TEACHING FOR TOMORROW
Building the necessary skills today
The Institute for Competitiveness & Prosperity is an independent not-for-profit organization that deepens public understanding of macro and microeconomic factors behind Ontario's economic progress. Research by the Institute is intended to raise public awareness and stimulate debate on a range of issues related to competitiveness and prosperity. It is the aspiration of the Institute to have a significant influence in increasing Ontario and Canada's competitiveness, productivity, and capacity for innovation. We believe this will help ensure continued success in creating good jobs, increasing prosperity, and building a higher quality of life. We seek breakthrough findings from our research and propose significant innovations in public policy to stimulate businesses, governments, and educational institutions to take action.

The Institute is advised by Ontario’s Panel for Economic Growth & Prosperity, led by Tiff Macklem.

Comments on this report are welcome and should be directed to the Institute for Competitiveness & Prosperity. The Institute is funded by the Government of Ontario through the Ministry of Economic Development, Job Creation and Trade. The views expressed in this report are the views of the Institute and do not necessarily represent those of the Government of Ontario.

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Are we ready for the future labour market?

**I AM PLEASED TO PRESENT** Working Paper 33 of the Institute for Competitiveness & Prosperity, which examines whether the current education system is designed and has the capabilities to meet the needs of the future labour market. As CEOs highlighted in Working Paper 30, *The future is not destiny*, talent is a key strength for Ontario but to maintain and build on talent as a source of competitive advantage, Ontario needs to ensure it is equipping its workforce with the skills and competencies for the workplace of the future.

This Working Paper is the companion to Working Paper 29, *The labour market shift*, which analyzed the state of training and retraining programs in the province offered by businesses and government. Given the incredible pace of technological change and the potential for more than 40 percent of the current jobs in Ontario to be automated, the nature of work and the skills required are shifting. As another school year begins, it is imperative that we reflect on whether our students, educators, and policymakers are ready for the labour market of the future.

While we cannot predict the jobs of the future, we can already foresee some of the skills and competencies – the foundations of jobs – that will be important to develop for the workplace of the future. Our analysis suggests that reading comprehension and social skills will be crucial skillsets to navigating the future workplace, and STEM-related skills such as math, statistics, complex problem solving, and systems skills will be increasingly important. Science and technical skills will also be required for some specialized jobs but at a greater depth. In addition, the future worker will need to be good at working in teams, resilient to change, and articulate and persuasive. Employers are looking for people with strong STEM skills that also have highly complementary skillsets like communication and entrepreneurship; and they are looking for students with strong critical thinking and social science backgrounds that are digitally literate and show initiative. Many more jobs will require comfort dealing with large amounts of data, together with a culture of entrepreneurship that goes beyond performing tasks to creating economic value. The implication is that our schools need to do more to prepare students for a more digital, more disruptive and more entrepreneurial work place.

Recommendations regarding the kinds of skills that should be taught in Ontario’s schools from kindergarten right through post-secondary must also consider whether the education system is poised and has the capacity to successfully impart these skills. As it stands, there are concerns about the readiness of the education system for the increased demand placed on educators by employers. The EQAO math scores of grades 3 and 6 students are slipping and it is not clear that Ontario’s education system has the capacity to teach math at the level of performance needed. In particular, only 19 percent of Ontario students were taught by a teacher with a math
Our post-secondary institutions, in which I have a particular vested interest as the Dean of the Rotman School of Management at the University of Toronto, also have areas for improvement. About 40 percent of humanities and social science undergraduates in Ontario are back in school at an equal or lower level six months after graduation, including 15 percent who enroll in college to become more career ready. We need more collaboration between these institutions to create new combined programs and facilitate the transfer of students between colleges and universities more readily. At the same time, educational institutions and the private sector should work more closely together to update and create programs with the skills being demanded, and expand work-integrated learning opportunities so that students learn job skills and gain work experience before graduation.

Ontario’s education system has been a source of competitive advantage. Companies come here and scale here because there is a deep and diverse pool of well-educated workers. This in turn creates good jobs for Ontarians. To maintain this advantage our education system needs to adapt and build capacity to develop students for a changing workplace. Few policies are more foundational. Education creates more opportunity for everyone, less inequality, a stronger economy, and more prosperous communities.

We gratefully acknowledge the funding support from the Ministry of Economic Development, Job Creation and Trade. We look forward to sharing and discussing our work, and welcome your comments and suggestions.
TEACHING FOR TOMORROW: BUILDING SKILLS TODAY

Talent development is one of Ontario’s key strengths:

- Schools are performing well globally on international testing indicators
- Highest rate of college or university degree attainment amongst peers

But with globalization and technology changing jobs, skills and competencies will be more important than ever to the future economy.

**A skill** is defined as the ability to perform a task or solve a problem.

**A competency** is a broader concept that involves the ability to use skills to meet complex demands in different scenarios.

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**21st century competencies include:**
- Transferrable skills such as communication and collaboration;
- Modern skills such as entrepreneurship and digital literacy; and
- Character skills such as citizenship and social responsibility.

Is Ontario capable of providing these skills?

- **Skills Gap**
  - Employers’ expectations of graduates increases, which causes a gap between the graduates’ skills and what is required.

- **Awareness Gap**
  - Graduates are unable to communicate the skills that they have developed in the education system.

Youth are not prepared to thrive in future labour markets.

Ontario’s K-12 and post-secondary education systems are best positioned to develop these increasingly important skills, but these systems require significant changes.
Youth are not prepared to thrive in future labour markets. Talent development is one of Ontario’s key strengths. But with globalization and technology changing jobs, skills and competencies will be more important than ever to the future economy.

A skill is defined as the ability to perform a task or solve a problem. A competency is a broader concept that involves the ability to use skills to meet complex demands in different scenarios.

- Transferrable skills such as communication and collaboration;
- Modern skills such as entrepreneurship and digital literacy; and
- Character skills such as citizenship and social responsibility.

21st century competencies include:

Ontario’s K-12 and post-secondary education systems are best positioned to develop these increasingly important skills, but these systems require significant changes.

What skills will we need in the future? Is Ontario capable of providing these skills?

EQAO

EQAO scores in recent years.

- reading and writing scores have increased significantly
- math scores have declined sharply

80%
Primary and junior teachers who never took a math course in university.

92%
Students and their parents believe digital technology will be extremely important for future careers

< 1/2
Ontarians view most high school students’ computer literacy as adequate for post-secondary or direct entry to the labour force.

STREAMS

Ontario is the only Canadian province that separates students into applied and academic streams in grade 9.

Students in grade 9 applied courses are much less likely to graduate within five years or go on to college.

RECOMMENDATIONS:
EQAO testing should also include sample-based testing of other crucial 21st century competencies.

Require math courses and assessments in teachers’ college for all future elementary school teachers.

REFORMATION:
Provide high school students with digital literacy skills by requiring them to take a business course.

RECOMMENDATIONS:
Consider removing academic and applied streams in grade 9.

Increase funding for guidance counsellors so grade 7 and 8 students receive adequate support selecting grade 9 courses.

POST-SECONDARY EDUCATION

> 40%
Humanities and social science graduates went back to school six months after graduation, with 15% enrolling in community college.

These graduates state that the subject matter and skills developed in university are not the skills required for their jobs.

56%
University students participated in work-integrated learning in 2018.

Access to work-integrated-learning opportunities are unevenly distributed because of academic, demographic, and financial barriers.

Apprenticeship completion rates in Ontario are low and apprentices are often the first to be laid off in an economic downturn.

High journeyperson-to-apprentice ratios restrict the number of apprentices an employer can take on.

RECOMMENDATIONS:
Increase business involvement in post-secondary program creation.

Facilitate more student transfers between colleges and universities to increase efficiency and better meet labour market needs.

RECOMMENDATION:
Incentivize universities to work with private sector partners to create more accelerated work-integrated learning opportunities.

RECOMMENDATIONS:
Implement the Graduated Apprenticeship Grant for Employers to increase employer buy-in.

Consider further reducing the ratio of journeypersons to apprentices.
CHAPTER 1

SKILLS FOR THE FUTURE OF WORK

Profound shifts in Ontario’s economy will require youth to enter the labour force with a different skill set than previous generations. Understanding what those skills are and ensuring that Ontario’s public education system provides them through elementary, secondary and post-secondary levels is crucial to assure the province’s future competitiveness and prosperity.
The changing economy and labour market

Ontario is currently in the midst of a fourth industrial revolution in which technological advancements build upon and amplify other economic shifts. This revolution will accelerate the province’s shift since the 1970s from a primarily goods-producing economy to an economy focused on services. Since 1997, the share of Ontario’s total annual gross domestic product (GDP) from service industries has increased by eight percentage points.

As the Institute examined in Working Paper 29, The labour market shift, these economic changes are already having profound implications for Ontario’s labour market and workforce. In line with shifts in GDP by industry, employment in service industries since 1976 has grown more than twice as much as employment in goods-producing industries (Exhibit 1).

Workers in both goods-producing and service industries are at risk of being affected by further technological change. Over 41 percent of workers in Ontario are in occupations at high risk of being impacted by automation in the next 10 to 20 years, and another 21 percent of workers face medium risk of being affected. Technological advances will wipe out some job tasks entirely while creating new ones that have never yet existed. These coming changes require Ontario to today start providing its future workers with flexible and career-relevant skill sets.

A skills approach to the future of work

These economic transformations, and the disruption they present to employment, have brought attention to the skills that will be required to thrive in the labour market of the future. Traditional competencies, including critical thinking and problem solving, have always been indicators of labour market success. However, the changing economic, technological, and social conditions of the 21st century mean that inter- and intra- personal competencies – the skills used to interact with others as well as self-manage – will come to play an increasingly important role (see What is a skill vs. a competency – and how do various frameworks stack up?).

Automation is unlikely to eliminate entire occupations but it will instead eliminate certain tasks better performed by technology, thus increasing the productivity and value of complementary human skills. Of the 1.3 million forecasted

EXHIBIT 1  Growth in goods and service-producing industries employment, Ontario, 1976-2017

Note: Goods industries includes the North American Industry Classification System (NAICS) codes 11-33. Service industries includes NAICS codes 41-91. Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada Table 14-10-0023-01.
Traditional competencies, including critical thinking and problem solving, have always been indicators of labour market success. However the changing economic, technological, and social conditions of the 21st century mean that interpersonal and intra-personal competencies – the skills used to interact with others as well as self-manage – will come to play an increasingly important role.

The Institute matched labour market forecasts from the Ontario government with a US Department of Labor database of skill requirements for each occupation to produce a forecast of what skills will be most in demand across the labour market over the next four years. This analysis shows that reading comprehension, social skills (such as coordination and social perceptiveness), writing, and skills related to process, complex problem solving, and systems are required for between 96 and 80 percent of Ontario’s 1.3 million projected job openings between 2017 and 2021 (Exhibit 2). Job candidates will need at least a medium-low aptitude level of these skills in order to fill the projected job openings, with one-third of all job openings requiring a medium-high or high skill level of reading comprehension. Math is important for 48 percent of job openings, with most requiring a
medium-low skill level, but is not important for another 47 percent of job openings. More dramatically – but in line with most predictions of the future of work and automation – there will be few job openings for which technical operations and maintenance skills (such as installation, equipment maintenance, and repairing) are important, and many jobs for which these skills will not be important at all.

Interestingly, despite growing rhetoric around the importance of science, computers, and automation, few jobs will require science skills or technical design and analysis skills such as programming. For the most part, only a low aptitude is needed for the small number of jobs for which science skills, technical design and analysis skills, and technical operations and maintenance skills are important (although two percent of jobs for which science is important – mostly occupations in physical science and engineering – require a high skill level).

