candidates often participate in outside-of-school projects, and improve their skills through activities such as building robots or entering STEM-related competitions. One expert expressed how much he was impressed with some of the engineering interns.

"Some of them have done engineering projects in high school that I hadn't done in my PhD program in engineering".

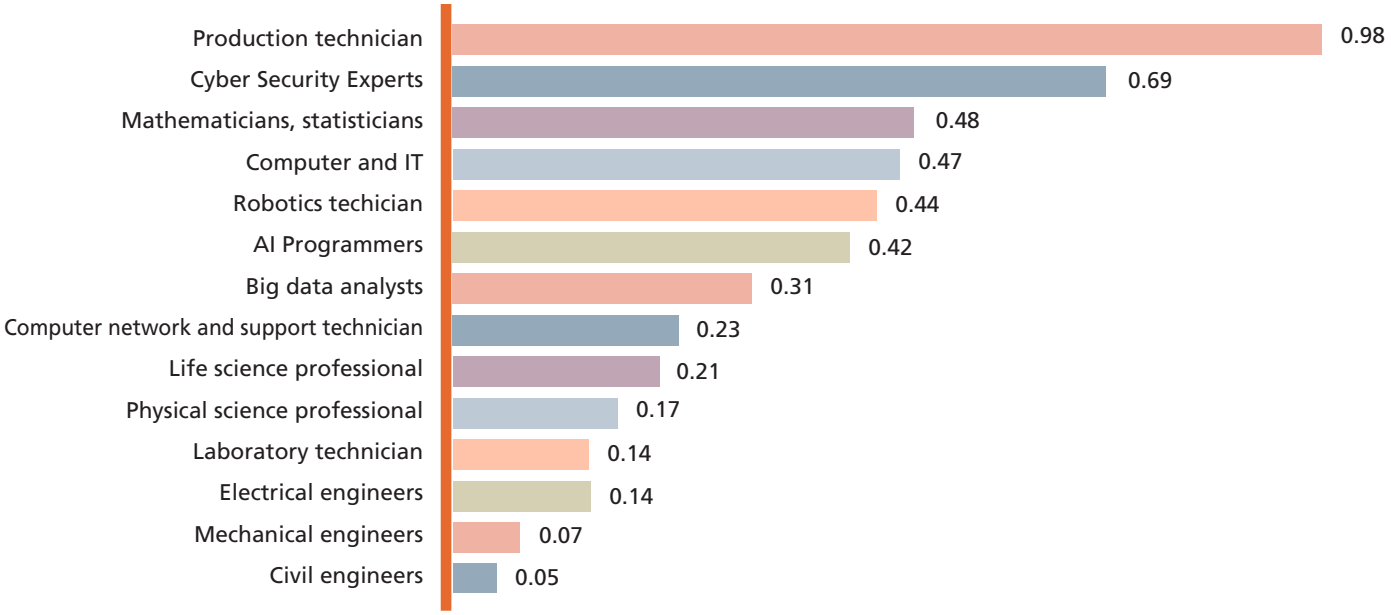
Predictions regarding shortages in STEM occupations

The survey asked employers to consider whether the common STEM occupations would experience a shortage of qualified candidates in the next one to three years. Each level of likelihood was scored using the following rating:

- Very Likely : 2
- Possibly: 1
- Not Likely: -1
- Don't know/Not Applicable: 0

The score for all answers was totaled and divided by the number of respondents for each statement, and the results were illustrated in Chart 3.7. It is evident from the chart that the majority of the employers agree that the labour market will possibly experience a shortage of production technicians and technologists, with cyber security experts being ranked slightly lower in terms of a possible shortage. Other occupations that scored somewhat higher on the possible shortage scale were mathematicians/statisticians, computer and IT professionals, robotics technicians, and AI programmers.

Chart 3.7: Likelihood of Common STEM Occupations Experiencing Shortages



Partnerships with post-secondary institutions

The vast majority (81%) of the employers who responded to the survey stated that they have a current partnership with post-secondary institutions. Their choices were scored using the following rating:

- High: 3
- Moderate: 2
- Low: 1
- Don't know/Not Applicable: 0

The score for all answers was totalled and divided by the number of respondents for each option.

Chart 3.8 shows that the employers' level of involvement with their respective post-secondary institutions focused on three main areas: work placements for academic credit, employment of students after graduation, and work placements.

