

**EMERGENCY FOR  
THE WORLD OF EDUCATION:**

# **ADAPTING TO THE DIGITAL REVOLUTION**

WHITE PAPER

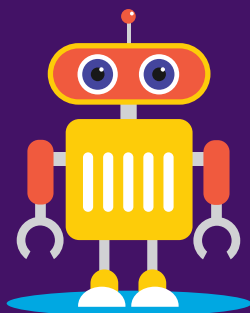


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*“Tomorrow’s illiterate will not be those who cannot read, but those who have not learned how to learn”.*

*Alvin Toffler (1970)*

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## FOREWORD

Under its mandate given by the Ministry of Education of Ontario, Groupe Média TFO has created and broadcast quality digital educational content, in French, while remaining ahead of trends and priorities in the field of education. It has always been Groupe Média TFO's mission to make a lasting and strong contribution to the thriving development of Ontario's Francophonie.

We are motivated to enable current and future generations of Francophones to thrive. We seize opportunities to advance the cause of the French language in Canada with passion. This desire to ensure that young Francophones continually have access to education is, intimately connected with franco-Ontarian history and culture, and the social and cultural fabric of Canadian society.

Recognizing the major transformations facing the world with the rise of the fourth Industrial Revolution, we clearly realized that the means currently at our disposal fell short of the needs and ambitions of educational organizations seeking meaningful opportunities to participate in transforming education. The availability of and access to digital learning content, tools and solutions in French is not some wild idea but a reality that we must bring to fruition.


As a public media organization, we needed time to think in order to align our efforts with sustainable solutions adapted to the needs of this revolution.

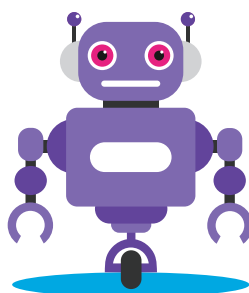
This White Paper was developed through the team effort of many individuals whose names appear in the Acknowledgements section. However, this first White Paper by Groupe Média TFO unquestionably reflects the inspired leadership of Julie Caron, Senior Director of Digital Learning, whose scholarly and contagious passion for advancing education never ceases to impress us.

Glenn O'Farrell

*President and CEO, Groupe Média TFO*

### **DEDICATION:**

This White Paper is dedicated to everyone interested in ensuring that future generations in Ontario and Canada have the opportunity to participate fully in learning adapted to the new realities of the fourth Industrial Revolution. 



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# SUMMARY



In a context where recent technological innovation suggests future upheavals in the job market, Groupe Média TFO wanted to develop a status report on the situation based on a survey of the research. **The goal was to identify issues of critical importance to the Canadian educational community, and propose concrete recommendations that would prevent citizens of the future from missing the innovation train.**

## 1

**THE IMPACT OF THE  
4<sup>TH</sup> INDUSTRIAL  
REVOLUTION ON THE  
CANADIAN LABOUR  
MARKET AND THE SKILLS  
TO BE DEVELOPED**

- Upheaval in the Canadian labour market arising from a widespread process: 47% of tasks performed by the Canadian workforce could be automated by 2055 using technologies already available (McKinsey, 2017).
- Emerging needs for new competencies (“global” and technological)
- Inclusion of these competencies in the curricula



**TEACHING PRACTICES  
REQUIRED TO PASS ON  
THESE SKILLS**

- Personalized education
- “STEAM” teaching (science, technology, engineering, arts, math)
- Digital instruction (innovative initiatives)



2

## What challenges await the Canadian educational system?

### TECHNOLOGICAL SKILLS

- Promote ICTs in public policy
- Strengthen the focus on teaching scientific subjects
- Developing the supply of post-secondary programs for Francophones centred on ICTs, in minority-language communities

### “GLOBAL” COMPETENCIES

- Adapt educational resources to new needs
- Promote cross-contact among scientific and artistic fields
- Promote the French language and cultural diversity in curricula

### VISIBILITY OF DIGITAL RESOURCES

- Publicize Canadian educational resources online
- Call attention to high-quality French-language teaching resources
- Heighten the visibility of French-language resources on the Web



## 3

## Recommendations for the Canadian Educational

### PREPARE A NEW GENERATION OF HIGHLY QUALIFIED CANADIAN EXPERTS

- Priority on support for innovation and new technologies in public policies
- Inclusive measures that attract and retain Canadian expertise in public, parapublic and private organizations

### SUPPORT LA FRANCOPHONIE IN LEARNING GLOBAL COMPETENCIES

- A fund dedicated to educational and instructional resources addressing 21<sup>st</sup> century issues, particularly in French
- Collaborative partnerships and projects with international stakeholders within La Francophonie to promote resource development and sharing
- Training on teaching global competencies and new educational practices

### ILLUMINATE THE FRANCOPHONE DIGITAL EDUCATION SPACES

- Funding for initiatives that drive the discovery of Francophone digital educational content in Canada
- Support for initiatives that value and promote the specific nature of Canadian digital educational content to ensure that it represents Canadian cultural values and markers

# INTRODUCTION



# INTRODUCTION

In recent years, significant progress in the digital field confirms that we are entering the era of the “4<sup>th</sup> Industrial Revolution.”<sup>1</sup> The rise of robotics, automation and artificial intelligence has made technology part of our everyday life. These advances are having a profound impact on our way of life and on the economy in general.

**In this context, it is vital to examine how the Canadian labour market is adapting to new and emerging trades, and workforce training needs to ensure that everyone can find a place in this new order.**

These questions concern all Canadians, particularly the Francophone community and French-speaking Ontario, whose cultural and linguistic identities are in the throes of change. The key is to train and retain talented Francophones, whether they were born in Canada or arrived here through immigration, to ensure they are fully equipped to become engaged citizens of tomorrow’s society.

This thought process examines the impact of the 4<sup>th</sup> Industrial Revolution on the labour market and the vital skills needed to participate in it fully. It explores current teaching practices by asking the key question:

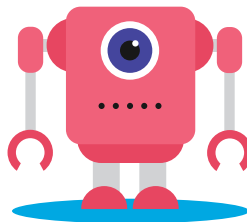
**Does our current educational system address issues surrounding technological innovation and the new knowledge-based economy?**

1 Theme from the World Economic Forum, Davos, January 2016.

This status report will help identify the major challenges facing the education community, and generate concrete, research-based recommendations to accompany the shift to a digital age.

### **METHODOLOGY:**

This white paper is based exclusively on a survey of research on the 4th Industrial Revolution and its impact on employment, skills and the educational system. It approaches the topic from the international, national and Ontario provincial levels.



# SITUATIONAL ANALYSIS



# 1. SITUATIONAL ANALYSIS

## 1.1 THE CANADIAN JOB MARKET AND THE 4<sup>th</sup> INDUSTRIAL REVOLUTION

As elsewhere in the world, the economy and the organization of the production system in Canada are undergoing deep transformations, with the acceleration of technological innovations over the last few years:

- ▶ Artificial intelligence and progress in robotics broaden the scope of automation to new activities in fields that already use it (industry, agriculture), but also to new fields entirely (health, services);
- ▶ 3D-printing and The Internet of Things helps to integrate new technologies into the production process (“Industry of the future” or “Industry 4.0” concept);
- ▶ Big Data helps manage great volumes of data and use them to improve knowledge.