The Institute also compared these skill requirements of Ontario’s projected job openings to the province’s employment composition in 2011 (Exhibit 3). For each skill the share of jobs that requires it is projected to increase, meaning that Ontario’s workforce must be generally more skilled in the future. However, some skills have grown more than others, and there are differences in the skill level generally needed to fill future job openings compared to jobs in the 2011 labour market. Although there have been only small increases in the share of jobs that require reading comprehension, social skills, and writing, higher levels of these skills will be necessary for these future jobs. There is a six percentage point increase in the projected share of jobs that need math skills, concentrated mostly among jobs requiring low and medium-low levels of math. On the other hand, while the total share of jobs requiring process, complex problem solving, and systems skills as well as resource management skills has also increased, the trend is toward more jobs that demand higher levels of these skills. Similar upskilling is projected to occur with science, technical design and analysis, and technical operation and maintenance skills, although the total share of jobs that need these skills is projected to remain relatively low.

<table>
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<th>Skill Category</th>
<th>2011 Share of Jobs (%)</th>
<th>2017-2021 Projections Share of Jobs (%)</th>
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<tr>
<td>Reading comprehension</td>
<td>3.8% point total increase</td>
<td>3.8% point total increase</td>
</tr>
<tr>
<td>Social</td>
<td>2.8% point total increase</td>
<td>2.8% point total increase</td>
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<tr>
<td>Writing</td>
<td></td>
<td></td>
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<tr>
<td>Process, complex problem solving, and systems</td>
<td></td>
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</tr>
<tr>
<td>Mathematics</td>
<td>6.0% point total increase</td>
<td>6.0% point total increase</td>
</tr>
<tr>
<td>Resource management</td>
<td></td>
<td></td>
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<tr>
<td>Science</td>
<td></td>
<td></td>
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<tr>
<td>Technical design and analysis</td>
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<tr>
<td>Technical operation and maintenance</td>
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What is a skill versus a competency – and how do various frameworks stack up?

VARIOUS TERMS - foundational, transferrable, 21st century, core, or global skills and competencies – are often used interchangeably when discussing the knowledge and abilities required for success in the labour market of the future. Yet there are distinctions between these two categories. Skills are more narrowly defined as the ability to perform a task and solve problems, while a competency is a broader concept that, while it may include skills, involves the ability to meet complex demands by drawing upon and mobilizing resources in a particular context.

There are dozens of skills and competencies frameworks with key differences. However all frameworks share a common focus on three dimensions—transferable skills, modern skills, and character skills (Exhibit A).

EXHIBIT A. Common elements of 21st century competency frameworks

Transferable skills
- Communication and collaboration
- Analytical abilities
- Creativity and problem solving

Modern skills
- Entrepreneurship (flexibility, adaptability, and resiliency)
- Digital fluency

Character skills
- Citizenship
- Personal and social responsibility
- Self-awareness and direction
- Social and cultural awareness

Source: The Institute for Competitiveness & Prosperity analysis of eight competency frameworks. Frameworks detailed in Appendix B.
The education system must better develop in-demand skills

Skills can be developed through a variety of channels. Ontarians, on their own or through educational institutions, can develop the required skills to thrive in future labour markets. Businesses are also responsible for providing their workers with both formal and informal training, especially for company-specific tasks and processes, although employer spending on training and development has declined since 1993.10

But since nearly one-quarter of the government’s total expenditures in 2017-18 went toward educating Ontarians through public elementary, secondary, and post-secondary education, it is most efficient, and equitable, for these systems to be geared towards developing in-demand skills across the economy.11 Moreover, there are strong empirical links between improving human capital and higher incomes, productivity, and living standards.12 However, changes are needed in order for Ontario’s education system to continue to fulfill its role as the key player in developing in-demand skills among Ontario’s future workforce.

Ontario’s education system is not adapting quickly enough

Talent development is one of Ontario’s greatest competitive advantages: it has the highest rate of tertiary education in Canada and among its peer jurisdictions (Exhibit 4). Additionally, Ontario’s students score above average on all metrics – including reading, science, and mathematics – in the Organisation for Economic Cooperation and Development (OECD) Programme for International Student Assessment (PISA), placing the province among the top performing education systems globally.13 However, these indicators do not demonstrate whether the current education system is oriented towards developing 21st century skills, an issue highlighted by a number of CEOs and futurists interviewed in The future is not destiny.14

Results from the first round of the OECD’s Programme for International Assessment of Adult Competencies (PIAAC) showed that 22 percent of Ontarians aged 16 to 65 scored at the lowest level of numeracy, 15 percent at the lowest level of literacy, and 13 percent at the lowest level of problem solving in technology-rich environments.15 These results suggest that a sizeable portion of the adult population may not have the skills necessary to succeed at complex tasks that are part of work and everyday life.16 Additionally, even though...
83 percent of Canadian education providers feel that youth are adequately prepared for the workforce, only 44 percent of youth and 34 percent of employers agree. While reporting that they expect shortages of technical skills in the near term – with information technology and analytics, statistics, and quantitative analysis areas of growing concern – employers in Ontario are already highlighting a gap in both cognitive and non-cognitive skills. More than a quarter of large Canadian employers said in 2014 that they were either “neutral” or “dissatisfied” with the preparedness of recent university, polytechnic, and college graduates, noting differences in the quality of students and quality of post-secondary programs across the country.

Only 60 percent of Canadian students in their last year of undergraduate studies in 2018 reported that university had contributed either much or very much to their ability to speak in front of small groups; and approximately half (56 percent) said the same about its contribution to their ability to think creatively in order to find novel solutions. Many students also reported that university did not contribute significantly to their skills or knowledge for employment, computer literacy skills, or entrepreneurial skills.

Part of the explanation for this skills gap may be post-secondary institutions’ focus on content knowledge, as opposed to skills development, particularly in universities, where transcripts convey only students’ mastery of disciplinary content, rather than transferrable skills. While Ontario universities do develop and assess skills, there continues to be a lack of systematic assessment of skills, which makes it difficult to understand whether students are any better off when they leave post-secondary than when they entered. This creates a second problem – known as the “awareness gap” – where many new graduates are unable to communicate the skills they have developed, and employers must attempt to infer the graduates’ skill sets from their content knowledge. Nonetheless, many employed post-secondary graduates report using the skills they acquired during their studies. Six months after graduation, 83 percent of 2014 Ontario university graduates working full-time considered their work closely or somewhat closely related to skills developed at university, with the figure rising to 89 percent two years after graduation.
Another potential explanation for the skills gap may have to do with employers’ rising expectations of new graduates. As the tasks that entry-level hires are typically responsible for become automated, youth seeking their first job are faced with more complex requirements. Large Canadian private sector employers report that rapid technological advancements are changing expectations of new graduates, including having them take on “thinking roles” earlier. This aligns with previous analysis of Canadian advertisements for entry-level positions, which found that the majority requested up to two years of experience. A follow-up survey of employers found that applicants with three to five years of experience were most likely to be hired for positions advertised as entry-level.

In 2018, 70 percent of employers indicated that they expect more from new graduates, as compared to five years earlier. Many also indicated a preference for graduates with multi-disciplinary backgrounds. This aligns with findings in The future is not destiny, where leaders stated that, as roles become increasingly multi-faceted, firms will seek employees with complementary skill sets, such as data analysis and business skills. Employers say graduates are for the most part meeting these higher expectations, demonstrating high levels of skills, adaptability and professionalism, but that human skills and basic business acumen remain low. This is problematic given that nearly 40 percent of employers said they are changing their recruitment policies to reflect the need for soft skills.

In Working Paper 29, The labour market shift, the Institute made recommendations to employers, government, and post-secondary educational institutions to train a highly skilled and resilient workforce for those already of working age. This Working Paper discusses the skills school-age Ontarians will need to succeed in the future labour market, and examines whether the current education system – elementary, secondary and post-secondary – is capable of imparting them. It will also assess whether Ontario’s education system is preparing youth to choose the most suitable post-secondary route (apprenticeships, college, or university) and succeed in it. Finally, this Working Paper proposes policy measures to be implemented at both the K-12 and post-secondary levels to improve future labour market outcomes, boost Ontario’s competitiveness, and develop a more prosperous province.

Ontario has a strong educational system and a well-educated population. Yet the province’s educational institutions require adjustments to ensure that students are being provided with the knowledge and skills employers will expect in the future labour market.
CHAPTER 2

LAYING THE FOUNDATION: ONTARIO’S K-12 SCHOOL SYSTEM

Over the past two decades, Ontario has invested in kindergarten to grade 12 (K-12) education in order to improve student outcomes. While many of these efforts have been successful, rapid technological and economic changes mean that the province will need to further invest in the K-12 education system to ensure that youth leave school with adequate skills and knowledge to directly enter the labour market or continue on to post-secondary education.
ONTARIANS HAVE ENJOYED free, compulsory, and centralized publicly-funded education since the mid-1800s – first at the elementary level, and later expanded to secondary education. They, as now, there was an understanding that government should provide youth with a basic level of education because of three main imperfections in education markets: externalities from attaining education that incentivize a lower-than-optimal level of education; the difficulty in obtaining loans for elementary and secondary education; and economies of scale in having the provincial government provide educational services. A strong public education system is additionally beneficial in providing equality of opportunity, thereby increasing students’ interaction with those from diverse backgrounds, which has a demonstrable positive influence at the individual and societal levels.

Economic transformations underscore the importance of a strong and flexible public education system. In fact, Ontario’s public education system was initially developed in recognition that jobs in the then-emerging industrial manufacturing economy required more skilled workers.

Today, the role that elementary and secondary education plays remains largely unchanged. According to the most recent publicly available education strategy, the government of Ontario justifies support for the public education system in order “to enable students to develop the knowledge, skills, and characteristics that will lead them to become personally successful, economically productive, and actively engaged citizens.”

Yet the education system's ability to perform this role is under stress. While grade 8 math and science scores improved in the 2015 Trends in International Mathematics and Science Studies (TIMSS), grade 4 math scores dropped, with only 70 percent of students achieving the intermediate benchmark, lower than the 75 percent of students internationally who met the intermediate benchmark. Additionally, there were more participating jurisdictions that performed better than Ontario than jurisdictions that performed worse.

Only 50 percent of Ontarians reported being satisfied with the school system in 2018, which is slightly higher than the levels reported in the 1980s and 1990s, but far below the 65 percent rate of satisfaction reported in 2012. The previous government recognized the need to expand the foundational skills currently being taught and to better measure higher order skills such as critical thinking, communication, collaboration, and entrepreneurship. Given the updated skill sets Ontarians will require to find jobs in the future, the K-12 education system requires several transformations in order to continue fulfilling this purpose.

A curriculum to better provide foundational skills

Arguably, the most critical component that must change is what is taught, and how well it is being taught, in order to ensure Ontario youth have the right skills to thrive in future labour markets (see Measuring, assessing, and communicating competencies). The current curriculum is grounded in educational reforms that took place in the 1990s, with a shift from a curriculum based upon goals and teaching objectives to one based on student outcomes.