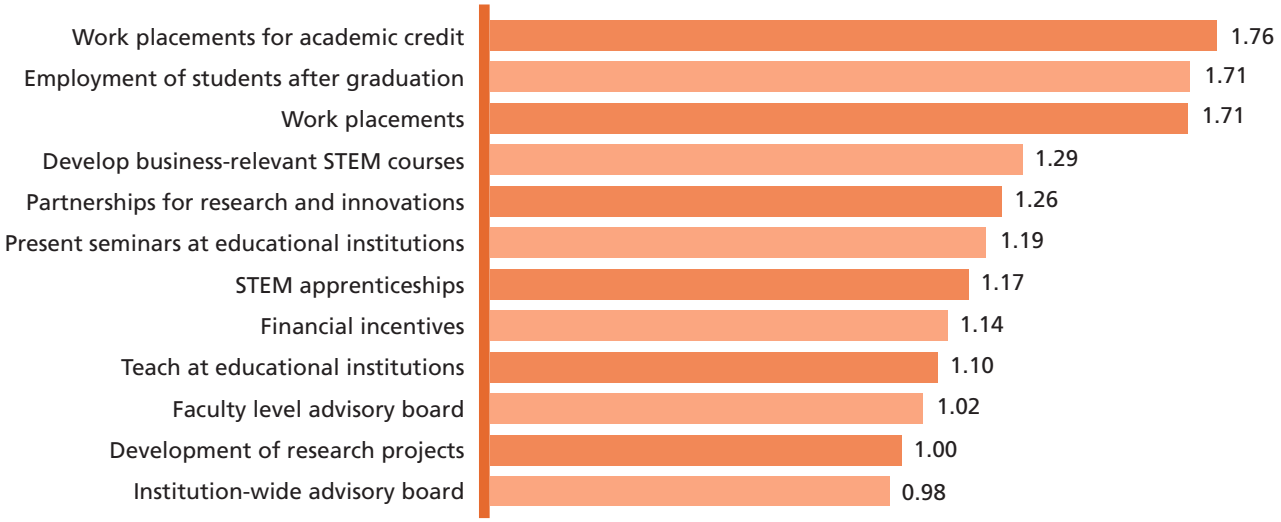
Activities that scored closer to "Moderate" (2.0) were:

- Work placements for academic credit;
- Employment of students after graduation;
- Work placements.

Activities that scored closer to "Low" (1.0) were:

- Institution-wide advisory board
- Development of research projects
- Faculty-level advisory board
- Teach at educational institution

Chart 3.8: Level of Involvement with Post-Secondary Institutions



Employers were also asked to identify the areas of involvement they would like to enhance with their partner post-secondary institutions. Similar to the analysis of previous question, their choices were scored using the following rating:

- High: 3
- Moderate: 2
- Low: 1
- Don't know/Not Applicable: 0

The score for all answers was totalled and divided by the number of respondents for each option. As the Chart 3.9 shows, many employers are interested in developing research projects, further encourage work placements for academic credit, and participate in institution-wide advisory boards.