This situation gives rise to fears of a jobless future, as well as to several studies seeking to measure the scope of the potential effects on existing jobs. The issue is to identify the essential skills that current and future generations will need to meet not only economic challenges, but worldwide social and environmental ones.

## A JOB MARKET IN UPHEAVAL

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*“65 % of children currently entering elementary school will have jobs that do not yet exist.”*

*World Economic Forum (2016)<sup>2</sup>*

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### A Significant Number of Jobs to Undergo Profound Changes

Several studies have been conducted to quantify the bulk of jobs likely to disappear or evolve (see the overview in [Appendix 1](#)). In this analysis, it is important to distinguish the effects on employment from those that affect tasks performed by workers. While there is no real consensus for the former, one can note fairly similar numbers relating to tasks that may be changed in depth.

IT IS URGENT TO FIND  
COMPLEMENTARITY BETWEEN  
THE TASKS PERFORMED BY PEOPLE AND  
THOSE THAT WILL BE AUTOMATED.

According to a study done by the McKinsey consulting firm (January 2017)<sup>3</sup>, based on an analysis of the work force of 46 countries, less than 5% of jobs risk disappearing in the short or medium term, but 45% of the tasks for which members of the work force are paid may be automated by 2055 through the use of existing technologies.

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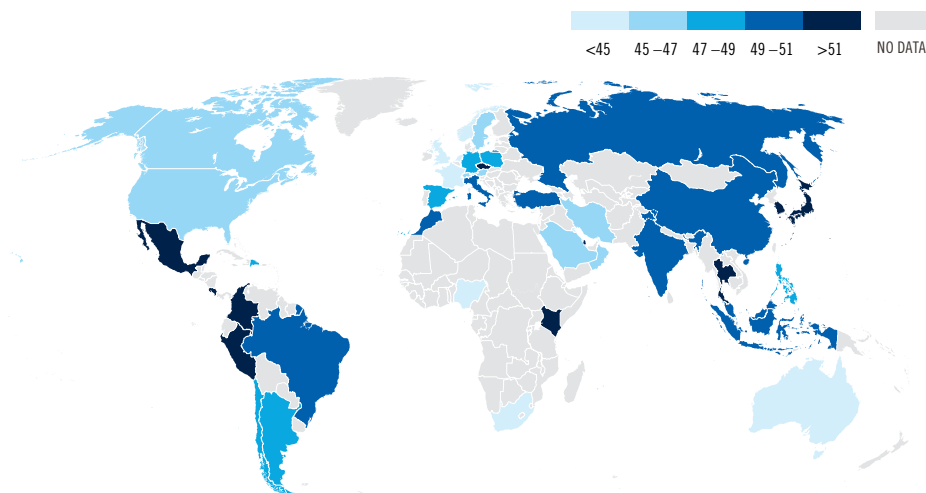
2 World Economic Forum. (2016). *The Future of Jobs*. Chapter 1.

3 McKinsey Global Institute. (2017). *Harnessing automation for a future that works*.



The technical automation potential of the global economy is significant, although there is some variation among countries.

Employee weighted overall % of activities that can be automated by adapting currently demonstrated technologies.



**Technical automation potential is concentrated in countries with the largest populations and/or high wages.**

Potential impact due to automation, adapting currently demonstrated technology (46 countries)

### CANADA'S AUTOMATION POTENTIAL IS 47% (MCKINSEY, 2017).

Source: McKinsey Global Institute. (2017). *A future that works: Automation, employment, and productivity*. Page 9.

**These high numbers underscore the scope of the digital revolution, which affects all occupations.** The most exposed occupations are routine, manual or low qualification jobs, mostly in the industrial field (for example, labourers, maintenance workers, cashiers, etc.). However, a wide diversity of occupations, with or without qualifications, namely in the services sector (for example, conductors, cashiers, home care services, etc.) will evolve significantly.

## Very Specific Occupations and Tasks Will Be Preserved

A French study conducted in 2017 by the Conseil d'orientation pour l'emploi (Employment Orientation Board), states that: *“The potential of job creation by new technologies is double natured. For one, it can directly create potential jobs creation specific to the development of that technology (digital and robotics jobs), but it can also, mainly, indirectly create jobs in the overall economy”*<sup>4</sup>, in the sectors dependent upon the new technologies sector or stemming from product and service innovations.

**A certain consensus can be drawn from the research as to the occupations and tasks that remain difficult to automate: these are jobs that call upon emotion, empathy and creativity.**

Graham Brown-Martin, renowned author and lecturer on the topic of education and its transformation through technology, published a report in 2017, in which he specifies that there are “three fields in which humans have a distinct advantage over machines: creative activities, social interactions, and jobs that require physical dexterity and mobility”<sup>5</sup>.

These results illustrate **the potential of giving more meaning to work, allowing employees to concentrate on tasks that call upon their creativity and their emotions.** Financial advisors, for example, could spend less time analyzing their clients' finances and more time giving them creative solutions.

4 Conseil d'orientation pour l'emploi. (2017). *Automatisation, numérisation et emploi – Tome 1 : Impacts sur le volume, la structure et la localisation de l'emploi*. Page 13.

5 Brown-Martin G. (2017). *Education and the Fourth Industrial Revolution*. Page 4. Traduction libre.

## CRITICAL COMPETENCIES TO MEET THE NEW NEEDS OF THE ECONOMY

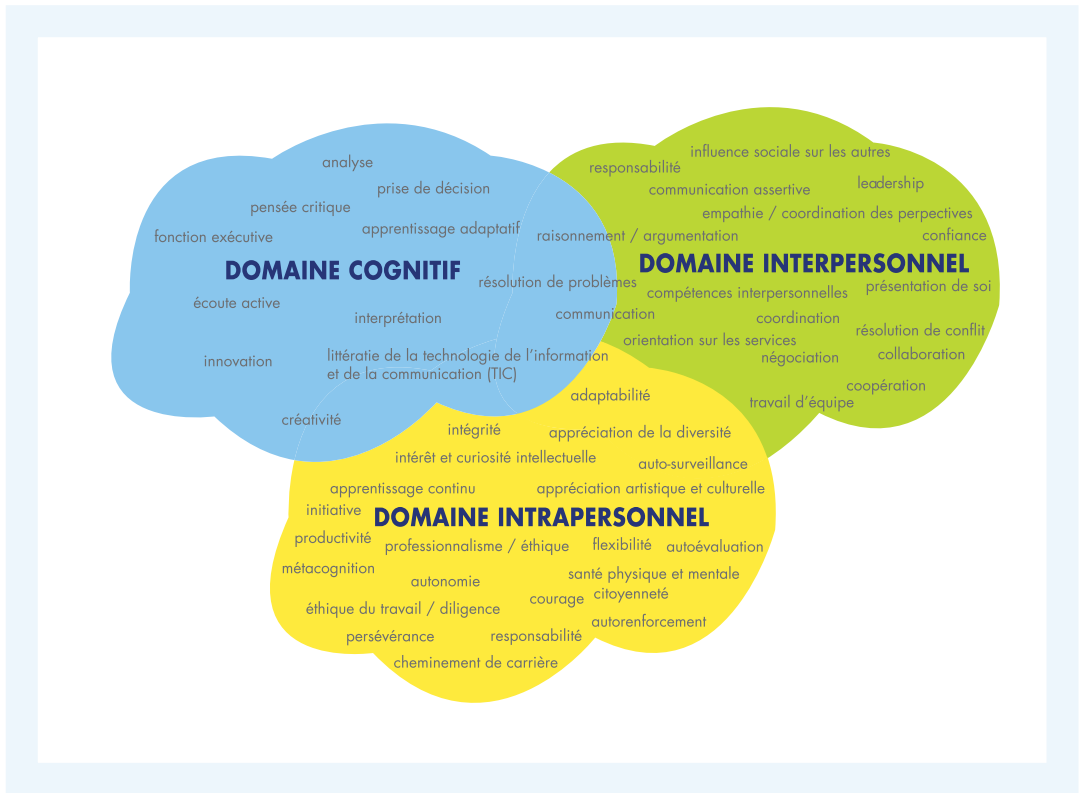
THE UPHEAVALS AT THE ORGANIZATIONAL LEVEL OF BUSINESSES AND OF JOBS REVEAL NEW NEEDS WITH REGARDS TO COMPETENCIES.