In 2003, elementary and secondary curricula in Ontario began a five-year review cycle, which was extended in 2007 to a seven-year cycle to allow teachers and school boards to build understanding of the updated curriculum and develop supporting materials. The reviews ensure that curricula remain current, relevant, and coherent for K-12 students, and the cyclical nature allows time to develop or update support materials such as textbooks. Revised curriculum documents have fewer targeted curriculum expectations, but are intended to maintain the rigour as well as opportunities for deep understanding. However, some educators say that reduced content in (for example) revised grade 11 and 12 math courses has resulted in students being taught fewer calculus fundamentals and negatively impacted student performance in post-secondary. Curriculum review is led by the Minister of Education’s Advisory Curriculum Council, comprising community leaders and education experts, and involves consultation with various stakeholders.

However, mandating content to be taught by including it in a course curriculum does not ensure that it will actually be learned by students. A lack of clarity about curriculum goals, insufficient teacher access to professional development, inadequate knowledge of new content, and perceived content overload relative to available instructional time can all obstruct the implementation of new course curricula. It is also important to put in place external accountability mechanisms to incentivize teacher (self-) training on mandated subjects. In order to ensure Ontario youth are actually being provided with skills necessary for the future of work, policymakers must also focus on the resources and processes necessary for effective curriculum implementation.
Reading and writing

According to the Institute’s analysis, two of the most important skills in Ontario’s future labour market are reading comprehension and writing, which will be required for 96 and 86 percent of all job openings between 2017 and 2021, respectively. Fortunately, Ontario’s results in these subjects remain strong. In each of the past five years, between 81 and 83 percent of English-language grade 10 students were successful on the Ontario Secondary School Literacy Test (OSSLT). Results for younger students are also strong, and have increased over time (Exhibit 5). This bodes well for Ontario students’ future labour market outcomes, although additional resources may be needed to maintain high achievement in this area.

Mathematics

In contrast to strong results in reading and writing, Ontario students’ math scores have experienced marked declines in recent years, which is problematic given that math is important for slightly more than half of Ontario’s future job openings. In addition to being crucial for jobs that require math skills, comprehension of mathematical concepts improves students’ ability to solve complex problems – a skill which is important for 81 percent of future job openings. Ontario’s Education Quality and Accountability Office (EQAO) math test scores have declined sharply, with only 53 percent of grade 6 students meeting the provincial standard in 2017, compared to 64 percent in 2006. At both the grade 3 and grade 6 levels, math performance has lagged behind reading and writing.

EXHIBIT 5  Share of students meeting provincial standard in reading, writing, and math, Ontario, 2006-2017

Note: Includes students writing both French and English language EQAO assessments. Break in series in 2015 due to incomplete data collection.
Source: Institute for Competitiveness and Prosperity analysis based on data from EQAO assessments microfiles.

Measuring, assessing, and communicating competencies

SOCIAL AND EMOTIONAL competencies are increasingly critical to labour market outcomes: social skills were rated as either moderately or highly important for 88 percent of Ontario’s projected job openings. It has been argued that students can learn them just as they learn formal academic skills—through regular interactions with teachers, classmates and other school staff. In addition to assessing students’ traditional content knowledge, the government of Ontario announced in 2017 that students would be assessed in the 2018-19 year on transferable skills, including critical thinking, communication, collaboration, and creativity and innovation, and character skills including citizenship and self-directed learning. However, the initiative has since been postponed. If implemented, assessing students on these competencies would bring Ontario in line with most prominent international frameworks and several other provinces, including Québec, Alberta, and British Columbia, which have embedded competency frameworks into their public education systems.
grade 6 levels there are also now more schools where fewer than half and fewer than one-quarter of students, respectively, fail to meet the provincial standard in math, and fewer schools where the majority of students meet the standard in math, a sharp contrast to trends in reading and writing scores (Exhibit 6). There is substantial regional variation in EQAO math scores in Ontario (Exhibit 7). Ontario’s performance in the math portion of the OECD’s PISA has similarly declined since 2003, with the province scoring slightly less than the Canadian average in 2015.\textsuperscript{54}

Popular attention has focused on the introduction of inquiry learning as the culprit of declining EQAO math scores.\textsuperscript{55}

Inquiry learning places students’ questions and observations
at the centre of their learning, while educators play an active role by establishing a culture where ideas are challenged and tested, encouraging understanding and further questioning. This model of learning places more cognitive responsibility on students compared with direct instruction and task-based learning. In 2017, slightly under half of grade 3 and grade 6 students had a teacher who utilized collaborative inquiry instructional methods. Despite negative attention directed at inquiry-based learning, teachers’ use of collaborative inquiry methods appears to actually be associated with slightly higher math scores according to 2017 EQAO microfiles: 50.4 percent of grade 3 students and 50.1 percent of grade 6 students who met the provincial math standard had a teacher who used these instructional methods. Slightly higher shares of students who scored at the highest level overall on the math section of EQAO – 52.3 percent of grade 3 students, and 50.4 percent of grade 6 students – had a teacher who utilized collaborative inquiry instruction. In addition, inquiry learning has not had a negative impact in other subjects where it has been introduced, such as language arts, potentially because teachers tend to have a stronger knowledge base in this area.

Ontario’s Task Force on Competitiveness, Productivity, and Economic Progress examined Ontario’s declining math scores in its 13th Annual Report, Finding its own way. At the time, many educators blamed the poor performance of students on changes to the math and science curriculum introduced in 2000 that made the material difficult for students to understand. The Task Force suggested that perhaps declining learning outcomes were not associated with the quantity of instruction but the quality. Although Ontario spent significantly more time per year teaching math in the eighth grade than the median among peer jurisdictions, math and science

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**EXHIBIT 7** Share of grade 3 students meeting provincial standard in math, Ontario, 2017

Note: Meeting provincial standard is defined as students graded at level 3 or 4 overall on the EQAO math section. Results for all publicly-funded schools in English and French secular and separate school boards aggregated by census sub-division.

Source: Institute for Competitiveness and Prosperity analysis based on data from Statistics Canada and EQAO assessments microfiles.
knowledge among Ontario teachers was significantly lower than among the province’s peers: only 19 percent of students in Ontario were taught math by a teacher with a math major compared to a median of 65 percent in comparable North American jurisdictions.\textsuperscript{62}

The previous provincial government recognized the problem of declining math scores and in 2014 announced $4 million in funding for teachers to upgrade their math skills through workshops and courses. This was followed by a $60 million renewed math strategy launched in 2016. While the renewed math strategy devotes significant resources towards teacher professional development and increased math instruction, it does not address issues in the curriculum or inadequate math training for teachers before they begin teaching.\textsuperscript{63} Encouraging greater parental support with math homework is another potential method of improving math scores that often receives attention. However, nearly two-thirds of Ontario parents surveyed feel they lack the knowledge or confidence to help their elementary-age children in mathematics.\textsuperscript{64}

One potential barrier to improving math scores may be that math is often overshadowed within STEM discussions, which tend to put more weight on fostering science.\textsuperscript{65} Considering Ontario’s declining math scores, as well as the much greater importance of math over science in Ontario’s future labour market, improving math skills merits increased emphasis in STEM discussions.

Poor math skills among entering students has already been noted as a problem by post-secondary institutions. For example, across 24 colleges in Ontario, approximately one-third of students in their first semester of college in 2012-13 were deemed at risk of not completing their program due to poor grades in first semester mathematics courses.\textsuperscript{66}

**Applied and academic courses: a new name for streaming**

The option to take either applied or academic courses in grades 9 and 10 was introduced with the intention of creating a system that kept options open for all students.\textsuperscript{67} Prior to 1999, students were streamed in grade 9 into vocational, college or university tracks, a system that was widely criticized for disproportionately placing low-income students into college or vocational tracks.\textsuperscript{68} Applied and academic courses in early secondary school have become prerequisites for “destination-based” (college or university preparation) courses taken in grades 11 and 12.

Academic courses were originally intended to focus on “abstract applications of essential concepts” while applied courses were to emphasize “practical, concrete, application of concepts.”\textsuperscript{69} The expectation was that students would take a combination of applied and academic courses that best aligned with their needs, but both would offer an equally high-quality educational experience with equal standards.

Despite these intentions, applied and academic courses have not had their intended effect. In 2010, 53.5 percent of students enrolled in grade 9 Toronto District School Board (TDSB) applied courses had not completed all grade 8 requirements and had been “transferred” to high school rather than promoted, compared to just 4.5 percent of students in academic courses.\textsuperscript{70} Grade 9 students in predominantly applied courses are also much less likely to graduate from high school within five years (40 percent) compared with those in academic courses (86 percent), and were less likely to proceed to college.\textsuperscript{71} TDSB data has also shown that only 53 percent of Black students were enrolled in an academic program, compared with 80 percent of students of other backgrounds.\textsuperscript{72}

Students in applied and academic streams are essentially divided into separate groups. Sixty percent of students taking applied math in 2014 were taking three or more applied courses, while only 11 percent of students in applied math were taking any academic course.\textsuperscript{73} While there does not seem to be an instructional resource gap between grade 9 academic and applied math with respect to accessibility of technology (internet, algebra tiles, calculators, and presentation technology), students wishing to switch from applied to academic or university preparation courses may require a bridge course, implying that the content itself is different.\textsuperscript{74} Additionally, students in applied courses are more likely to score poorly on standardized tests – in 2016-17 there was a 39 percentage point gap in EQAO test performance between those in academic and applied courses.\textsuperscript{75}

The OECD has affirmed that separating students into groups produces worse outcomes for low-income groups, especially when separated from their peers early in secondary school. This may be due to lower teacher expectations, with students in turn adjusting their expectations and efforts.\textsuperscript{76} While the public generally supports streaming in grade 11 to prepare students for either work, college, or university, less than 20 percent favour streaming in grade 9.\textsuperscript{77} The TDSB has been experimenting with pilot projects to remove applied and academic courses for over three years and has demonstrated that, given the right support, all students can succeed in the academic stream.\textsuperscript{78} On the recommendation of the TDSB’s Enhancing Equity Task Force, the school board
Completion of a business studies course is not currently required to successfully attain an Ontario Secondary School Diploma. The most popular business studies course in 2015-16 was grade 9 Information and Communication Technology in Business, which 38,488 students took (compared to approximately 135,000 grade 9 students enrolled in English, which is mandatory.)

**Digital literacy and fluency**

Another area of growing importance in the labour market is digital literacy. While 92 percent of students and their parents or guardians agree that knowing how to use digital technologies is extremely important to future careers, only slightly less than half of Ontarians view most high school students’ computer literacy as adequate for either post-secondary education programs or directly entering the labour market after high school.

Digital literacy is a wide-ranging area that includes far more than coding skills (which tend to receive the most public attention). While coding is currently an in-demand skill, curricula should include more transferrable skills such as computational thinking and computer science theory, required to understand, use, and create digital tools.

Additionally, there is a need for certain skills to be taught universally: how computers operate, basic computer skills such as word processing and writing emails, and internet literacy (such as how to operate safely online). Current grade 9 and 10 business courses cover many of these topics, but these courses are optional. Advanced skills such as coding and computer-aided design can be developed in optional upper level courses in grades 11 and 12. Finally, digital literacy could be better integrated into other course subjects, which likely would be more agreeable to many Ontarians than reducing class time for teaching reading, writing, and mathematics.

This more holistic view of digital literacy and computer skills makes sense given Ontario’s future labour market trends. Not everyone will need to know how to code: programming is important for only 4.8 percent of projected job openings, and only 27.6 percent of this small number of jobs require a medium-high skill level of programming (62.9 percent require a medium-low level, 9.5 percent require a low level). There is broad public support for providing students with an understanding of the “logic” behind computers, rather than simply how to operate them for specific purposes.
Can teachers provide (new) foundational skills?