Chart 3.9: Ideal Level of Involvement with Post-Secondary Institutions

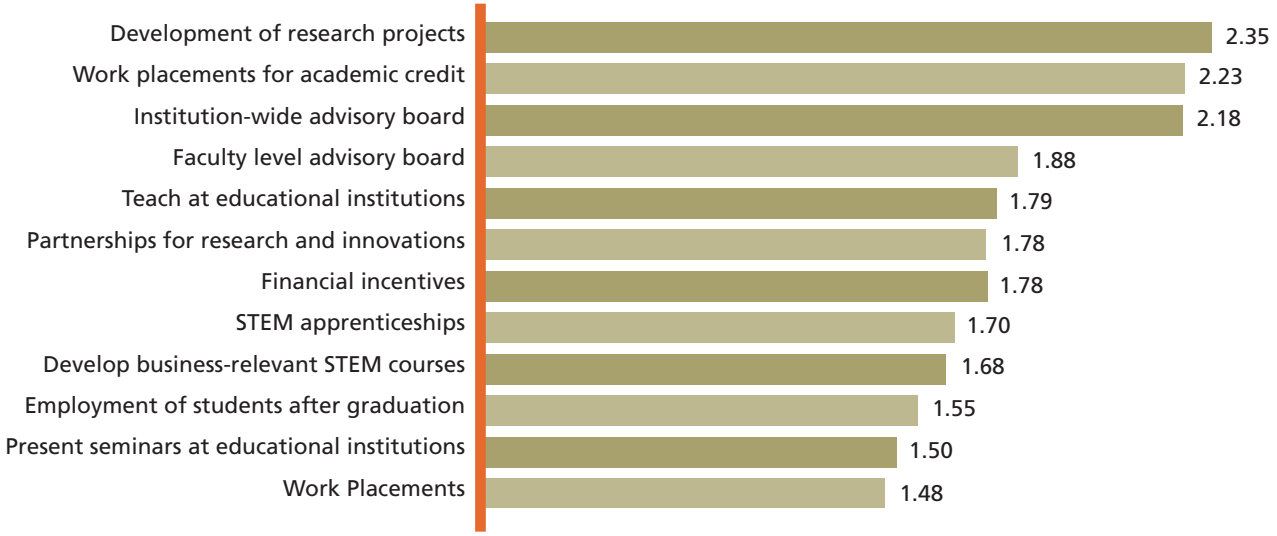
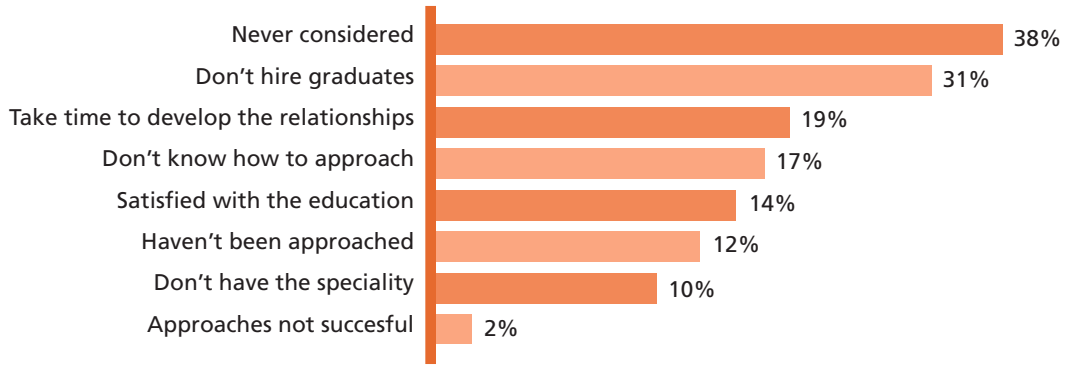


Chart 3.10 explores why some employers do not have relationships with post-secondary institutions. Employers who aren't involved with post-secondary institutions, stated that their lack of involvement was due to two main reasons: they haven't considered entering a partnership with a post-secondary institution and they do not hire new graduates. Some employers also stated that building partnerships with these institutions requires significant time commitment. Employers also provided other reasons in addition to the explanations listed in Chart 3.10, such as lack of government funding to sponsor such partnerships.

Chart 3.10: Reasons for Lack of High-Level Involvement with Post-Secondary Institutions



Strategies to ensure a future supply of STEM workers

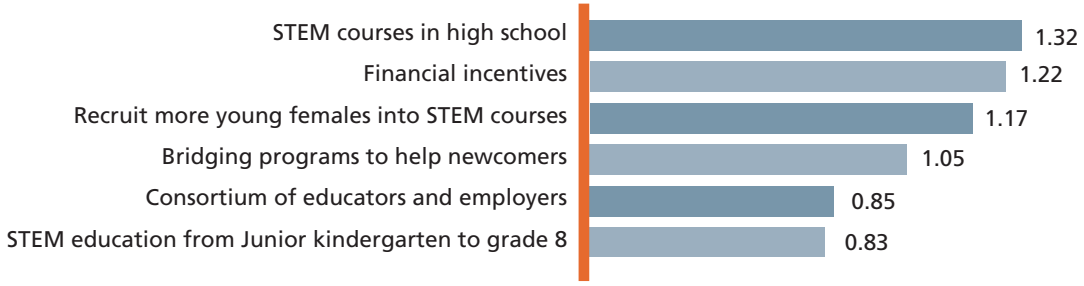
STEM employers were asked to indicate their support or preference for a list of proposed strategies that would ensure an appropriate supply of STEM workers in the future. Each statement was scored using the following rating:

- Very High: 2
- Somewhat High: 1
- Moderate: 0
- Somewhat Low: -1
- Very Low: -2

The score for all answers was totaled and divided by the number of respondents for each option.

The majority of employers agreed that it was important to place greater emphasis on STEM courses in high school to expose more students to STEM studies. Providing more financial incentives to encourage students to study STEM as well as encouraging more young female students to study STEM were also identified as priorities to increase the number of STEM educated candidates (Chart 3.11).