### The Need to Acquire “Global” Competencies

Several studies have sought to determine the competencies necessary in the 21<sup>st</sup> century or “Global competencies” (they are also called “21<sup>st</sup> century competencies”, “essential competencies”, etc.). The proposed competencies frameworks are generally quite similar, demonstrating **a large international consensus on this issue** (a synthetic study is attached as [Appendix 2](#)).

The term “competencies” includes knowledge, skills (know-how) and abilities (specialized abilities). These global competencies supplement the general fundamental competencies taught to students (such as literacy, mathematics, etc.).

These different competencies fall **within the cognitive, interpersonal and intra personal fields**.



### GROUPEMENT DES COMPÉTENCES DU 21E SIÈCLE EN TROIS GRANDS DOMAINES

Source: Ministry of Education of Ontario (2016), *Digital teaching in action – Foundation document, Winter 2016 edition*, Page 11.

In its Future of Jobs report (January 2016), the World Economic Forum distributed a list of ten skills that will be most sought after in 2020. This list was prepared after consulting human resource specialists in large corporations.

**Creativity will become one of the main skills of the future**, in order to deal with the massive and rapid arrival of new products, new technologies and new ways to work.

**Emotional intelligence will also climb into the top 10 skills of the future**, to facilitate employee integration in a more collaborative, international and virtual work situation.

## TOP 10 SKILLS

### IN 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgement and Decision-Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

### IN 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgement and Decision-Making
9. Active Listening
10. Creativity

Source: Future of Jobs Reports, World Economic Forum

Given that a change in essential skills is contemplated to occur as early as 2020, engaging with today's teens, who will be entering the job market in the next few years, must be a priority. Not only will they have to possess the global competencies that businesses will require, they will also need to have acquired a heightened sense of adaptation in order to successfully realign their careers throughout their life.

IN AN INCREASINGLY DIGITAL WORLD,  
ACQUIRING TECHNICAL SKILLS  
IS ESSENTIAL.

### The Need to Develop Technical Skills

Business related digital skills differ from those acquired through personal use. **All generations are thus required to learn them, including those born in a digital world.** Specifically, these skills include digital

literacy (use and management of information, capacity to use technology efficiently, etc.) and digital citizenship (based on the responsible use of technology).

Beyond general technical skills, **cutting edge technical skills must be developed. It is also important to ensure that highly skilled workers remain in the country.** In Canada, this represents a particular challenge, as many graduate and post-graduate students may be drawn to the United States, especially because of salaries. This was demonstrated by a Canadian study (B. Boudarbat and M. Connolly, August 2013), which brought to light the substantial brain drain of Canadians with science degrees towards the United States.

**At the postsecondary level, integrating technology to education is the priority.** As the Ministry of Advanced Education and Skills Development stated in a press release dated March 15, 2017:

*“All publicly-assisted colleges and universities in Ontario are members of eCampusOntario, a not-for-profit corporation that provides students with access to online courses in Ontario postsecondary institutions. This year [2017-2018], 45 project teams will receive Research and Innovation Grants totaling \$2.6 million.”*<sup>6</sup>

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6 Ontario Ministry of Education. (2017). *Ontario Boosting Digital and Online Learning for Students*. Press re-lease.

THE CHALLENGE FOR CURRENT AND FUTURE GENERATIONS IS NOT ONLY TO FILL THE NEW NEEDS OF BUSINESSES IN ORDER TO FULLY FIT IN THE LABOUR MARKET, BUT ALSO TO FACE THE WORLDWIDE SOCIAL AND ENVIRONMENTAL CHALLENGES ON THE HORIZON.

## NECESSARY COMPETENCIES TO FACE GLOBAL CHALLENGES

Multiple challenges are already being observed on our planet (climate change, population growth, aging population, etc.) or will intensify through technological development (greater concentration of wealth and job insecurity). The reports on this issue highlight **the need to train current and future generations to adapt and find solutions to these worldwide challenges** (Brown-Martin G., 2017).

To better understand and manage the ecological, social and economic problems of our planet, it is imperative to develop global competencies, especially in relation to **world citizenship, intercultural dialogue and sustainable development** (OCDE, 2016)<sup>7</sup> These competencies will be evaluated within the framework of the Program for International Student Assessment (PISA) 2018 managed by the OECD. Designed for the assessment of 15-year-old students from several countries, the program illustrates how important it is for today's teens to develop these competencies.

<sup>7</sup> OCDE. (2016). *Global competency for an inclusive world*.



Given that our planet is facing several worldwide challenges, whether economic, social or environmental, it is urgent to train, attract and retain Canadian talent, as well as support research and development.

## 1.2 THE NECESSARY TRANSFORMATION OF THE EDUCATION SYSTEM

**With the upheaval of the job market, how does the current education system handle the new training issues with regards to the essential global and technological competencies of the 21<sup>st</sup> century?** This line of inquiry will lead us to question the place of new technologies in teaching practices, with a focus on francophone Ontario

### REINVENTING TEACHING PRACTICES

The challenges of adapting the traditional educational environment to meet the new needs of students have been the subject of abundant research. Indeed, the traditional model prepared students to integrate into the industrial economy of the 20<sup>th</sup> century by transmitting a set of “standardized” facts and procedures. For Education Innovation Specialist Valérie Hannon (2017)<sup>8</sup>, the traditional pillars of education must evolve to better teach students how to integrate into a constantly evolving world.

8 Valérie Hannon, “Thrive”, Innovation Unit Press, 2017.

An alternative to the standardization of teaching is the “customization” of educational practices, which focuses on the specific needs, talents and interests of each student. The Canadian Teachers’ Federation (CTF) and the Alberta Teachers’ Federation endorse this teaching approach. In a movement called “**We the educators**”, they warn of the risks of the privatization and overuse of data in public education, tied in with a standardized teaching model.<sup>9</sup>

In this new knowledge-based economy, the focus should not be on content, but rather on the students’ ability to take charge of their own learning. This requires a radical transformation of the teacher’s role and the teacher/student relationship.