Teachers’ College
The Ontario College of Teachers has self-regulated the teaching profession since 1997. The College has a mandate to license teachers in the province, set and maintain professional standards for the profession, implement and enforce a disciplinary process, and accredit teacher education programs, including initial teacher education and career development (advanced qualifications). There are currently 18 university faculties of education in Ontario accredited by the Ontario College of Teachers.

In order to be certified as a teacher in Ontario before 2015, a teacher candidate was required to have at least a three-year bachelor’s degree from an eligible post-secondary institution followed by successful completion of an initial teacher education program (pre-service education), which comprised two semesters of course work and 40 hours of classroom practicum. However, an oversupply of teacher candidates led to high unemployment among recent graduates. In response, beginning in September 2015, the length of time teacher candidates spend in pre-service was doubled to four semesters with 80 hours of classroom practicum. Admissions were also restricted to reduce the supply of teachers (Exhibit 8). In 2017, first-year full-time employment among recent teachers’ college graduates was 62 percent, up from 34 percent in 2014.

Teacher candidates in Ontario choose to teach in two consecutive divisions: primary and junior (kindergarten to grade 6), junior and intermediate (grades 4 to 10), or intermediate and senior (grades 7 to 12). For candidates applying to teach at the primary and junior levels it is not mandatory to have taken courses during undergraduate studies in the areas that a teacher candidate will be required to teach. However, admission preference is given to those with at least one course in each of the core subjects (English, mathematics, physical or life sciences, social sciences/humanities, and an arts specialization). For those wishing to teach in the intermediate or senior divisions, teacher candidates must select one (for junior/intermediate) or two (for intermediate/senior) teachable subjects. Teachable subjects are dependent on undergraduate coursework and include subjects taught at both elementary and secondary levels, such as English and math, as well as more specialized subjects only available at the secondary level, such as business studies or computer studies.

EXHIBIT 8  Number of teachers eligible to teach, Ontario, 1998-2017

Source: Institute for Competitiveness & Prosperity analysis based on data from Ontario College of Teachers Historical Statistics.
Some have criticized the consecutive division structure of Ontario’s initial teacher education programs as misaligned with the elementary and secondary structure of public education. Additionally, primary and junior divisions often have no mandatory prerequisites for undergraduate areas of study in complex teaching areas such as math and science, although the most common arrangement up to grade 6 (and in some schools in grades 7 and 8) is for one teacher to teach the full curriculum, with the exception of certain subjects such as French. Although teacher candidates will have been exposed to mathematical topics through their pre-service education, they may still have limited understanding of certain concepts, and may lack confidence to effectively teach them. This is problematic for inquiry-based learning, which requires that teachers have an in-depth knowledge of the conceptual frameworks underlying what they are teaching since students are encouraged to generate questions related to the content that are then investigated.

In both Alberta and Quebec, initial teacher education programs are divided into elementary (up to grade 6) or secondary divisions (beginning in grade 7). In Alberta, initial teacher education is a four-year degree, with elementary teacher candidates required to take a generalist course load covering all subjects they will teach, and secondary school teachers choosing a major and minor specialization. Similarly, elementary teachers in Quebec are required to have completed coursework in all the subjects taught at the elementary level including math, English, social science, French, ethics/religious culture, and science, while secondary education is provided by teachers who specialize in one or two subjects.

In Ontario, initial teacher education programs are beginning to incorporate mandatory assessment of mathematics competency for all teacher candidates. Lakehead University has instituted a Math Competency Exam that teacher candidates in the primary/junior and junior/intermediate divisions must pass with a minimum score of 75 percent. The test assesses math content knowledge up to grades 6 and 7 for primary/junior candidates and grade 9 for junior/intermediate candidates. This aligns with the Department of Education in England, which has instituted a “professional skills test” designed to ensure all teacher candidates are competent in numeracy and literacy. These types of assessments should be used primarily to identify those who need to remediate their own skills before being licensed to teach, rather than to prevent individuals from joining the teaching profession (see Training for math teaching).

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Beginning in the 2018-19 academic year, the Ontario Institute for Studies in Education (OISE) at the University of Toronto will implement a pilot non-credit “MathPlus” course for teacher candidates, based upon research that shows teacher candidates enter pre-service with limited math content knowledge. As of 2014, incoming primary/junior and junior/intermediate candidates have been required to take a math test geared at the grade 6 and 7 level during orientation week. Findings from four years of data, from 2014 to 2017, reveal that approximately one-third of teacher candidates scored below 70 percent. Without solid underlying knowledge, teacher candidates may have difficulty appreciating conceptual roadblocks that can limit a child’s understanding. The MathPlus non-credit course will be compulsory for all teacher candidates and will comprise two hours of weekly instruction for 12 weeks during the first year of the program. The course revisits elementary math concepts up to grade 8, and teacher candidates will need an overall score of 75 percent or higher to pass.

Part of the challenge in improving teachers’ math fluency is the issue of teacher math anxiety, most often indicated by avoidance. Few teacher candidates opt to make math their teachable subject at the intermediate and secondary levels (Exhibit B). EQAO data also shows that approximately 80 percent of primary and junior teachers have never taken a post-secondary math course. Relative to other additional qualifications, few teachers engage in further math training, although this has improved significantly since 2014 when the government allocated $4 million in additional funding to help teachers upgrade their math skills by subsidizing math additional qualifications (Exhibit C). In 2017, only 2.8 percent of the additional qualifications held by eligible teachers in Ontario were in mathematics. Without compulsory math education for teachers, those who are less confident in the subject will continue to engage in professional development in subject areas they feel more comfortable with.
**EXHIBIT B** Share of new teachers with math as teachable subject, Ontario, 1998-2017

Note: Includes math teachable subjects (basic qualifications) in both English and French.
Source: Institute for Competitiveness & Prosperity analysis based on data from Ontario College of Teachers historical statistics.

**EXHIBIT C** Total number of math additional qualifications (AQs) held by teachers, Ontario, 1998-2017

Source: Institute for Competitiveness & Prosperity analysis based on data from Ontario College of Teachers historical statistics.
Additional Qualifications
Given the rapid changes in education and the long careers of many teachers, teachers’ development should be lifelong, with initial teacher education serving only as the foundation for ongoing learning and professional development. Ontario teachers can also choose to engage in lifelong learning by taking additional qualifications accredited by the Ontario College of Teachers and delivered primarily by post-secondary institutions or school boards. Teachers can either take additional basic qualifications (ABQs), which allow a teacher to add another division or subject to what they are already qualified to teach based on their pre-service education, or additional qualifications (AQs), which allow teachers to expand their knowledge and skills within the divisions and subjects they are already qualified to teach in, or acquire knowledge in new areas. Some AQs are offered as three part sessions which, when taken together, allow a teacher to become a specialist in an area such as business, mathematics or guidance counselling. There are over 150 ABQs and AQs available and thousands of teachers take courses each year. However, teachers must usually pay out of their own pocket to take additional qualifications and advanced degrees in education that come with an opportunity, but no guarantee, of a higher salary.

Professional Activity days
Currently, school boards must designate three professional activity (PA) days focused on teachers’ professional learning with respect to the educational priorities outlined in the province’s strategic plan.100 School boards may also designate up to four additional PA days per year. However, the bulk of additional PA days are allocated for teachers to accomplish administrative tasks such as marking exams, creating report cards, and conducting parent teacher interviews, leaving very little time to focus on professional development.

School boards receive funding for professional development through the Grants for Student Needs but teacher access varies highly by school board, principal, and teachers’ participation.101 Beyond the seven days allocated by the province for professional development, it is challenging for schools and school boards to schedule professional development for teachers during the academic year, since they must pay for substitute teachers on days that are designated for student instruction. While school boards can use their professional development funding to schedule additional teacher training during the summer months and many teachers choose to participate, teachers are not required to attend programming taking place outside the academic year.

In 2017-18, only one guidance counsellor was budgeted per 5,000 students enrolled at the primary, junior, and intermediate levels (kindergarten through grade 8), jumping to 1 guidance counsellor per 385 students at the secondary level (grades 9 to 12).
Career guidance and counselling

Aside from grade 10 Canadian and world studies – which provides limited exposure to civics (politics) and career studies – Ontario public school students receive career and life planning assistance primarily from guidance counsellors. Guidance counsellors play an important role informing and supporting students’ decisions about career paths, including potential jobs and post-secondary education opportunities. Students generally lack information about what skills they will need after graduation, especially technical skills. Considering the fast-moving shift in the skills required to thrive in Ontario’s future labour market, guidance counsellors today are more important than ever. Moreover, while the role of guidance staff is often cited as helping students with transitions and academic programming, guidance personnel are increasingly being called to support student mental health and well-being.

There is no shortage of teachers with additional qualifications in guidance – in 2017 there were approximately 15,300 teachers that held the specialist level guidance and career education additional qualifications. However, funding for guidance services is limited. In 2017-18, only one guidance counsellor was budgeted per 5,000 students enrolled at the primary, junior, and intermediate levels (kindergarten through grade 8), jumping to 1 guidance counsellor per 385 students at the secondary level (grades 9 to 12). Yet in 2018, among secondary schools with guidance counsellors, on average there were 396 students for every guidance counsellor and 826 students per counsellor in ten percent of schools. Just thirty-one percent of elementary schools in the Greater Toronto Area had guidance counsellors, and this was more than triple any other region. In elementary schools with grades 7 and 8, only 29 percent had guidance counsellors in 2014, despite the fact that students are choosing whether to take applied or academic courses in grade 9, which sets in motion their academic path for high school and post-secondary studies.

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K-12 education prepares some students directly for the workforce and lays the foundation for other students’ specialized, disciplinary education in college, university or at an apprenticeship. A rigorous, engaging, and up-to-date curriculum delivered by confident teachers to all students will prepare Ontarians for life-long learning and contribute to the province’s economic competitiveness and stability.
Ontario’s university, college, and apprenticeship systems send tens of thousands of skilled workers into the labour force each year, and the province has among the highest rates of tertiary education attainment in the world. However, there are several areas where change is needed to ensure post-secondary graduates are developing skills relevant in the labour market, including better coordination between what post-secondary institutions teach and what private sector employers seek in future employees.
WHILE ELEMENTARY AND SECONDARY education provides Ontarians with foundational skills for both further education and direct entry into the workforce, post-secondary education – including from universities, colleges, and apprenticeship programs – primarily focuses on specialized, disciplinary skills that are more closely related to employment. Many university graduates report that the subject matter of their studies is closely or somewhat closely related to their subsequent employment (Exhibit 9). However, the degree of association between the subject matter of educational programs and employment varies greatly – for example, it is much higher for health and other professional programs, and lower for arts and science programs (see Assessing skills in PSE).111

The justification for public involvement in post-secondary education – on the grounds of both efficiency and equity – is broadly similar to that of elementary and secondary education. A more educated populace is a more productive one, and public subsidization is required to ensure equality of opportunity between youth from all backgrounds. Investing in higher education also increases innovation and therefore economic competitiveness, as a result of knowledge spillover from post-secondary institutions.112

There is greater room for private involvement in the market for higher education because of its non-compulsory nature, the greater differentiation between programs, and the comparative ease of obtaining loans at the post-secondary level. However, the federal and provincial governments still play a substantial role in encouraging and shaping higher education. There are therefore many channels through which the government can transform Ontario’s post-secondary education system to ensure that Ontarians will thrive in the future labour market.