Chart 3.11: Strategic Priorities to Maintain Appropriate Supply of STEM Candidates for the Future



Conclusions and Recommendations

While this report has covered a lot of ground, its overall findings are summarized as follows:

- Based on the statistical analysis, there does not appear to be a shortage of STEM-educated individuals and STEM occupations, although employers cite challenges finding qualified STEM workers.
- In particular, employers cite current and imminent skill shortages relating to specific technical categories in mechanical engineering, bioengineering, artificial intelligence and blockchain.
- There is a widespread view among employers that STEM candidates need to improve their soft skills.
- In the last few years, employers acknowledge that the quantity and to some degree the quality of job candidates has improved.
- It is important to continue to attract more students to enrol in STEM fields in terms of promoting innovation and economic growth.
- While in general individuals with STEM degrees tend to do slightly better as far as their labour market outcomes are concerned, there is a tremendous range of outcomes; and such outcomes depend on a number of factors, including gender and whether one studied in Canada or outside Canada. There are also major variations by different occupations, for example in non-STEM, occupations in Legal and Business Administration have significantly higher labour market outcome than some STEM occupations.
- Compared to international averages, the Toronto CMA has somewhat lower levels of graduates from STEM programs. These numbers are significantly enhanced by the contribution of immigrants, who make up two-thirds of Toronto CMA's STEM grads.
- Immigrants with degrees from outside Canada are assessed by employers as having somewhat lower skills compared to individuals with degrees from Canada, particularly when it comes to soft skills; females with degrees from outside Canada fare especially poorly in terms of their labour market outcomes. The non-participation rates of females with degrees from outside Canada from certain countries warrants further study, given how much higher these rates are compared to other countries.
- The single biggest challenge employers find during the recruitment process is the lack of work experience among job candidates.
- Employers are moderately engaged with post-secondary institutions with respect to providing work placements for students and in hiring graduates. Ideally, employers should expand their work placement offerings, and participate more in joint research and contribute in advisory roles with post-secondary institutions.
- The survey identified two main reasons why employers are not engaged with post-secondary institutions: because they do not even consider opportunities to engage and because they do not hire graduates.
- In order to ensure an adequate supply of STEM graduates in the future, employers feel that high school students should be introduced earlier to STEM studies, the financial incentives should be offered, and that more females should be recruited into STEM disciplines.

Overall, then, these findings point to the following broad actions:

- Encourage and expand enrolment in STEM studies
- Make better use of newcomer STEM degree holders
- Ensure that STEM educational curriculum is current and that it also emphasizes developing soft skills
- Ensure that students have opportunities to acquire work experience

In order to achieve these solutions, this study offers the following recommendations:

1. Cultivate interest for STEM education

In order to develop STEM literacy and build a skilled society, it is important to make STEM education accessible to more people in different age groups with different education level. One of the problems facing employers is that it is difficult to find qualified STEM graduates with domestic STEM education. As mentioned by one employer:

"The foreign trained professionals have qualified education, experience and skills, however it's challenging to get them well integrated into Canadian labour market because they lack Canadian education and experience. However, it is difficult to find domestically trained STEM professionals with the skills and experience in need".

Additionally, only one third of STEM degree holders are female (Table 1.3). This is much lower than the proportion of female in non-STEM fields of study, which is 58%. One strategy to address the supply challenge of STEM graduates is to draw more females into the STEM field of study through special incentives. Another is to cultivate interest for STEM education at a younger age by integrating STEM into elementary school curriculum and promoting STEM careers in high school.

2. Integrate foreign-trained STEM professionals into the Canadian labour market

Over two thirds of STEM degree holders in Toronto CMA are immigrants, and a great proportion of those immigrants obtained their degree from outside of Canada (Table 1.5). In certain occupations, the number of foreign degree holders is quite high: for example, over half of physical science professionals and computer and information systems professionals in Ontario are immigrants who have received their post-secondary education from outside of Canada (Table 1.11). However, there are barriers for foreign-trained professionals to enter the Canadian market as they often lack Canadian experience and have weak people skills. As stated by one of the employers:

"It is challenging for foreign trained professionals to enter into Canadian labour market because there is lacking acknowledgement about their credential".

In order to properly integrate foreign-trained STEM professionals into the Canadian labour market, immigrant employment support programs, such as bridging programs, should be more widely available to orient and support immigrant STEM professionals seeking work and in the workplace. Industry associations and employers should also provide soft skills-focused training to strengthen immigrant employees' people skills and communication skills, in order to make better use of their education.

3. Fill skill gaps between STEM education curriculum and current skills demand

It can be hard for employers to hire or retain employees with specific skills because there are limited educational institutions that offer those programs:

"The employees have to travel long distance to another city to take a trade program every day since it is not available in a local college".

It is important that post-secondary institutions consult with representatives of various industries to keep their curriculum updated on regular basis, and that employers provide their input, either by serving on advisory committees or by responding to surveys regarding current skill needs. It is only by getting current information from employers that education institutions can stay up-to-date on employer and sector needs and offer relevant programs.