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*It appears evident in the 21st century that traditional lecture-style teaching does not itself help to develop new competencies and that the changes required in the school system are numerous.”*

*Ontario Ministry of Education (2016)<sup>10</sup>*

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An approach being deployed more and more in the world is the “STEAM”<sup>11</sup> teaching method. Originally, its purpose was to promote interdisciplinarity between scientific subjects (sciences, technology, engineering and mathematics, known as “STEM”), through applied exercises linked to the real world. Recent initiatives have sought to incorporate artistic disciplines

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9 <https://wetheeducators.com/>

10 Ontario Ministry of Education. (2016 - revised version). *Digital teaching in action – Foundation document for French language schools and school boards in Ontario*. Pages 20-21.

11 STEAM = Science, Technology, Engineering, Art and Math..

in order to go further into deeper learning, the goal being to show students how technical concepts are directly related to real life situations and provide tools so that they may apply these concepts to other contexts.

THE STEAM TEACHING METHOD SEEKS TO INCREASE STUDENT CURIOSITY AND DEVELOP THEIR CREATIVITY TO FIND INNOVATIVE SOLUTIONS.

## TECHNOLOGY, A CRITICAL MEANS TO TEACH GLOBAL COMPETENCIES

### An Obvious, Internationally-Acknowledged Fact

### An Obvious, Internationally-Acknowledged Fact

To support the development of these global competencies, **teaching practices must be redefined to structure them around new technologies**. This requirement is at the heart of a study conducted by the Conference Board of Canada (2016), a Canadian think tank specialized in the research and analysis of public policy performance.

DIGITAL LEARNING IS IN FACT A MORE CAPTIVATING, LESS PASSIVE, AND MORE PERSONALIZED WAY OF TEACHING THAN LECTURE-STYLE TEACHING METHODS.

An overview of international research performed by the Ministry of Education of Ontario (2016) shows **the major role played by technology**

**in the development of all the global competencies**<sup>12</sup> A table showing connections between different types of technology in relation to 21<sup>st</sup> century competencies was prepared by the Ministry of Education in 2016; it is attached as [Appendix 3](#).

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*“Collaboration tools, online and hybrid educational environments, tools that support learners as makers and creators, immersive media, and games and simulations can help prepare students for life and work in the 21<sup>st</sup> century.”*

*Fishman and Dede (2016)*<sup>13</sup>

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## Several Innovative Digital Education Initiatives in Francophone Ontario

In Ontario, Francophones of today and tomorrow will not only be bilingual, they will also have diverse cultural backgrounds. Whether born here or arrived as immigrants<sup>14</sup>, these talented Francophones must be retained, and their skills must be optimized so that they become engaged citizens in the world of tomorrow.

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12 Ontario Ministry of Education. (2016). *Towards Defining 21<sup>st</sup> Century Competencies – Foundation document for discussion*, Winter 2016 Edition, page 35.

13 Quoted in the Ontario Ministry of Education: *Towards Defining 21<sup>st</sup> Century Competencies – Foundation document for discussion*. (2016). Page 35.

14 According to Statistics Canada (2015), 16% of Ontarians whose primary language is French come from immigrant stock (1<sup>st</sup> and 2<sup>nd</sup> generation).

THESE ISSUES ARE OF PARTICULAR IMPORTANCE FOR FRANCOPHONE ONTARIO, WHICH SEEKS TO TRANS-FORM ITS IDENTITY.

To support school boards in Ontario with the integration of technology and educational practices, the Ministry of Education of Ontario prepared a report titled *“Digital teaching in action – Foundation document for French language schools and school boards in Ontario”*, published in 2014 and revised in 2016.

Among the many initiatives launched in Ontario, the **Tactic Initiative** supports the teaching community (school board members, principals and teaching staff) in developing global competencies and integrating technology in educational practices. In 2016-2017, over a hundred French-language elementary and secondary schools received this support<sup>15</sup>.

Another innovative initiative is the offer of **online and hybrid courses**, which are managed by the Consortium d'apprentissage virtuel de langue française de l'Ontario (French-Language Virtual Learning Consortium) (CAVLFO) since 2010. In 2017-2018, 105 online courses are and will be offered from kindergarten to 12<sup>th</sup> grade (K-12)<sup>16</sup>.

This new dynamic in French Ontario has given rise to a growing need for access to French-language digital educational content. And yet, the minority Francophone community in Canada is globally underrepresented both in online and traditional media

15 <http://tactic.cforp.ca/coles-accompagnees-2016-2017/>

16 <http://www.apprentissageenligne.org/cours-en-ligne/>

(Chaput & Champagne, 2012). A study conducted by Statistics Canada in 2015 on the language practices of children<sup>17</sup> concludes that even when the children were immersed in a francophone environment, they “*used more English than French when accessing media. There were even a number of situations in which the use of English for browsing the Internet or watching television exceeded 90%. This finding confirms what has previously been observed in the literature, which is that English holds a great deal of appeal for media use, regardless of the region of residence or the Francophone minority concentration in a particular community.*” This demonstrates the importance of prioritizing the development of innovative French-language content.

PUBLIC MEDIA PLAY A SIGNIFICANT ROLE IN PUBLICIZING TEACHING RESOURCES AND SUPPORTING SCHOOLS AT THIS TURNING POINT INTO THE DIGITAL ERA.

In this regard, **Idello**<sup>18</sup>, the collaborative platform of Groupe Média TFO, is an example of an innovative initiative. In order to facilitate access to online resources, the platform offers French-language teaching and educational features and resources, not only for teachers and students, but also for parents. Collaborative in nature, Idello seeks to promote the trading and sharing of information among its members. Thus, students are supported through activities both at school and at home, which fosters a learning continuum amongst the various actors along the student’s learning path.

17 <http://www.statcan.gc.ca/pub/89-642-x/2015012/conclusion-eng.htm>

18 <https://www.idello.org/en>

WITH THE OBVIOUS EFFECTS OF RECENT TECHNOLOGICAL PROGRESS ON TOMORROW'S JOBS, IT IS URGENT TO INTEGRATE GLOBAL COMPETENCIES INTO SCHOOL PROGRAMS.

## INTEGRATING GLOBAL COMPETENCIES INTO SCHOOL PROGRAMS

**These past ten years, the international community has increasingly focused on defining the critical competencies for the digital age.**

In 2009, an OECD working paper<sup>19</sup> incited governments to define 21<sup>st</sup> century skills and competencies. Since then, reflections on the matter have been occurring across the world. An evocative example of the progress of these reflections is the adjustment of the **competencies framework in the Program for International Student Assessment (PISA) 2018.**<sup>20</sup>

The Canadian world of education, for its part, reflected on the matter through partnerships in order to agree on a common definition of global competencies. Some ten years later, the Council of Ministers of Education of Canada (CMEC) published a **Canada-wide framework for global competencies** (July 2017).

19 Ananiadou, K. et M. Claro. (2009). *21<sup>st</sup> Century Skills and Competences for New Millennium Learners in OECD Countries*.