Universities and colleges

Ontario’s institutions of higher education have been tasked with skill development since their establishment in the mid-1800s and expansion in the latter half of the 1900s. Initially, it was envisioned that universities would focus on academic education and colleges on career-oriented vocational training. In fact, Ontario’s colleges of applied arts and

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**EXHIBIT 9** Relatedness of job skills and subjects to university program, Ontario, 2013 - 2015

<table>
<thead>
<tr>
<th>Subject</th>
<th>Relatedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; medical professions</td>
<td>2.5</td>
</tr>
<tr>
<td>Law</td>
<td>2.5</td>
</tr>
<tr>
<td>Architecture &amp; landscape arch.</td>
<td>2.5</td>
</tr>
<tr>
<td>Education</td>
<td>2.5</td>
</tr>
<tr>
<td>Engineering</td>
<td>2.5</td>
</tr>
<tr>
<td>Computer science &amp; mathematics</td>
<td>2.5</td>
</tr>
<tr>
<td>Journalism</td>
<td>2.5</td>
</tr>
<tr>
<td>Business &amp; commerce</td>
<td>2.5</td>
</tr>
<tr>
<td>Physical sciences</td>
<td>2.5</td>
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<tr>
<td>Kinesiology &amp; food science &amp; nutrition</td>
<td>2.5</td>
</tr>
<tr>
<td>Agriculture &amp; biological sciences &amp; forestry</td>
<td>2.5</td>
</tr>
<tr>
<td>Humanities &amp; fine &amp; applied arts</td>
<td>2.5</td>
</tr>
<tr>
<td>Social sciences</td>
<td>2.5</td>
</tr>
<tr>
<td>Other arts &amp; sciences</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Note: Average rating from 1 (not related) to 3 (closely related) of job skills and subjects used, 24 months post-graduation for 2011-13 graduates working full time.
Source: Institute for Competitiveness and Prosperity analysis based on data from Ontario Council of Universities, Ontario University Graduates Survey.
Universities primarily offer programs leading to a bachelor’s, master’s, or doctoral degree, while college programs typically lead to a certificate, diploma, or applied bachelor’s degree.\textsuperscript{115} Colleges also deliver the in-class portion of apprenticeship training. However, the missions of universities and colleges have gradually converged: both types of institutions are now often focused on providing career-relevant education for economic growth.\textsuperscript{116}

In contrast to that initial vision, all publicly-funded Ontario universities now have a school of continuing studies offering various non-degree certificate programs, while some colleges now offer master’s degrees. Fourteen Ontario colleges have also been granted the ability to award baccalaureate degree programs.\textsuperscript{117} Some of these colleges offer programs through a 2+2 partnership (two years of college followed by two years of university). Nonetheless, a great deal of differentiation remains. Some university undergraduate programs, most notably in the liberal arts, provide students with further development of their foundational skills, rather than specialized skills for a specific career.

**Differentiation among universities**

Ontario has 21 colleges of applied arts and technology, three institutes of technology and advanced learning, and 20 universities.\textsuperscript{118} While there is little differentiation among colleges, universities differ on several dimensions, most notably with regards to academic standards, program mix, credentials awarded, equity of access, learning environment, and research intensity, all of which impact an institution’s finances.\textsuperscript{119} These differences among universities have several benefits: higher quality teaching and research; a greater degree of student choice; increased institutional accountability; and a more competitive and financially sustainable system.\textsuperscript{120} Differentiation therefore offers one means of increasing the breadth and quality of specialized skills provided by universities. Ontario’s past policies regarding differentiation have encouraged universities to specialize in order to retain funding.\textsuperscript{121} However, diversity among institutions tends to be restrained by a commitment to inter-institutional and geographic equity.\textsuperscript{122} As a result, in most areas of study, students can enrol in roughly comparable programs at universities across Ontario.

**Post-secondary programs**

An alternative to differentiation between institutions is greater differentiation within them. This can be accomplished through the creation of new post-secondary programs in order to supply changing labour market demands, develop emerging fields of study, and meet societal needs.

Programs must be constantly created and updated to ensure students are provided with labour market-relevant skills. It typically takes one to one-and-a-half years to launch a new certificate or diploma college program and two-and-a-half to three years to create a new degree program at a college or university, and even longer for higher-credential and multi-institution programs.\textsuperscript{123} Primary responsibility for the design and quality assurance of new programs lies with institutions, which are responsible for curriculum design, development of program objectives, and assembling the required resources.\textsuperscript{124} Programs are typically conceived at the discipline level, with involvement from faculty, administration, and students. After progressing through internal governance, quality assurance processes, and external reviews, the program then requires approval of several arms-length expert bodies, notably the Ontario Universities Council on Quality Assurance (OUCQA).\textsuperscript{125} This process can result in a long wait between program creation and launch.

It is also a supply-side approach – it is unclear to what extent, and through which formal channels (if any), businesses are able to advocate for the creation or modification of programs that provide graduates with in-demand skills, although the Ministry of Training, Colleges and Universities can consider labour market demand when granting final approval of funding and Ontario Student Assistance Program (OSAP) eligibility.\textsuperscript{126} Major modifications to programs, such as adding or removing a co-op requirement, also require approval from the OUCQA, albeit in an expedited process. OUCQA accepts or rejects the program modifications based on the institutions’ stated objectives, admission requirements, program content, and mode of delivery, among other factors, and renders decisions on most applications within a year.\textsuperscript{127}

The creation and modification of programs can face significant resource constraints that limit the extent to which educational programming can match labour market demand. For example, labour supply inelasticity due to tenure and the immobility of faculty between disciplines may mean universities are unable to allocate staff resources to enlarge or shrink programs in line with demand. The removal of mandatory retirement for professors in 2006 resulted in 1,239 fewer faculty hires due to non-retirements by older faculty.\textsuperscript{128}
Assessing skills in post-secondary education

Universities have historically assessed students primarily on content or disciplinary knowledge rather than on the skills they developed during their studies. Increasingly, however, students, employers, and some universities are viewing competencies and learning outcomes as the preferred measure for assessing post-secondary students on acquired skills, in part to address the “awareness gap” around the skills they have when entering the labour market.

“Competency-based education” models upend the semester-based, content-focused format of traditional post-secondary education in order to allow students to work at their own pace at a much lower cost. The model was pioneered by several institutions in the United States including Alverno College and Western Governors University (WGU). Alverno College, located in Milwaukee, Wisconsin, has been delivering an in-class curriculum it refers to as “ability-based” since 1973. Alverno has identified its focus on student outcomes, integrated in a liberal arts approach, as a key characteristic of their delivery model and employs a “narrative transcript” which provides specific examples of students’ accomplished learning outcomes at course completion, and can be shown to employers. WGU was established in 1997 as a stand-alone institution to deliver competency-based online education. At its founding, WGU did not deliver humanities or social sciences disciplines available through other institutions. WGU's competency-based education is characterized by a number of features including courses developed around and assessed on specific competencies, accelerated tracks for students with existing competencies, and monthly rather than semester-based admission fees.

However, there are a number of barriers to introducing competency-based education in Ontario, and many of the purported benefits, including increased affordability, have not yet been proven. Regardless, some aspects of competency-based education, such as a narrative transcript demonstrating how a student achieved learning outcomes, could be incorporated into traditional post-secondary assessment in Ontario.

Learning outcomes – broad yet direct statements that describe the competencies students should possess upon completion of a course or program – are increasingly preferred, because they lend themselves to the common language of skills development. Discipline-specific learning outcomes are stated most explicitly in professional programs where accreditation standards exist concurrently. Nonetheless, it continues to be challenging to accurately assess students’ learning progress, particularly for skills such as teamwork, which can be difficult to accurately measure.

While content-focused assessment predominates in Ontario universities, the Ontario College of Applied Arts and Technology Act (2002) mandates that students are “offer[ed] a comprehensive program of career-oriented post-secondary education and training to assist individuals in finding and keeping employment, to meet the needs of employers and the changing work environment and to support the economic and social development of their local and diverse communities.” Graduates must be able to reliably demonstrate six Essential Employability Skills: communications, numeracy, critical thinking and problem-solving, information management, interpersonal, and personal. Similarly, apprenticeships can be considered a competency-based education, in that training standards include a Competency Analysis Profile, which identifies the training needs of an individual trade and details the skills an apprentice must demonstrate to practice.
Nonetheless, OUCQA has approved 364 undergraduate and graduate programs at Ontario universities since 2011 including 78 STEM programs, 63 health programs, and 57 multi-disciplinary programs (Exhibit 10). At the college level, 123 of 140 applications for new programs were granted between 2011 and 2016.\textsuperscript{129}

**Student pathways: transfer between institutions and further certification at an equal or lower level**

As universities and new programs become more specialized, transferring credits between institutions becomes more important in order to create pathways to a university degree.\textsuperscript{130} This is especially true given the growing importance of interdisciplinary skill sets that combine skills from multiple specialized programs.

Approximately 35,000 students apply to transfer to a university from other post-secondary institutions in Ontario each year, but less than 10,000 actually enrol as transfer students.\textsuperscript{131} The number of students who successfully transferred to an Ontario university remained relatively stable between 2005 and 2016, despite efforts in 2011 to create a province-wide transfer credit system in response to a lack of support for students and demand for improved transparency and access to information about pathways and credit transfer.\textsuperscript{132} The ability to transfer credits is dependent on a number of factors including the grade achieved and the similarity of content. Each college and university in Ontario has its own transfer policy, and may require completion of bridge courses.\textsuperscript{133} Transfer policies are the result of differentiation between universities, including whether the content taught is similar and should receive credit recognition, but also depend on institutional reputation, as well as institutions’ interest in protecting revenue.\textsuperscript{134}

Research has shown that groups traditionally underrepresented in post-secondary education, including Indigenous Peoples, students from low-income backgrounds, and students with disabilities, make up a relatively large portion of the college-to-university transfer student population compared to those who enter university directly from high school. This lends support to previous theories that the pathway allows for those students who traditionally would have attended university at a lower rate to obtain credentials.\textsuperscript{135} Almost one-quarter of college applicants identify lack of preparation for university as a major reason for applying to college.\textsuperscript{136} However, from 2006-07 to 2014-15, the percentage of college students transferring to a university program actually decreased from 8.0 percent to 5.5 percent.\textsuperscript{137}

This could be a side effect of efforts to facilitate transfer between colleges. Since 2014, the Ontario Council on Articulation and Transfer has enabled students in business diploma programs at any of Ontario’s 24 colleges to transfer to any other college in the province after one or two years, without academic penalty or impact on completion time.\textsuperscript{138} Between the 2006-07 academic year and 2014-15, the number of college students transferring to another college program increased from 17.0 percent to 19.1 percent.\textsuperscript{139} An additional reason students may consider doing two years of college

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**EXHIBIT 10** New degree programs approved at universities, Ontario, 2011-2018

<table>
<thead>
<tr>
<th>Category</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Graduate diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts and social sciences</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Business and commerce</td>
<td></td>
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<td>Health</td>
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<tr>
<td>Science, Technology, Engineering, Math (STEM)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Multi-disciplinary and other</td>
<td></td>
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</tbody>
</table>

Note: Approved programs include both entirely new programs and substantially modified existing programs. Excludes new degree programs at Dominican University College (Carleton University) and Saint Paul University (University of Ottawa).

Source: Institute for Competitiveness & Prosperity analysis based on data from the Ontario Universities Council on Quality Assurance list of approved programs.
followed by two years of university is that it can result in lower costs than a four-year full time university degree, provided the student does not have to take any additional semesters. An increase in transfers between institutions could indicate uncertainty regarding program choices, possibly due to inadequate guidance counselling, or poor preparation for post-secondary education in high school. However, this could also be a necessary result of increased specialization of institutions and programs, and an outcome of policies that facilitate these transfers.