4. Promote workplace learning experience

New graduates usually have knowledge but lack applied experience and working skills. As stated by one employer:

"For many of the students, the theory knowledge is good, but not good in practical experience".

It would be helpful if post-secondary STEM programs incorporated mandatory co-op or internship components to consolidate students' STEM skills and better prepare them for future employment. Most co-op programs are usually four months long, and by the time students settle into their positions and learn about their roles, the placement comes to an end. Industry experts recommended that co-op programs should be as long as one year. In order to accomplish this, employers must be more active and offer co-op placements and other experiential learning opportunities.

In conclusion, most of these actions require the involvement of a range of stakeholders: educational institutions, employment service providers, and employers. Any existing or potential skills shortage cannot be solved by the educational system alone; the importance of very up-to-date skills, the need for effective soft skills, and understanding how the workplace functions, can only be accomplished with the active participation of employers in the learning process. These challenges require collaborative, integrated solutions.

These suggestions are not new or unique to Peel and Halton. The emphasis on more employer engagement with the educational system and the provision of greater workplace opportunities have been pursued in other jurisdictions. We have the opportunity to learn from these and other experiences and to adapt the successful practices to our local situation.

The Peel Halton Workforce Development Group intends to consult further with the various stakeholders to discuss ways of exploring how these recommendations can be implemented. A focused and collaborative approach will result in better outcomes and greater impact than we have achieved to date.

Appendices

Appendix A Descriptive Statistics

The following set of tables present the full range of demographic groups and their distribution by skill level for each field of study and post-secondary degree level. These groups are as follows:

- Canadian-born males who obtained their degree in Canada (already presented in Table 2.3);
- Canadian-born females who obtained their degree in Canada;
- Immigrant males who obtained their degree in Canada;
- Immigrant females who obtained their degree in Canada (already presented in Table 2.4);
- Immigrant males who obtained their degree outside Canada;
- Immigrant females who obtained their degree outside Canada.

Table A1: Composite score for distribution by occupational skill level of all employed Canadian-born males who earned their post-secondary degree in Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.76**	**2.90**	**3.44**	**3.79**
ALL STEM	**2.72**	**3.12**	**3.56**	**3.79**
Science and science technology	2.41	2.77	3.26	3.74
Engineering and engineering technology	2.66	3.05	3.72	3.83
Mathematics, computer and IT science	3.03	3.26	3.69	3.81
BHASE (non-STEM)	**2.76**	**2.83**	**3.40**	**3.78**
Business and administration	2.89	2.97	3.48	3.77
Arts and humanities	2.73	2.87	3.25	3.65
Social and behavioural sciences	2.10	2.97	3.30	3.69
Legal professions and studies	2.00	2.58	3.76	3.91
Health care	2.57	2.82	3.40	3.93
Education and teaching	2.57	2.88	3.71	3.82
Trades, services, natural resources	2.76	2.70	3.33	3.71
Mechanics, construction, production	2.82	2.78	3.55	3.76
Other trades, services, natural resources	2.49	2.61	3.18	3.66

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Table A2: Composite score for distribution by occupational skill level of all employed Canadian-born females who earned their post-secondary degree in Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.57**	**2.82**	**3.36**	**3.75**
ALL STEM	**2.54**	**2.97**	**3.29**	**3.67**
Science and science technology	2.57	2.79	3.17	3.66
Engineering and engineering technology	2.82	2.93	3.62	3.80
Mathematics, computer and IT science	2.60	3.10	3.60	3.69
BHASE (non-STEM)	**2.58**	**2.81**	**3.36**	**3.76**
Business and administration	2.66	2.89	3.44	3.72
Arts and humanities	2.64	2.84	3.23	3.62
Social and behavioural sciences	2.51	2.82	3.23	3.66
Legal professions and studies	2.81	2.84	3.67	3.85
Health care	2.37	2.80	3.61	3.87
Education and teaching	2.62	2.86	3.71	3.81
Trades, services, natural resources	2.60	2.63	3.27	3.77
Mechanics, construction, production	2.62	2.78	3.42	3.82
Other trades, services, natural resources	2.60	2.62	3.23	3.77