20 OCDE. (2016). *Global competency for an inclusive world*.



## CMEC CANADIAN FRAMEWORK FOR GLOBAL COMPETENCIES:

1. Critical thinking and problem solving,
2. Innovation, creativity and entrepreneurship,
3. Learning to learn / self-awareness and self-direction,
4. Collaboration,
5. Communication,
6. Global citizenship and sustainability.

This thought process has materialized into practical undertakings on a provincial level. For instance, the Ministry of Education of Ontario has recently published a competencies framework, quite similar to the CMEC one, with the stated purpose of being used in report cards starting in the 2018-2019 school year. To support the implementation of this measure, the Ministry has created an Incubation & Design Branch dedicated to innovation and global competencies research. Furthermore, a \$10 million yearly ongoing investment will be provided to train teachers in teaching global competencies and to support innovative projects.<sup>21</sup>

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*“It is also important for education systems across Canada to actively work towards fostering these global competencies in a context reflective of Indigenous knowledge, perspectives, languages, and histories.”*

*Council of Ministers of Education, Canada (2017)<sup>22</sup>*

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<sup>21</sup> [http://www.edugains.ca/newsite/21stCenturyLearning/about\\_learning\\_in\\_ontario.html](http://www.edugains.ca/newsite/21stCenturyLearning/about_learning_in_ontario.html)

<sup>22</sup> [https://www.cmec.ca/682/Global\\_Competencies.html](https://www.cmec.ca/682/Global_Competencies.html)

# CHALLENGES AND RECOMMENDATIONS FOR THE WORLD OF EDUCATION



## 2. CHALLENGES AND RECOMMENDATIONS FOR THE WORLD OF EDUCATION

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*“Educational systems will have to put more emphasis on creativity, critical thinking, resiliency and flexibility in a world where everyone will have to adapt to the rapid evolution of the job market, and in order to meet world-wide social and environmental challenges.”*

*McKinsey Global Institute (2017)<sup>23</sup>*

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The situational analysis highlights the scope of upheaval associated with the 4<sup>th</sup> Industrial Revolution and its effect on the job market. Given the situation, the educational system must also adapt quickly if it wishes to catch the innovation train.

Research provides practical courses of action upon which the Canadian world of education can rely to better prepare youth to integrate into a complex and rapidly changing world. For this purpose, operational recommendations must be identified.

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<sup>23</sup> McKinsey Global Institute. (2017). *A Future That Works: Automation, Employment, and Productivity - Executive summary*. Page 19. Traduction libre,

## 2.1 PREPARING A NEW GENERATION OF HIGHLY-QUALIFIED CANADIAN EXPERTS

### AT THE NATIONAL LEVEL

The World Economic Forum report published in 2016<sup>24</sup> highlights Canada's challenges regarding information and communications technology (ICT). Out of 139 countries ranked on their capacity to capitalize on the 4<sup>th</sup> Industrial revolution, Canada ranks fourteenth, three ranks lower than the preceding year. Canada's profile<sup>25</sup>, shows the government's "*lack of vision regarding information and communications technologies (ICT) (49<sup>th</sup> position), and the relatively weak promotion of ICT by the government (38<sup>th</sup> position).*" **It is recommended that future innovation policies include more ICT components and that they grant more support to the integration of ICT in businesses (22<sup>nd</sup> position).**

In the field of education, this challenge is of paramount importance in order to **train a workforce of experts in cutting edge technologies** which fully meets the needs of tomorrow's businesses. A McKinsey Global Institute (2017) report specifies that **policymakers will have to work with the world of education to strengthen the place of science in education.**

### IN CANADA'S MINORITY FRANCOPHONE COMMUNITIES

The Canadian Francophonie outside of Québec includes a network of fifteen francophone universities usually located in towns of the Canadian

<sup>24</sup> McKinsey Global Institute. (2017). *A Future That Works: Automation, Employment, and Productivity - Executive summary*. Page 19.

<sup>25</sup> World Economic Forum, in partnership with Cornell University and INSEAD. (2016). *The Global Information Technology Report 2016 – Innovating in the Digital Economy*.

Francophonie<sup>26</sup>. Ontario is the province with the largest Francophone population outside of Québec: over 610,000 French-speakers, of which over 430,000 are Toronto-residents. Yet Ontario only has three bilingual universities (Ottawa, Laurentienne –to which Hearst University is affiliated– and Glendon), with no strictly francophone academic institution<sup>27</sup>.

In November 2017, the Ontario government agreed to create a French-language university via *Bill 177, Stronger, Fairer Ontario Act (Budget Measures), 2017*. Ontario's first francophone university is slated for inauguration in 2020. Located in Toronto, it will accommodate approximately 1,000 students in 2023-24. The first programs are to be multidisciplinary and deal with the following topics: “*human plurality, urban environments, a globalized economy and digital cultures*”. **This initiative represents an opportunity to offer to Francophones quality postsecondary programs in the field of new technologies.**

For this new generation of Francophones to have high-level skills, it is critical to **prepare children from early childhood and onward**. A learning continuum must be established from early childhood to the postsecondary level. Particular attention must be paid to adolescence, as it represents a hinge moment in the construction of young people's sense of identity, particularly in a minority Francophone community.

<sup>26</sup> <http://www.francophoniedesameriques.com>

<sup>27</sup> <http://ici.radio-canada.ca/nouvelle/1052071/universite-francaise-toronto>

## RECOMMENDATIONS:

### Prepare A New Generation of Highly-Qualified Canadian Experts

- ▶ Prioritize the support of innovation and new technologies as part of public policy, by using the necessary funds at all educational levels.
  - Create programs dedicated to digital teaching and the development of horizontal competencies essential to innovation, in both elementary and secondary education.
  - Support concerted initiatives that target the specific needs of teens in order to ensure continuity in the development of their talents up to the postsecondary level.
  - Support the development of postsecondary programs centered around cutting-edge technologies and high-level skills, especially the offer to Francophones in minority communities (specifically at the Francophone University of Ontario).
- ▶ Create inclusive measures, to attract and retain Canadian expertise in public, quasi public and private bodies, so that the Canadian society, as a whole, may benefit from investments in education.
  - Support a culture of innovation, collaboration and knowledge-building in businesses (for example through the creation of francophone talent incubators).

- Encourage employers to offer fair and competitive salaries and to create inclusive work-places that foster the personal and professional development of employees

## 2.2 SUPPORT THE FRANCOPHONIE IN LEARNING GLOBAL COMPETENCIES

### AT THE NATIONAL LEVEL

In Canada, a major turning point in education has begun with the publication of a global competencies framework by the CMEC. In Ontario, this framework will be integrated into report cards starting in 2018-2019. This situation has given rise to **new needs, not only in the training of teachers, but also in teaching resources** to suggest educational activities and content based on experience, comparison, analysis, reflective thinking and problem resolution, cooperation, etc. (OECD, 2016).