One area of concern is the increase in college enrolment among university degree holders looking to supplement their university education. Across Canada, nearly one in four university graduates reported having gone back to school for another certificate, diploma, or university degree of equal or lower level, most often in business, management and public administration (27 percent); education (18 percent); and health and related fields (13 percent). Bachelor's degree holders in the humanities and physical and life sciences were the most likely to complete further post-secondary education. Graduates from the humanities, arts, and behavioural science fields are also more likely to be overqualified for the job they hold, compared to graduates from other fields. In Ontario, 47 percent of humanities graduates and 43 percent of social sciences graduates were in school six months after graduation, with 15 percent of these re-entered students enrolled at a community college. Earlier evidence indicates that this has increased over time: in the 2007-2008 academic year, 8.5 percent of college students reported holding a university degree, up from 7.4 percent in 1999-2000.

Though in some cases these supplementary certifications are compulsory, such as university graduates attending professional school in law or medicine, anecdotal evidence suggests that university graduates are pursuing further college education in order to gain skills for a specific line of work, or may reflect an awareness gap. In these latter cases, pursuit of an additional credential represents an inefficiency in the educational system because students are spending time and (often publicly-subsidized) money to obtain a university degree, only to then need an additional college degree to attain employable skills. Notably, only 23 percent of graduates were back in school six months after completing a business or commerce university degree – highly applied programs often developed in consultation with potential employers.

Degree completion and retention rates
Across the 2013-14 and 2014-15 academic years, 23 percent of Ontario university students who began their degree in 2007 and 2008 had not yet completed it at the same institution where they began. There is significant variance in the completion rate depending on the university a student attends and the program they are enrolled in. Similarly, there is variation among Ontario’s universities in terms of the retention rate of first-year, full-time students. This variation in completion and retention rates may be related to the fact that some universities admit considerably more students with lower high school averages (below 80 percent) while others admit predominantly high achieving direct-entry students.

Average college graduation rates across all programs have hovered between 64 and 67 percent from the 2010-11 to 2016-17 periods. For diploma, advanced diploma, and degrees, students in health programs tend to have much higher graduation rates than in other occupational divisions, followed by applied arts, technology, and business; whereas for certificates, technology students have the highest graduation rate, followed by applied arts and business. Students who take college preparatory courses in mathematics and English in grade 11 and 12 are more likely to have low grades during their first year of college, risking completion of their program, compared with students who took university preparatory classes. Students who took remedial coursework in high school are at a particularly high risk of not completing their post-secondary program. While some youth reported being academically unprepared for post-secondary studies as a reason for dropping out, many reported dissatisfaction with their program, lack of motivation, or uncertainty about career prospects.

In addition to academic or program-related factors, many youth who drop out of post-secondary education share characteristics with those who chose not to pursue further education including: being male, married or living with a partner and children, having parents without post-secondary education including: being male, married or living with a partner and children, having parents without post-secondary education such as being male, married or living with a partner and children, having parents without post-secondary education, not living with two parents while in high school. Among drop outs, 50 percent perceived a barrier to their education – including 11 percent reporting financial barriers – compared to 42 percent who stayed or graduated.

Having university-educated parents is often cited as having an impact on students’ aspirations to attend post-secondary education, and the likelihood of completion, which is linked to parental involvement and higher expectations of educational attainment. While parents’ higher education levels do not prevent some students from leaving their first
post-secondary program, it is “positively and significantly related to the decision to re-enrol in another PSE program.” One reason that has been suggested for these students’ return to post-secondary education is resilience, or their “capacity to overcome obstacles, adapt to change, recover from trauma and to survive and thrive despite adversity.”

**Cost of education**

University remains the most expensive post-secondary option, often justified on the grounds of the earnings premium of university degree holders over other Ontarians. However, it is impossible for the entire population to enjoy this earnings premium. Only 26 percent of projected non-management job openings will require university education, compared to 37 percent that will require college education or apprenticeship training. More students need to consider college and apprenticeships as viable career pathways.

Given the economy-wide productivity benefits of a more educated populace, the government should maintain recent steps, such as simplifying the billing process for OSAP recipients and increasing access to non-repayable assistance, that make both university and college education more accessible. These measures have been widely successful: between 2001 and 2014, the gap in post-secondary participation between children from families in the bottom 20 percent based on income versus the top 20 percent shrank in Ontario more than any other province. However, access is not everything: in order to increase completion of degrees, low-income students also benefit from non-financial supports such as faculty and peer mentorship, and summer counseling. Parental education experiences also have an impact, for example, by establishing academic expectations, demonstrating the earnings benefits of post-secondary education, and providing their children with academic and non-financial support.

**Work-integrated learning**

Work-integrated learning (WIL) and other forms of experiential learning encompass a broad range of post-secondary experiences, including classroom-based experiences (lab work), structured work experiences (co-op and work placements), and institutional partnerships (such as applied research projects). By integrating classroom study with learning in the workplace or a practice setting, WIL provides students with the opportunity to develop the transferable skills necessary to succeed in the job market upon graduation: employers view work-integrated learning as among the most important sources of relevant experience. Among employers who participate in work-integrated learning programs such as co-ops, 82 percent offered employment to at least one graduate who participated in the program at their worksite. Bachelor-level graduates who participate in co-op or work placements also earn more than their peers, have higher full-time employment rates, and are more likely to pay off debt within two years.

However, access to these opportunities is unevenly distributed. Fifty-six percent of university students participated in a WIL experience in 2018. Bachelor degree students in architecture and engineering programs tend to have the highest rates of participation in co-op programs, while graduates with social sciences, psychology and law degrees tend to participate less. College students generally have higher rates of participation in WIL, though they often describe it as a mandatory component, whereas co-op programs for many university students are optional and highly competitive. First-generation students; students who are married, divorced or with dependents; and men are less likely to participate in WIL than immigrants, single students, and women.

Enrolment in more comprehensive WIL such as co-op programs can be more challenging for students from low-income backgrounds because they often must pay tuition and co-op fees, and face additional travel costs, while working at a placement that can pay less than other employment options. Students participating in co-op programs must receive some form of monetary compensation for their work terms in order to receive credit based on the guidelines set by Co-operative Education and Work-Integrated Learning Canada (CEWIL), which regulates the accreditation status of all universities in Canada with co-op programs; however, it does not have to be a wage. Some universities, including the University of Waterloo, which operates the largest and oldest co-op program in Canada, have internal standards requiring students to be paid at least the minimum wage in the jurisdiction of employment. Despite potentially lower wages, students in both college and university with above average debt are actually more likely to participate in WIL than students with below average or no debt.

One deterrent to participating in co-op in Ontario is that it can add to the time it takes to complete already lengthy programs. For example, students enrolling in the University of Waterloo’s co-op program complete their bachelor’s degree in five years instead of the usual four, including summer semesters to accommodate three to five work terms, while also completing eight academic semesters. CEWIL requires that co-op work be no less than 30 percent of the time a
student spends in academic studies (two work terms for a three-year program, three work terms for a four-year program) as well as requiring that students enrol in a school term after their last work placement to “allow for integration between co-op and academic experience, and to prepare for graduate employment.”

Forty-one percent of Ontario students have said they would enrol in a three-year degree if it allowed them to graduate with honours, even if it required them to work harder during their studies. Trades and apprenticeships

Apprenticeships are educational pathways that combine on-the-job training, work experience, and technical training. There are nearly 215,000 projected job openings in Ontario’s apprenticed occupations between 2017 and 2021. However, apprenticeship training receives far less attention compared to the other two post-secondary education channels, in part because relatively few Canadians pursue this route. This is despite the fact that there is more public support for increased spending on apprenticeships than on colleges and universities.

Ontario’s apprenticeship system

Ontario’s apprenticeship system has evolved since its creation in 1928. Since 2013, the Ontario College of Trades, an industry-driven professional regulatory body, has been

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**EXHIBIT 11** Number of apprenticeship registrations and certificates granted, all major trades, Ontario, 2003-2016

Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada Table 37-10-0023-01.
responsible for ensuring that individuals have the skills, training, and certification required to legally practice over 150 trades in Ontario, including the 23 compulsory trades, which fall primarily in the construction and motive power sectors. To practice a compulsory trade, an individual must be a licensed journeyperson (holder of a valid Certificate of Qualification) or an apprentice. The remaining trades are voluntary, meaning certification is offered but not legally required. Typically, employers provide 85 to 90 percent of apprenticeship training in the workplace, while the remaining 10 to 15 percent involves classroom instruction provided by an approved training delivery agent. Upon completion of workplace and in-school components, an apprentice can complete the apprenticeship and, where one exists, write a provincial or interprovincial (Red Seal) exam to become certified in the trade.

Despite an increase in new apprentice registrations over the 2003 to 2011 period, registration in trades has since dropped to 2003 levels, and the number of completions continues to be much lower (Exhibit 11). Additionally, few new apprenticeship registrants in Ontario and across Canada are below the age of 24.

The Ontario apprenticeship system aims to make young people, their families, and educators in Ontario’s elementary and secondary schools more aware of apprenticeships as a viable post-secondary route on par with obtaining a college or university credential. Many complain however that the apprenticeship system lacks the resources and organizational capacity to increase the numbers of students joining the skilled trades. The low rate of apprentices who go on to obtain a trade certificate is an issue that Ontario’s Task Force on Competitiveness, Productivity and Economic Progress previously flagged in its 12th Annual Report. One of the biggest flaws of Ontario’s apprenticeship system is the restriction on ratios of apprentices to journeypersons. Ratios are usually justified on the grounds that they reduce work-related injuries, however academic research has not demonstrated this connection. In 2013 Ontario College of Trades’ Review Panels completed reviews of all 33 trades subject to ratios in Ontario and their decisions were implemented through a new regulation in April 2014. Fourteen trades in the construction sector had their ratios reduced, however many ratios remained the same and one ratio (floor covering installer) had its ratio increased. Ratios are to be reviewed every four years, although the government has postponed the next cycle of ratio reviews to April 2019.
Whether apprentices find work and complete their training is highly influenced by macroeconomic swings, since apprentices are among the first to be laid off during an economic downturn if they are not in the academic portion of their apprenticeship.\(^{190}\) For many apprenticed occupations, the employment rate is below that of the Ontario population in general (Exhibit 12).

Ontario’s plan to enhance apprenticeships must not only include increased awareness of the viability of a trades career, but also sufficient employer buy-in so that apprentices are retained for their full apprenticeship term. In 2016-17, Ontario invested $161 million in apprenticeship programs, while an estimated $129 million was provided through tax rebates to employers training apprentices.\(^{191}\)

In the 2017 Ontario Economic Outlook and Fiscal Review, the government announced it would be replacing the Apprenticeship Training Tax Credit with a new Graduated Apprenticeship Grant for Employers (GAGE). GAGE will provide eligible employers who register and train apprentices in over 100 eligible trades with incentive bonuses when the apprentice completes each level of in-class training, and a bonus upon completion of the apprenticeship itself. GAGE also includes an additional incentive to eligible employers who retain an apprentice from an underrepresented group through training to program completion. Eligible employers can receive up to $19,200 per apprentice over the period of the apprenticeship, depending on the number of schooling levels per trade. The Institute previously noted that the tax credit may have discouraged employers from hiring and keeping apprentices through to certification, as only costs within the apprentices’ first forty-eight months of registration (thirty-six months for those registered after April 2015) with the Ministry of Training, Colleges and Universities could be claimed.\(^{192}\) Therefore, GAGE is a step in the right direction to increased employer buy-in to register, train, and complete apprentices, though details of how employers will access the grant have not yet been released.