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Table A3: Composite score for distribution by occupational skill level of all employed immigrant males who earned their post-secondary degree in Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.68**	**2.84**	**3.45**	**3.75**
ALL STEM	**2.69**	**3.00**	**3.57**	**3.76**
Science and science technology	2.63	2.82	3.25	3.68
Engineering and engineering technology	2.65	2.91	3.63	3.76
Mathematics, computer and IT science	2.76	3.13	3.66	3.81
BHASE (non-STEM)	**2.68**	**2.77**	**3.36**	**3.74**
Business and administration	2.79	2.85	3.42	3.74
Arts and humanities	2.66	2.83	3.21	3.62
Social and behavioural sciences	2.13	2.83	3.22	3.61
Legal professions and studies	1.78	2.62	3.64	3.87
Health care	2.29	2.64	3.50	3.89
Education and teaching	2.58	2.83	3.72	3.79
Trades, services, natural resources	2.68	2.69	3.32	3.64
Mechanics, construction, production	2.72	2.73	3.51	3.75
Other trades, services, natural resources	2.53	2.61	3.03	3.54

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Table A4: Composite score for distribution by occupational skill level of all employed immigrant females who earned their post-secondary degree in Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.38**	**2.69**	**3.34**	**3.68**
ALL STEM	**2.53**	**2.86**	**3.35**	**3.68**
Science and science technology	2.35	2.66	3.15	3.61
Engineering and engineering technology	2.57	2.81	3.60	3.71
Mathematics, computer and IT science	2.63	2.97	3.54	3.78
BHASE (non-STEM)	**2.38**	**2.68**	**3.33**	**3.69**
Business and administration	2.60	2.75	3.38	3.65
Arts and humanities	2.58	2.75	3.16	3.58
Social and behavioural sciences	2.43	2.77	3.18	3.59
Legal professions and studies	2.71	2.82	3.49	3.75
Health care	2.15	2.56	3.63	3.82
Education and teaching	3.00	2.88	3.68	3.74
Trades, services, natural resources	2.44	2.55	3.24	3.67
Mechanics, construction, production	2.25	2.71	3.29	3.66
Other trades, services, natural resources	2.44	2.54	3.21	3.67

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Table A5: Composite score for distribution by occupational skill level of all employed immigrant males who earned their post-secondary degree outside Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.56**	**2.67**	**3.09**	**3.39**
ALL STEM	**2.55**	**2.75**	**3.20**	**3.49**
Science and science technology	2.40	2.71	2.96	3.38
Engineering and engineering technology	2.55	2.73	3.18	3.45
Mathematics, computer and IT science	2.63	2.86	3.45	3.64
BHASE (non-STEM)	**2.56**	**2.63**	**2.95**	**3.31**
Business and administration	2.62	2.76	3.02	3.37
Arts and humanities	2.61	2.65	2.80	3.16
Social and behavioural sciences	2.40	2.55	2.94	3.17
Legal professions and studies	2.80	2.57	2.98	3.31
Health care	2.25	2.45	3.01	3.39
Education and teaching	2.22	2.36	2.83	3.28
Trades, services, natural resources	2.56	2.58	2.86	3.18
Mechanics, construction, production	2.56	2.59	3.17	3.48
Other trades, services, natural resources	2.58	2.53	2.65	2.94

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Table A6: Composite score for distribution by occupational skill level of all employed immigrant females who earned their post-secondary degree outside Canada, by field of study, Toronto CMA, 2016

	Apprentice	College	Bachelor	>Bachelor
ALL POST-SECONDARY	**2.26**	**2.50**	**2.84**	**3.21**
ALL STEM	**2.27**	**2.43**	**3.02**	**3.34**
Science and science technology	2.15	2.43	2.82	3.22
Engineering and engineering technology	2.45	2.47	3.10	3.39
Mathematics, computer and IT science	2.39	2.41	3.17	3.45
BHASE (non-STEM)	**2.26**	**2.51**	**2.78**	**3.17**
Business and administration	2.39	2.53	2.76	3.17
Arts and humanities	2.20	2.48	2.69	3.01
Social and behavioural sciences	2.22	2.42	2.78	3.04
Legal professions and studies	0.50	2.54	2.99	3.26
Health care	2.19	2.60	2.99	3.30
Education and teaching	2.34	2.44	2.65	3.23
Trades, services, natural resources	2.23	2.34	2.83	3.22
Mechanics, construction, production	2.12	2.32	3.10	3.29
Other trades, services, natural resources	2.22	2.36	2.65	3.17

Statistics Canada, 2016, Cat. No.98-400-X2016272.