To expand, **horizontality between scientific and artistic fields (“STEAM”)** must be promoted by viewing teaching programs in an integrated fashion. According to a 2016 article quoting Paul Davidson, President of Universities Canada<sup>28</sup>, teaching science will no longer be sufficient to meet the emerging needs of businesses and society: *“Interdisciplinarity must become second nature for students.”* In the same article, Gina Cherkowski, founder and director of Calgary’s “STEM Learning Lab”, believes that Canada is far behind other countries (such as the United States and Finland) for the integrated teaching of STEAM. This type of integrated teaching provides all the tools necessary

<sup>28</sup> <https://www.univcan.ca/media-room/media-releases/from-stem-to-steam/>



for students to successfully integrate into this new “*age of innovation*”. **These researchers recommend exposing students to this type of teaching in schools. This requires the reinforcement of educators’ teaching skills and the provision of adapted resources.**

## IN CANADA’S MINORITY FRANCOPHONE COMMUNITY

The minority Francophone community in Canada is characterized by its cultural diversity and its attachment to bilingualism. Maintaining the French language is a particularly big issue where the community is an extremely small minority: in 2017, the Canadian Teachers’ Federation (CTF) reported that “*between 2001 and 2015, the share of 3<sup>rd</sup> grade students in Francophone schools who speak mostly or only French at home [...] has decreased in urban schools of central and south-west Ontario to less than one child out of five*<sup>29</sup>.”

**The challenges specific to the Canadian Francophonie echo OECD recommendations concerning the future pillars of education, which include bilingualism and intercultural dialogue.** In fact, the competencies framework document contemplated for the Program for International Student Assessment (PISA) 2018 recommends integrating global, international and intercultural perspectives in school programs (for example, teaching the languages, cultures and histories of our societies’ minorities) (OECD, 2016). Intercultural dialogue and knowledge of several languages will play an increasingly important role in the competencies to be developed in order to better integrate into a globalized society

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29 Dupuis S. (2017). *L'école de langue française dans les provinces et territoires à majorité anglophone au Canada*. Page 49. (French language schools in English language majority provinces and territories in Canada)



**In this context, bilingualism and cultural diversity become a force for the Canadian Franco-phone community to be put forward in the integration of global competencies in school programs.**

As for Francophone students living in a minority community, the focus must be on teenagers. Indeed, they may turn away from the French language for reasons related to prestige, status, the attractiveness of a majority language, and to “*build for themselves negative linguistic representations regarding the minority language and its legitimacy, representations that may manifest themselves as linguistic insecurity*”<sup>30</sup>. Furthermore, the growing proportion of new arrivals in French language schools significantly changes students’ self-identity, and “*in these new circumstances, Ontario Francophones are called upon to redefine themselves, not only within the Canadian Francophonie but also with-in the world Francophonie*”<sup>31</sup>. It is therefore essential that young people be offered learning conditions that meet their expectations by opening up to the world Francophonie in order to identify themselves to a broader Francophone community.

30 Cormier M. « Quand des élèves adolescents de milieux minoritaires ont l’occasion d’écouter des chansons francophones... ». *Revue du Nouvel-Ontario* 35-36 (2010) : 163– 187. DOI: 10.7202/1005969ar.

31 Diane Gérin-Lajoie « La problématique identitaire et l’école de langue française en Ontario. » *Francophonies d’Amérique* 18 (2004): 171–179. DOI: 10.7202/1005360ar »

## RECOMMENDATIONS::

### Support the Francophonie in Global Competencies Training

- ▶ Create a dedicated fund to support the creation of teaching and educational resources that address 21<sup>st</sup> century issues, particularly for the French language, concerning:
  - The global competencies that will have increasing importance (for example, global citizenship, sustainability, bilingualism, intercultural exchanges).
  - Integrated teaching of STEAM (for example, creation of a fund for the development and the production of French-language interactive media tools to support innovation learning).
  - The specific interests and issues of teens in a minority Francophone community.
- ▶ Create collaborative partnerships and projects with stakeholders of the Francophonie at the international level, supporting the creation and the sharing of innovative resources for teaching global competencies, in particular:
  - Support research on teens, which helps to better understand their needs to develop of these competencies.
  - Support fair and equal access to digital educational content throughout Francophone communities and for Francophiles.
- ▶ Support training to teach global competencies and new educational practices (deeper learning, evolution of the teacher-student relationship, integrated teaching of STEAM):

- Support the creation of coaching content for and by teachers, focused on STEAM, interdisciplinarity and the development of global competencies.
- Support local initiatives that support the transformation of teaching practices in order to enhance and bring focus on innovation, with parent participation during the transformation process.

## 2.3 ILLUMINATE THE DIGITAL FRANCOPHONE EDUCATIONAL SPACE

### AT THE NATIONAL LEVEL

**The lack of information concerning quality digital educational resources is a pressing need often highlighted by the education world.** A report prepared for the Association of Canadian Publishers (ACP) in March 2017 shows that one of the biggest obstacles hindering the deployment of digital education is the *“lack of online information highlighting all of the appropriate Canadian-developed content, in print or digital form”*<sup>32</sup>. Consequently, one of the recommendations of this report is to develop a website with the purpose of allowing teachers to discover Canadian-authored resources appropriate for K-12 schools.

**Another challenge frequently cited in research is tied into the increasing use of free online educational resources, of lesser quality and unsuitable for school programs.** A study conducted for the People for Education association with Ontario schools (2014) shows that *“in 36% of elementary and 25% of secondary schools pooled, principals*

<sup>32</sup> Howell S. and O'Donnell B. (2017). *Digital Trends and Initiatives in Education: The Changing Landscape for Canadian Content*. Toronto, prepared for the Association of Canadian Publishers (ACP). Page 53.

*report that **teachers are most likely to use free online resources when they need new learning resources***".<sup>33</sup>, This can be related to the budget cuts in resources allocated to educational resources in the last few years. These free resources are not the subject of Ministry of Education quality control, as is the case for books (Trillium list) and are not adapted to the official programs. Besides, the previously quoted ACP report (2017) reaches the same finding nationally. **It is thus critical, in this context of digital plurality, to showcase quality resources that meet Canadian school program requirements.**

## IN CANADA'S MINORITY FRANCOPHONE COMMUNITY

One of the main challenges of Francophone education is the integration of new technologies, as shown in a study of the Canadian Teachers' Federation in 2013<sup>34</sup>. This study warned of **the insufficient presence of French language content and digital learning platforms on the web in Canada**. Brown-Martin G. (2017) estimates that one of the main issues for Canada is to meet demands by Francophones for French digital content: **"Reaching these minority communities, through a wide variety of platforms, constitutes both a constitutional and economic imperative"**<sup>35</sup>. In fact, the number of people whose primary language is French in 2011 was close to 7.3 million, or 21% of the Canadian population<sup>36</sup>.

Moreover, **these resources are not well known in the world of education**. As mentioned, the report issued by the Association of

33 People for Education. (2014). *Digital Learning in Ontario Schools: The 'new normal'*. Page 5. Traduction libre.

34 Oliveira M.. (2013). *Canada's francophone slower to adopt new technology*.

35 Brown-Martin G. (2017). *Education and the Fourth Industrial Revolution*. Page 16..

36 [http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/98-314-x2011003\\_1-fra.cfm](http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/98-314-x2011003_1-fra.cfm)

Canadian Publishers (ACP) in March 2017 showed a **communication and visibility deficit for all Canadian educational resources**, whether anglophone or francophone. It is essential to meet this need in order to satisfy the constitutional obligation to offer quality French education (minority language rights) (Section 23 of the Canadian Charter of Rights and Freedoms).