One way to expand uptake of the program may be to encourage more vocational training in voluntary trades, particularly in the industrial and service sectors (including information technology trades), where there is currently only one compulsory trade (hairstylist). While there are noted economic disadvantages to requiring certificates of qualifications in fields where there is no public interest reason for requiring a higher standard of education, there is also low incentive to complete training and obtain certification in a voluntary trade. While voluntary trades should not be made compulsory, encouraging high school students participating in OYAP to register as an apprentice at higher levels in voluntary trades makes sense, given the forecast growth in job opportunities in these sectors. Other jurisdictions, including Germany and Switzerland, have achieved great success with Vocational Education Training (VET) programs at the upper secondary level that include a far broader range of career options, spanning from high tech and human services to traditional trades. Upwards of 50 percent of youth participate in the VET system in Germany and Switzerland, which has been credited as one of the key factors behind their low youth unemployment rates, which were 5.5 and 4.2 percentage points lower than Ontario’s in 2017, respectively.\(^{195}\)

The mission of Ontario’s universities, colleges, and apprenticeship system has converged such that all are focused on ensuring graduates have the skills required by the labour market. However, there are roadblocks unique to each type of institution, preventing them from effectively achieving their goal. Looking to the future, institutions should prioritize engaging private sector stakeholders in the process of program creation, facilitating student transfer between institutions, and ensuring the availability of work-integrated learning and apprenticeship opportunities.

Ontario’s Youth Apprenticeship Program (OYAP) is a school-to-work program that allows students to explore and work in apprenticeship trades, beginning in Grade 11 or Grade 12, through a co-operative education program offered by a District School Board. While 17,496 students participated in OYAP in 2016-17, just 3,157 were registered apprentices.\(^{193}\) This also represents a significant drop in participation from 2015-16, when approximately 22,000 students participated in the program and 3,600 registered as apprentices.\(^{194}\)
CONCLUSION AND RECOMMENDATIONS

As 21st century skills and competencies become increasingly required to thrive in Ontario’s future labour market, elementary, secondary, and post-secondary institutions each face unique challenges in preparing students for jobs that demand different and higher levels of skills. To overcome these hurdles, the Institute proposes a series of recommendations across the educational system.
Ontario’s education system has historically provided residents with the skills required for the labour market, and is recognized as among the top performing education systems globally. However, the changing economic landscape will require Ontario’s elementary and secondary schools to adapt. The Institute offers several recommendations to ensure students are adequately prepared for further education or direct entry into the workforce.

Retain, but modify, EQAO testing. Despite some criticism of the annual grades 3, 6, and 9 EQAO tests, 52 percent of the public supports testing every student, and an additional 16 percent of the public (and 19 percent of parents) supports testing a sample of students only. Yet the EQAO fails to test vital competencies in creativity, social-emotional learning, citizenship, and health. The government should modify the EQAO to retain a core math, reading, and writing test taken by all students that takes up 75 percent of test time, with the remaining 25 percent used for sample-based tests of other vital competencies. As the sample tests reveal how to best measure these competencies, they could be incorporated into the census-based testing component of the EQAO. The government should also remain vigilant about the risk of incentivizing ‘teaching to the test’ and other unintended consequences of standardized testing.

Evaluate students on their ability to demonstrate 21st century skills. The province should update the skills section of report cards for K-12 students in the 2019-20 academic year to better assess students on the skills that will be required for the future of work. It is important to explicitly articulate and evaluate students on the development of these skills given that they will be required for success in post-secondary as well as the labour market.

Phase out separate applied and academic courses. Ontario is the only Canadian province that separates students into applied and academic courses in grade 9 – most other provinces begin streaming students in grade 10. The Institute recommends that the government collect data on student outcomes under the current model and, based on a review of the data and the Toronto District School Board’s pilot project on enhanced pathways in grade 9, the government should remove applied and academic streaming in grade 9 across the province. Additionally, the government should conduct a review of the delivery of all college destination-based courses in grade 11 and 12 to ensure students are actually learning the content required to succeed in college.

The government should also increase funding for guidance counsellors at the grade 7 and 8 level towards matching the level of funding at the secondary school level (1 counsellor per 385 students), at least until a decision is made about the removal of grade 9 streaming. This will result in students being more likely to receive sufficient advice on their grade 9 course selection.

Improve teacher development in teachers’ college. The government, in collaboration with the Ontario College of Teachers, should restructure teachers’ college, reducing the three divisions into two: elementary (kindergarten to grade 8), with one teachable subject, and secondary (grade 7 to 12), with two teachable subjects. This will better guarantee that students are getting subject-specialized education at a suitable age, delivered by teachers teaching one or two subjects they are highly knowledgeable in, while still affording principals flexibility when hiring teachers for intermediate years, which can be associated with an elementary or secondary school. Ontario teachers’ colleges should also consider letting pre-service teachers use some of the extra course space available in the now-longer programs towards a subject specialization that pairs content courses taken in other university departments with pre-service courses on how to best teach that specific subject.
Additionally, all Ontario faculties of education should assess incoming elementary teachers on their math knowledge up to grade 8, and require an additional mathematics foundations course for all elementary teacher candidates without an undergraduate mathematics background. This will allow the educators to hone in on their quantitative skills and gain a greater understanding of the content so that they can better impart the knowledge required for students to attain the province’s most in-demand jobs. This mathematics foundation course should be standardized across all of Ontario’s faculties of education.

**Incentivize teacher specialty education.** The government, in collaboration with the Ontario College of Teachers and teachers’ unions, should further incentivize teachers to take more advanced qualifications in subjects crucial to student success in the future labour market, whether through additional pay increases or reducing the cost of the courses. These incentives should be offered for Part 1, Part 2, and Specialist courses, in order to encourage teachers to become as knowledgeable as possible in a subject area. Being a teacher requires a commitment to lifelong learning. However, under the present system teachers are required to undertake the bulk of their continuing studies at their own expense. The Institute has in the past advocated that employers provide sufficient on-the-job training for employees, including public sector employees. The Institute has also previously argued that the current seniority-based salary policy in Ontario’s education system does not reward effective teachers for high performance, or incentivize specialized training. Harmonizing the existing salary policy with a pay system that incentivizes specialty education is advised.

**Introduce a compulsory business and digital literacy course.** High school students graduate with insufficient skills in entrepreneurship and digital literacy, although these skills are addressed in current optional business courses. The government should consider making a business studies course mandatory so that all students have the opportunity to learn the logic of computers, basic skills such as word processing and email writing, and internet literacy, as well as basic entrepreneurial skills to help them be more resilient in the changing labour market. This follows from the recommendation in the 12th Annual Report of Ontario’s Task Force on Competitiveness, Productivity and Economic Progress to promote entrepreneurship in universities.

**Review curricula more frequently.** The government should conduct cost-benefit analyses of a return to a five-year curriculum review cycle (as was introduced in 2003), rather than the current seven-year cycle (as of 2007). This would enable more frequent updating of course content in line with post-secondary education and labour market needs. Increased resources for in-service education would allow for better implementation of updated curricula in these shortened review timeframes.
Involve businesses more in program creation. Currently, new university programs are largely created by faculty in academic departments, although the Ministry of Training, Colleges, and Universities can consider labour market demand when giving its final approval for funding and OSAP eligibility. The government and universities should consider more formal channels, such as advisory councils and program reviews, for employer involvement from the very beginning of the process of program creation. Educational institutions should work with the government to streamline program creation and modification processes.

Increase transfers between institutions. Facilitating smoother transfers between colleges and universities increases equity and can better meet labour market demands. The government should increase funding to the Ontario Council on Articulation and Transfer, or find an alternate method to establish more transfer agreements between colleges and universities, increasing combined programs, greater transferability of credits, and stackable credentials.

Create more work-integrated learning opportunities. The government should incentivize universities to work with private sector partners to create more accelerated (four year) work-integrated learning degrees, complement existing co-op programs, and expand the range of options available to students. These measures will reduce potential barriers associated with the length and cost of WIL degrees so that more students can access these programs. By creating more avenues for partnership with the private sector for WIL opportunities, students will have more opportunities to acquire the skills necessary to succeed in the labour market.

Fix the apprenticeship system. The government should ensure thorough implementation of the Graduated Apprenticeship Grant for Employers to increase employer buy-in to the apprenticeship system. The Ontario College of Trades should consider further reducing the ratio of journeypersons-to-apprentices. Additionally, the government, through the Ontario Youth Apprenticeship Program, should focus on promoting the trades as viable career options, including encouraging youth to register as apprentices so that they can begin vocational training in high school.

Collect data for program improvement. The government and educational institutions should collaborate to collect more feedback at the program or discipline level, rather than at the institutional and course levels, and incorporate input from recent alumni, rather than current students only, in order to guide program improvement. Institutions should improve communication and understanding between their faculties and the major employers of their alumni.

Ontario has all the building blocks necessary to cement its status as home to a world class education system of the future. By implementing changes in the elementary, secondary, and post-secondary educational systems today, Ontario will ensure its youth have the most sought-after skills needed to succeed in the labour market of tomorrow, fortifying the province’s competitiveness and prosperity in a new economic era.
END NOTES


2 Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada, Table 36-10-0402-01.


4 ibid.


7 Institute for Competitiveness & Prosperity analysis. Methodology described in Appendix A.


9 Institute for Competitiveness & Prosperity analysis. Methodology detailed in Appendix A.

10 Institute for Competitiveness & Prosperity. “The labour market shift: Training a highly skilled and resilient workforce in Ontario”.


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16 ibid.


21 ibid.


31 ibid.

32 Institute for Competitiveness & Prosperity. “The future is not destiny: CEO perspectives on realizing Ontario’s potential.”


34 Royal Bank of Canada, “Humans Wanted: Humans Wanted: How Canadian Youth can Thrive in the Age of Disruption.”


42 ibid.


48 ibid.


54 ibid. “Programme for International Student Assessment (PISA), 2015.”


57 ibid.

58 Institute for Competitiveness & Prosperity analysis based on data from EQAO microfiles.


Hart and Kempf. "Public Attitudes Toward Education in Ontario 2018."


Hart and Kempf. "Public Attitudes Toward Education in Ontario 2018."


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Institute for Competitiveness & Prosperity analysis. Methodology described in Appendix A.


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Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada Table 37-10-0023-01.


Hart and Kempf, “Public Attitudes Toward Education in Ontario 2018.”

Task Force on Competitiveness, Productivity and Economic Progress, “Course correction: Charting a new road map for Ontario.”


Task Force on Competitiveness, Productivity and Economic Progress, “Course correction: Charting a new road map for Ontario.”


ENDNOTES TO SIDEBARS


b The Institute for Competitiveness & Prosperity reviewed eight skills frameworks listed in Appendix B.


g Dorwood and Sandford Brown, “Closing the Numeracy Gap: An Urgent Assignment for Ontario.”

h Institute for Competitiveness & Prosperity analysis of Ontario College of Teacher Historical Data.


j ibid.

k ibid.

l ibid.

m Abner, Bartosh, Ungerleider. “Productivity Implications of a Shift to Competency-Based Education: An Environmental Scan and Review of the Relevant Literature.”

n ibid.


p ibid.


Hart and Kempf, “Public Attitudes Toward Education in Ontario 2018.”


Task Force on Competitiveness, Productivity and Economic Growth, “Finding its own way: Ontario needs to take a new track.”