Appendix B Employer Survey

BASIC INFORMATION

1. In what industry/sector is your organization?

- ❑ Accommodation and Food Services
- ❑ Administrative & Support, Waste Management
- ❑ Agriculture, Forestry, Fishing and Hunting
- ❑ Arts, Entertainment and Recreation
- ❑ Construction
- ❑ Educational Services
- ❑ Finance and Insurance
- ❑ Health Care and Social Assistance
- ❑ Information and Cultural Industries
- ❑ Management of Companies and Enterprises
- ❑ Manufacturing
- ❑ Mining, Quarrying, and Oil and Gas Extraction
- ❑ Other Services (except Public Administration), such as automotive repair and dry cleaning services
- ❑ Professional, Scientific & Technical Services
- ❑ Public Administration
- ❑ Real Estate and Rental and Leasing
- ❑ Retail Trade
- ❑ Transportation and Warehousing
- ❑ Utilities
- ❑ Wholesale Trade

2. In which Municipality is your organization located?

- ❑ Burlington
- ❑ Halton Hills
- ❑ Milton
- ❑ Oakville
- ❑ Mississauga
- ❑ Caledon
- ❑ Brampton
- ❑ Toronto
- ❑ York Region
- ❑ Durham Region

3. On an annual basis, approximately how many full-time equivalent staff do you employ? (By full-time equivalent, we mean hours that add up to a full-time job; for example, if TWO employees work 20 hours part-time a week for a year, that equals ONE full-time equivalent job)

- ❑ Zero employees
- ❑ 1-4 employees
- ❑ 5-9 employees
- ❑ 10-19 employees
- ❑ 20-49 employees
- ❑ 50-99 employees
- ❑ 100-199 employees
- ❑ 200-499 employees
- ❑ 500 or more employees

PERCENTAGE IN STEM OCCUPATIONS

4. Considering the total number of FTE employees you have, what percentage of your employees are employed in STEM occupations:

- ❑ None
- ❑ Under 15%
- ❑ Between 15% and 40%
- ❑ Over 40%

SKILL RATING OF JOB CANDIDATES

We wish to ask you to rate two categories of job candidates:

- Individuals with STEM degrees from a Canadian institution (can be Canadian-born or an immigrant)
- Individuals with STEM degrees from an institution located outside Canada (usually an immigrant with a degree from their country of origin)

We wish you to rate them in relation to four skill categories:

TECHNICAL SKILLS

Occupational knowledge related to the job
Use/operation of equipment and tools
Familiar with latest knowledge related to the job

SKILLS

Organizational skills
Problem-solving skills
Math, reading, writing and computer skills

PEOPLE SKILLS

Listening and speaking skills
Interpersonal skills (one-on-one)
Working effectively in a group

PROFESSIONALISM

Good work ethic
Accepts direction and applies advice
Motivated and takes initiative

5. How would you score the average job candidate with a STEM degree from a Canadian institution, according to the following matrix:

	Very good	Adequate	Needs some improvement	Needs a lot of improvement	Don't Know/ Not applicable
TECHNICAL SKILLS					
WORK SKILLS					
PEOPLE SKILLS					
PROFESSIONALISM					

6. How would you score the average job candidate with a STEM degree from an institution located outside Canada, according to the following matrix:

	Very good	Adequate	Needs some improvement	Needs a lot of improvement	Don't Know/ Not applicable
TECHNICAL SKILLS					
WORK SKILLS					
PEOPLE SKILLS					
PROFESSIONALISM					

RECRUITING STEM SKILLS

7. In the past 12 months, did you recruit STEM qualified candidates in any of the following categories: (check all that apply)

- ❑ Managers
- ❑ Professionals
- ❑ Technicians and Trade Workers
- ❑ Other , please elaborate_____
- ❑ None

8. Did you encounter any of the following challenges when recruiting STEM qualified candidates? (check all that apply)

- ❑ There are not a sufficient number of candidates with STEM qualifications
- ❑ STEM qualified candidates are not in the right field of study
- ❑ Not enough STEM qualified candidates with sufficient work experience
- ❑ Difficulty recruiting people with STEM qualifications for technician and/or trade worker role
- ❑ Difficulty recruiting people with STEM qualifications for professional role
- ❑ Difficulty recruiting people with STEM qualifications for management role
- ❑ Other, please elaborate_____

9. What type of employment was offered in the majority of new STEM hires in the last 12 months? (check all that apply)

Permanent/ Contract	0%/100%	10%/90%	20%/80%	30%/70%	40%/60%	50%/50%	60%/40%	70%/30%	80%/20%	90%/10%	100%/0%	Not Applicable
Full-Time/ Part-Time												

10. Based on your experiences of employing and/or recruiting people with STEM qualifications, how much do you agree or disagree with each of the following statements?