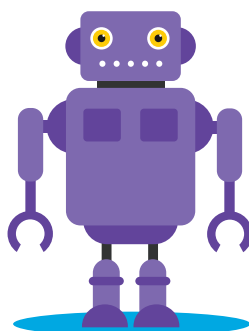
**The lack of visibility of French content on the web is more specifically related to its potential to attract the attention of internet users.** This lack of “discoverability” was noted by a Québec researcher, Destiny Tchéhouali, President of Internet Society Québec Chapter (ISOC Québec), according to whom: *“the real problem of French in the digital space is not productivity, but discoverability<sup>37</sup>.”* He adds, *“Those who control search engines have become content providers, and they give themselves an edge through secret algorithms of which we know nothing.”* Several projects seeking to make changes to regulations and improve the visibility of Francophone content are ongoing (data analysis, researching best practices, training, etc.).

<sup>37</sup> <http://www.ledevoir.com/societe/actualites-en-societe/506703/la-decouvrabilite>

## RECOMMENDATIONS:

### Illuminate the Digital Francophone Educational Space

- ▶ Public financing of initiatives which propel the discoverability of digital Francophone educational content in Canada.
  - Create a fund for the communication, promotion and accessibility of French-language digital educational resources at a Canada-wide level.
  - Support initiatives that highlight the creativity and innovation of teens in to allow an engaged, competent and proud Canadian youth to shine.
- ▶ Support initiatives that enhance and promote the specificity of Canadian digital educational content to ensure that Canadian values and cultural references be represented



# CONCLUSION





### 3. CONCLUSION

We are in the midst of a 4<sup>th</sup> Industrial Revolution, wherein complete sectors of the economy are going digital. Even if we do not know what tomorrow's occupations will be, most of the research agrees on the fact that these future jobs will require strong critical thinking, as well as adaptability and continuous learning.

**It is therefore urgent to develop global competencies and technological skills that will allow everyone to fit in the world of tomorrow.**

Given that everyone will be called upon to adapt to the rapid change of the job market and respond to worldwide social and environmental challenges, educational systems must be trans-formed –reinvented– so that young people may “*learn how to learn, unlearn and relearn*” (Toffler A., 1970).

Digital learning is an essential component of an education centered on developing crucial competencies and skills. However, several challenges still must be overcome to integrate these global competencies and technological skills in educational systems. This particularly applies to the Francophone school community.



## FOR THE CANADIAN EDUCATION SYSTEM TO NOT MISS THE INNOVATION TRAIN, THREE AREAS OF INTERVENTION ARE CRUCIAL:

- ▶ For the Canadian education system to not miss the innovation train, three areas of intervention are crucial:

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*“**Change does not wait:** business leaders, educators and governments all have to be proactive in reinforcing skills and labor retention so that every-one can profit from the 4<sup>th</sup> industrial revolution.”*

*World Economic Forum (2016)<sup>38</sup>*

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<sup>38</sup> World Economic Forum. (2016). *The 10 skills you need to thrive in the Fourth Industrial Revolution*.

## FOR MORE INFORMATION, PLEASE CONTACT GROUPE MÉDIA TFO'S COMMUNICATIONS SERVICE:

Carole Nkoa

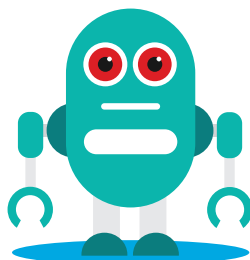
*Communication Director and*

*Chef de missions communautés franco-ontariennes*

Email: [cnkoa@tfo.org](mailto:cnkoa@tfo.org)

Office: 416.968.8313

Mobile: 416.606.5113



# ACKNOWLEDGMENTS



## 4. ACKNOWLEDGMENTS

### JOURNEY

The idea of publishing a White Paper began to germinate in early summer 2017, in Sudbury, during conversations between Groupe Média TFO's Board of Directors and its management team. I can still hear Glenn O'Farrell, with that visionary's spark in his eye, saying, "There's trouble brewing, guys! What do we do?" He was talking about the deep change undergoing in our society, the imperative of preparing future generations, and, most especially, the need to equip Ontario's young Francophones, who are at the heart of our mission. To begin with, how could Groupe Média TFO find the means to address these needs in a way that would match the ambitions of Ontario and Canada?

A small internal committee was formed to define a process that would allow TFO to better understand the new era we were entering, as well as the issues in the field of education. The team's varied expertise (technology, marketing, digital media, and education) allowed for some rich discussions. It was there that the foundation of this work was laid.

First, we needed an assessment of the state of education across the world. We called upon Graham Brown-Martin and his wise leadership to create a survey of the literature on the topic, which would allow us to encompass the 4<sup>th</sup> Industrial Revolution, its issues and its impact on the transformation of education.

Thanks to him, we got our hands on “Education and the Fourth Industrial Revolution”. In consulting the various studies and the data collected, we realized this work we had accomplished could foster some thoughts, illuminate some decisions, and inspire actions not only within our humble company, but without, too, and in so doing be the driver of a positive change in education.

But there was still much work to be done! We asked the CLÉ (Centre de Leadership en Évaluation) to support us in writing this White Paper and complete our research with a greater focus on the Ontarian Francophonie, our provincial school system, its specific issues and its ability to overcome challenges.

So here we now stand, with the fruit of collective efforts that will, we hope, inspire, create focus, and clear the way for the future. And finally, thank you to all of those who believe in youth, education, the Francophonies of Ontario, Canada and the world, as well as the work of Groupe Média TFO: the employees of TFO, its Board of Director.

## ACKNOWLEDGEMENTS

A journey such as this would not be possible without the help and collaboration of passionate and talented people. I want to thank those who provided their precious support to this work.

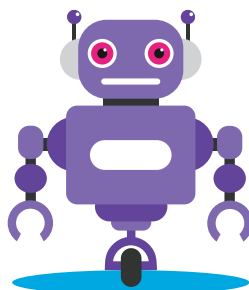
Thank you to my colleagues, Éric Minoli, Magalie Zafimehy, and Michel Tremblay, for their openness and their generous contributions. Thank you, as well, to Aude Aprahamian and Mélanie Grenier for their support in managing the project. Hats off to Carole Nkoa for her passionate belief

in a forward-moving Francophonie, and to Glenn O'Farrell, whose vision continues to motivate us. Thank you, Graham Martin-Brown, for inspiring and educating us. Thank you, Brigitte Cyr and Fanny Cazeau, from CLÉ, for generously sharing your abilities with us.

In this digital world of ours, during this 4th Industrial Revolution where time and focus are as precious as gold, a journey like this one would not have been possible without stealing precious time away from our children, our partners, and our friends, whom I applaud for their patience.

And finally, thank you to those who believe in youth, in education, in the Ontarian, Canadian, and world Francophonie, as well as all of Groupe Média TFO's works: our TFO employees, TFO's Board of Directors, (list supporting organizations).

This journey was an extremely enriching experience for me, a feast that **nourished** my love for education!