Task Force on Competitiveness, Productivity and Economic Progress, “Course correction: Charting a new road map for Ontario.”

ibid.
ANALYZING THE CHANGING SKILL REQUIREMENTS OF ONTARIO RESIDENTS’ JOBS

To examine and assess how predicted skill trends would play out in the Ontario labour market, the Institute analyzed forecasts produced by the Ontario Ministry of Training, Colleges, and Universities from the Canadian Occupational Projections System for the projected number of job openings across Ontario, by occupation, over the following five years. The Institute utilized currently available forecasts for the period 2017 to 2021. These forecasts are produced for 500 occupations at the 4-digit ‘unit group’ level in the 2011 version of the National Occupational Classification (NOC), produced by Statistics Canada and Employment and Social Development Canada. A computable estimate of the number of job openings was calculated as the mid-point between the low-end and high-end estimates of job openings per occupation. For occupations with only a low-end or only a high-end estimate given, the computable estimate of openings was calculated as 50 percent higher (lower) than the given low-end (high-end) estimate.

These labour market projections by occupation were then matched to occupational skill requirements produced by the US Department of Labour Occupational Information Network (O*Net), using a concordance process established by Statistics Canada. O*Net skills data are based on ratings of the importance of 35 specific skills to the performance of a specific occupation and the level of these skills needed to perform the occupation. These ratings were made by individuals currently working in an occupation and their employers, as well as from “trained occupational analysts who base their ratings on a variety of resources, including job titles, descriptions and updated job incumbent ratings.” Skill importance is rated from 1 to 5, with ‘not important’ for skills rated less than or equal to 1, ‘somewhat important’ for ratings between 1 and 2.5, ‘medium importance’ for ratings between 2.5 and 3.5, and ‘high importance’ for skills rated between 3.5 and 5. Similarly, level is rated from 1 to 7, for occupations that skill is rated important for (i.e., level 3 and greater), with ‘low skill level’ for ratings between 1 and 3, ‘medium-low skill level’ for ratings between 3 and 4, ‘medium-high skill level’ for ratings between 4 and 5, and ‘high skill level’ for skills rated between 5 and 7.

Combining these job-skill ratings with the Ontario labour market projections enabled the calculation of the number of projected job openings for which the importance or aptitude level of a certain skill was within a certain range, as following:

\[
A_{k, x_0, x_1} = \sum_{j=1}^{495} \alpha_j \beta_{j,k} ; \beta_{j,k} = \begin{cases} 
1 & \text{if } x_0 < \delta_{j,k} < x_1 \\
0 & \text{if else}
\end{cases}
\]

Where \(A_{k, x_0, x_1}\) is the number of projected job openings for which the required importance or aptitude level of a certain skill \(k\) was within a certain range defined by \(x_0\) and \(x_1\); \(j\) refers to one of 495 occupations (4-digit NOC unit groups) for which there are skills data; \(\alpha_j\) is the number of projected job openings in occupation \(j\); and \(\beta_{j,k}\) is a dummy variable to indicate whether \(\delta_{j,k}\), the required importance or aptitude level of skill \(k\) in occupation \(j\), is within the skill range under consideration (e.g., no or low importance, medium importance, etc., and low skill level, medium-low skill level, etc.). This summation was performed separately for the required importance and for the required aptitude level of each range of each skill \(k\).

The 35 skills included in the O*Net occupational skill requirements dataset were aggregated to nine skill categories through an established confirmatory factor analysis.
<table>
<thead>
<tr>
<th><strong>Reading comprehension</strong></th>
<th>Understanding written sentences and paragraphs in related documents.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Writing</strong></td>
<td>Communicating effectively in writing as appropriate for the needs of the audience.</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>Using mathematics to solve problems.</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>Using scientific rules and methods to solve problems.</td>
</tr>
<tr>
<td><strong>Process, complex problem solving, and systems</strong></td>
<td><strong>Active learning</strong>: Understanding the implications of new information for both current and future problem solving and decision making.</td>
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<tr>
<td></td>
<td><strong>Complex problem solving</strong>: Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.</td>
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<td></td>
<td><strong>Critical thinking</strong>: Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.</td>
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<td></td>
<td><strong>Judgement and decision making</strong>: Considering the relative costs and benefits of potential actions to choose the most appropriate one.</td>
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<tr>
<td></td>
<td><strong>Learning strategies</strong>: Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.</td>
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<tr>
<td></td>
<td><strong>Monitoring</strong>: Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.</td>
</tr>
<tr>
<td></td>
<td><strong>Systems analysis</strong>: Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.</td>
</tr>
<tr>
<td></td>
<td><strong>Systems evaluation</strong>: Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td><strong>Active listening</strong>: Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.</td>
</tr>
<tr>
<td></td>
<td><strong>Coordination</strong>: Adjusting actions in relation to others’ actions.</td>
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<tr>
<td></td>
<td><strong>Instructing</strong>: Teaching others how to do something.</td>
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<td></td>
<td><strong>Negotiation</strong>: Bringing others together and trying to reconcile differences.</td>
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<tr>
<td></td>
<td><strong>Persuasion</strong>: Persuading others to change their minds or behaviour.</td>
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<tr>
<td></td>
<td><strong>Service orientation</strong>: Actively looking for ways to help people.</td>
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<tr>
<td></td>
<td><strong>Social perceptiveness</strong>: Being aware of others’ reactions and understanding why they react as they do.</td>
</tr>
<tr>
<td></td>
<td><strong>Speaking</strong>: Talking to others to convey information effectively.</td>
</tr>
<tr>
<td>Technical operation and maintenance</td>
<td>Equipment maintenance: Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.</td>
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<tr>
<td>-------------------------------------</td>
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</tr>
<tr>
<td></td>
<td>Equipment selection: Determining the kind of tools and equipment needed to do a job.</td>
</tr>
<tr>
<td></td>
<td>Installation: Installing equipment, machines, wiring or programs to meet specifications.</td>
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<tr>
<td></td>
<td>Operation and control: Controlling operations of equipment or systems.</td>
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<tr>
<td></td>
<td>Operation monitoring: Watching gauges, dials or other indicators to make sure a machine is working properly.</td>
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<tr>
<td></td>
<td>Quality control analysis: Conducting tests and inspections of products, services or processes to evaluate quality or performance.</td>
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<td></td>
<td>Repairing: Repairing machines or systems using the needed tools.</td>
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<td></td>
<td>Troubleshooting: Determining causes of operating errors and deciding what to do about it.</td>
</tr>
<tr>
<td>Technical design and analysis</td>
<td>Operations analysis: Analyzing needs and product requirements to create a design.</td>
</tr>
<tr>
<td></td>
<td>Programming: Writing computer programs for various purposes.</td>
</tr>
<tr>
<td></td>
<td>Technology design: Generating or adapting equipment and technology to serve user needs.</td>
</tr>
<tr>
<td>Resource management</td>
<td>Management of financial resources: Determining how money will be spent to get the work done, and accounting for these expenditures.</td>
</tr>
<tr>
<td></td>
<td>Management of material resources: Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.</td>
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<tr>
<td></td>
<td>Management of personnel resources: Motivating, developing, and directing people as they work, identifying the best people for the job.</td>
</tr>
<tr>
<td></td>
<td>Time management: Managing one’s own time and the time of others.</td>
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</tbody>
</table>

The number of openings for these aggregated skill categories was calculated as the mean number of projected job openings for each of its component skills (for the skill range under consideration), since there is no relative weighting differences among component skills within a category. The number of jobs in Ontario in 2011 by importance and skill level required of each skill was calculated by a similar process, using employment data by occupation (4-digit NOC unit group) from the 2011 National Household Survey.

The number of projected job openings by education requirement (university education and college education or apprenticeship training) was calculated by grouping the occupation-level estimates by skill level (education usually required), from the Variant of NOC 2011 – Analysis by skill level. Similarly, the number of projected job openings for Ontario’s apprenticed occupations was calculated by summing the number of projected job openings for NOC unit groups listed as apprenticeable occupations.

Appendix A Endnotes

A The Institute is very grateful to Statistics Canada researchers Marc Frenette and Kristyn Frank for providing guidance and a concordance file between NOC 2011 and O*Net job skill requirements.


D Described in Frenette and Frank, “Do Postsecondary Graduates Land High-Skilled Jobs?”


## 21ST CENTURY COMPETENCY FRAMEWORKS

<table>
<thead>
<tr>
<th>Competency Framework</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>21st Century Skills &amp; Competencies for New Millennium Learners</strong> <em>(OECD, 2009)</em></td>
<td>Competencies are thought of in three dimensions: information, which typically involves research and problem solving; communication, including sharing and transmitting information and collaboration; and ethics and social impact, such as social responsibility and consciousness about challenges of the new digital world.</td>
</tr>
<tr>
<td><strong>Assessment &amp; teaching of 21st Century Skills (ATC21S)</strong> <em>(University of Melbourne sponsored by Cisco, Intel, Microsoft; 2012)</em></td>
<td>Groups ten basic skills into four broad categories: ways of thinking (creativity and innovation; critical thinking, problem solving and decision making, and learning to learn/metacognition); tools for working (information literacy; information and communication technology literacy); ways of working (communication and collaboration); and ways of living in the world (citizenship, local and global; life and career; personal and social responsibility including cultural awareness and competence).</td>
</tr>
<tr>
<td><strong>The Competencies Learners Need to Succeed</strong> <em>(Centre for Curriculum Redesign, 2015)</em></td>
<td>Groups competencies into three areas: knowledge, including traditional (e.g. mathematics), modern (e.g. entrepreneurship), and thematic (e.g. global literacy); skills, such as creativity, critical thinking, communication, and collaboration; and character, including mindfulness, curiosity, courage, resilience, ethics, leadership.</td>
</tr>
<tr>
<td><strong>21st Century Student Outcomes</strong> <em>(Partnership for 21st Century Learning, 2016)</em></td>
<td>Student outcomes are tied to four components: key subjects and themes, including both traditional content knowledge and 21st century interdisciplinary themes such as global awareness, financial literacy, health literacy, and environmental literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, communication, and collaboration; information, media and technology skills; and life and career skills including flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership, and responsibility.</td>
</tr>
<tr>
<td><strong>Measuring What Matters</strong> <em>(People for Education, 2017)</em></td>
<td>Defines school success by broadening the indicators used to measure progress beyond literacy and numeracy. Alongside academic achievement, the framework considers five domains (each with concrete competencies and skills): citizenship education, creativity, health (physical and mental), social-emotional learning (self-awareness, self-management, social awareness, interpersonal relationships), and quality learning environments.</td>
</tr>
</tbody>
</table>
### Global Competencies
(Toronto District School Board, 2018)

Proposes three domains of knowledge which contribute to the “global learner character” of students: foundational knowledge (including cognitive competencies), meta knowledge (including intrapersonal competencies), and citizenship, or humanistic knowledge (including interpersonal competencies).

Also critical is digital fluency, the dynamic, evolving, and graduated aptitude which empowers the users of digital technologies to reach high levels of digital expertise and produce works of significance by exploring, accessing, organizing, interpreting, evaluating, realizing, and creating digital information and ideas in order to enhance learning in other domains and participate successfully in society.

### Pan Canadian Global Competencies
(Council of Ministers of Education, Canada)

Outlines six competencies: critical thinking and problem solving; innovation, creativity and entrepreneurship; learning to learn/self-awareness and self-direction; collaboration; communication; and global citizenship and sustainability.

### C21 Canada 7Cs Competencies
(Canadians for 21st Century Learning and Innovation, 2012)

There are seven competencies all students need to succeed in the 21st century: creativity, innovation and entrepreneurship; critical thinking; collaboration; communication; character; culture and ethical citizenship; and computer and digital technology.
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