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree	Don't Know/ Not Applicable
STEM qualified people are among our most innovative staff					
STEM qualified people have good interpersonal skills					
STEM qualified people can be too narrowly specialized					
STEM qualified people are able to adapt to changes in my business					

SKILL SUPPLY OVER TIME

11. Are there any specific skills or functions among STEM workers, which you find are already in short supply or in your estimate very soon will be?
Please be as specific as you can (you may name up to three):

_____

_____

_____

12. How would you assess the number of STEM job candidates over the last three years?

- ❑ It has gotten better
- ❑ It has stayed the same
- ❑ It has gotten worse
- ❑ Don't know/Not applicable

13. How would you assess the quality of STEM job candidates over the last three years?

- ❑ It has gotten better
- ❑ It has stayed the same
- ❑ It has gotten worse
- ❑ Don't know/Not applicable

14. In your opinion, how likely are the following STEM occupations to experience a shortage of qualified candidates in the next one to three years?

	Very likely	Possibly	Not Likely	Don't know
Mathematicians, statisticians				
Production technicians and technologists				
Life science professionals				
Physical science professionals (physicists, chemists)				
Civil engineers				
Electrical engineers				
Mechanical engineers				
AI programmers				
Robotics technicians				
Big data analysts				
Computer and information systems professionals (software engineers, computer programmers, web designers)				
Laboratory technologists and technicians				
Computer network and user support technicians				
Cyber security experts				

Please feel free to list other STEM Occupations:

RELATIONSHIP WITH POST-SECONDARY INSTITUTIONS

15. Does your workplace currently have any links with post-secondary educational institutions?

- ❑ Yes
- ❑ No

16. Overall, how would you rate your workplace's level of involvement with post-secondary educational institutions against each of the following activities?

	High	Moderate	Low	Don't Know/ Not Applicable
Provision of work placements(eg summer jobs)				
Provision of work placements for academic credit (eg co-op or internship)				
Provision of STEM apprenticeships				
Provision of financial incentives, e.g. sponsorship for work placements				
Engagement with post-secondary educational institutions to develop business-relevant STEM courses				
Encouragement of employees to present seminars at educational institutions				
Encouragement of employees to teach at educational institutions				
Partnership with post-secondary institutions for research and innovations				
Membership of subject or faculty level advisory board (e.g. engineering faculty board)				
Membership of institution-wide advisory board				
Development of research projects				
Employment of students after graduation				

17. Ideally what level of involvement would you want your work place to have with post-secondary institutions?

	High	Moderate	Low	Don't Know/ Not Applicable
Provision of work placements				
Provision of work placements for academic credit				
Provision of STEM apprenticeships				
Provision of financial incentives, e.g. sponsorship for work placements				
Engagement with post-secondary educational institutions to develop business-relevant STEM courses				
Encouragement of employees to present seminars at educational institutions				
Encouragement of employees to teach at educational institutions				
Partnership with post-secondary institutions for research and innovations				
Membership of subject or faculty level advisory board (e.g. engineering faculty board)				
Membership of institution-wide advisory board				
Development of research projects				
Employment of students after graduation				

18. What are the reasons that your workplace does not have higher levels of involvement with post-secondary educational institutions?

- ❑ We haven't been approached by post-secondary educational institutions
- ❑ Our approaches to post-secondary educational institutions have not been successful
- ❑ It would take too much of our time to develop these relationships
- ❑ We are satisfied with the quality of education being provided by post-secondary educational institutions
- ❑ We don't hire graduates
- ❑ We don't know how to approach post-secondary educational institutions
- ❑ We never considered approaching post-secondary educational institutions
- ❑ Most of postsecondary institutions do not have the speciality we are interested in
- ❑ Other (Please specify)_____

FUTURE SUPPLY OF STEM WORKERS

19. Please indicate what priority you would place on the following strategies for ensuring an appropriate supply of STEM workers in the future ("1" is very high priority and "5" is low priority).

	Very high	Somewhat High	Moderate	Somewhat Low	Very low
Place greater emphasis on STEM courses in high school to expose more students to STEM studies.					
Place greater emphasis on STEM education from junior Kindergarten to Grade 8					
Make greater use of bridging programs to help newcomers with STEM degrees to transition into the Ontario labour market.					
Increase efforts to recruit more young females into STEM courses in high school and post-secondary institutions.					
Create a Peel Halton consortium of educators and employers to develop strategies to ensure local supply of STEM workers.					
Provide more financial incentives to encourage more students to pursue STEM degrees as opposed to non-STEM degrees.					

20. If you would like to be connected with post-secondary institutions for potential partnership opportunities, please provide the following information:

Contact name	
Title	
Contact e-mail	
Phone	
Organization name	

21. If you would like to receive the results of this research study, please provide your contact information:

❑ Same as information provided on Question 20

❑ Contact Information (Name, email, phone, and organization):

_____

_____

_____

STEM

MATTERS

LEPC PEEL-HALTON LOCAL EMPLOYMENT PLANNING COUNCIL

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