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# APPENDIXES



# APPENDIX 1:

## OVERVIEW OF SELECTED RECENT STUDIES ON THE IMPACT OF AUTOMATION AND FUTURE OF WORK

### OVERVIEW OF SELECT RECENT STUDIES ON THE IMPACT OF AUTOMATION AND FUTURE OF WORK

Carl Benedikt Frey and Michael A. Osborne	Citibank with Frey and Osborne	OECD	World Economic Forum	McKinsey Global Institute
<b>Date</b>				
September 2013	January 2016	June 2016	January 2016	January 2017
<b>Unit of analysis</b>				
Jobs/occupations	Jobs/occupations	Tasks	Not applicable	Work activities
<b>Scope</b>				
US labor market	50+ countries and regions	21 OECD countries	15 major developed and emerging economies	46 countries representing about 80% of global labor force
<b>Approach summary</b>				
Analysis of 702 occupations (70 hand-labeled working with ML researchers, followed by a tailored Gaussian process classifier to estimate others and confirm hand-labels) to approximate the impact of future computerization on the US labor market	Extension of Frey-Osborne (2013), using World Bank data, to estimate impact of automation globally. Further analyses include examination of demographic changes, global value chain, etc.	Estimates of automatibility of tasks were developed based on matching of the automatibility indicators by Frey-Osborne and the PIAAC data occupational codes, followed by a two-step, tailored regression analysis	Analysis of large-scale survey of major global employers, including 100 largest global employers in each of WEF main industry sectors, to estimate the expected level of changes in job families between 2015–20 and extrapolate number of jobs gained/lost	Disaggregation of occupations into 2,000 constituent activities and rating each against human performance in 18 capabilities. Further analysis of time spent on each activity and hourly wage levels. Scenarios for development and adoption of automation technologies
<b>Key relevant findings</b>				
<ul style="list-style-type: none"> <li>About 47% of total US occupations are at high risk of automation perhaps over the next decade or two</li> <li>Wages and educational attainment show a strong negative relationship with probability of computerization</li> </ul>	<ul style="list-style-type: none"> <li>Building on Frey and Osborne's original work, data from the World Bank suggests the risks are higher in many other countries; in the OECD, on average 57% of jobs are susceptible to automation. This number rises to 69% in India and 77% in China</li> </ul>	<ul style="list-style-type: none"> <li>On average, 9% of jobs across the 21 OECD countries are automatable</li> <li>There are notable differences across OECD countries when it comes to automation (e.g., the share of automatable jobs is 6% in Korea vs. 12% in Austria)</li> </ul>	<ul style="list-style-type: none"> <li>Automation and technological advancements could lead to a net employment impact of more than 5.1 million jobs lost to disruptive labor market changes between 2015–20, with a total loss of 7.1 million jobs—two-thirds of which are concentrated in the office and administrative job family—and a total gain of 2 million jobs in several smaller job families</li> </ul>	<ul style="list-style-type: none"> <li>Almost half of work activities globally have the potential to be automated using current technology. &lt;5% of occupations can be automated entirely; about 60% have at least 30% of automatable activities</li> <li>Technically automatable activities touch 1.2 billion workers and \$14.6 trillion in wages. China, India, Japan, and the United States constitute over half</li> <li>Automation's boost to global productivity could be 0.8–1.4% annually over decades</li> </ul>

SOURCE: Carl Benedikt Frey and Michael A. Osborne, *The future of employment: How susceptible are jobs to computerisation?*, Oxford Martin School, September 17, 2013; *Technology at Work v2.0. The future is not what it used to be*, Citibank, January 2016; *The future of jobs: Employment, skills, and workforce strategy for the fourth Industrial Revolution*, World Economic Forum, January 2016; Melanie Antz, Terry Gregory, and Ulrich Zierahn, *The risk of automation for jobs in OECD countries: A comparative analysis*, OECD Social, Employment and Migration working paper number 189, OECD, May 2016; McKinsey Global Institute analysis. See also Holger Bonin, Terry Gregory, and Ulrich Zierahn, *Übertragung der Studie von Frey/Osborne (2013) auf Deutschland*, Forschungsbericht 455, Bundesministerium für Arbeit und Soziales, April 14, 2015; and Jeremy Bowles, *The computerisation of European jobs*, Bruegel, July 24, 2014.

## APPENDIX 2: EXAMPLES OF GLOBAL COMPETENCIES

22 ♦ 21st Century Competencies

**Table 1: Sample competencies and frameworks**

Ontario Vision/Budget Based on Results of Public Consultations (2014)	ATC21S (2012) (Summary of International Frameworks)	Fullan and Scott (2014) The Six Cs
<p>"Achievement also means raising expectations for valuable, higher-order skills like <b>critical thinking, communication, innovation, creativity, collaboration, and entrepreneurship.</b>" (<i>Achieving Excellence</i>, p. 3)</p> <p>"[O]ur learners will also need to develop characteristics such as <b>perseverance, resilience, and imaginative thinking</b> to overcome challenges. Combined with a deep sense of <b>compassion and empathy</b> for others, our learners will develop the skills and knowledge they need to become actively <b>engaged citizens.</b>" (<i>Achieving Excellence</i>, p. 5)</p> <p>"To achieve success, Ontario will... Foster more young entrepreneurs in Ontario schools by increasing training in <b>innovation, creativity, and entrepreneurship.</b>..." (<i>Achieving Excellence</i>, p. 6)</p> <p>"By 2025... Ontario will be a world leader in higher-order skills, such as <b>critical thinking and problem solving</b>, which will allow Ontario to thrive in the increasingly competitive global marketplace." (<i>2014 Ontario Budget</i> [Sousa, 2014], p. 9)</p>	<p><b>Ways of Thinking</b></p> <ol style="list-style-type: none"> <li>1. Creativity and innovation</li> <li>2. Critical thinking, problem solving, decision making</li> <li>3. Learning to learn, metacognition</li> </ol> <p><b>Ways of Working</b></p> <ol style="list-style-type: none"> <li>4. Communication</li> <li>5. Collaboration (teamwork)</li> </ol> <p><b>Tools for Working</b></p> <ol style="list-style-type: none"> <li>6. Information literacy</li> <li>7. Information and communication technology literacy</li> </ol> <p><b>Living in the World</b></p> <ol style="list-style-type: none"> <li>8. Citizenship – local and global</li> <li>9. Life and career (including adapting to change; managing goals and time; being a self-directed learner; managing projects; working effectively in diverse teams; being flexible; producing results; guiding and leading others)</li> <li>10. Personal and social responsibility (including cultural awareness and competence)</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>Character</b> – "qualities of the individual essential for being personally effective in a complex world including: grit, tenacity, perseverance, resilience, reliability, and honesty." (Fullan &amp; Scott, 2014, p. 6)</li> <li>2. <b>Citizenship</b> – "thinking like global citizens, considering global issues based on a deep understanding of diverse values with genuine interest in engaging with others to solve complex problems that impact human and environmental sustainability." (Fullan &amp; Scott, 2014, p. 6)</li> <li>3. <b>Communication</b> – the "mastery of three fluencies: digital, writing, and speaking tailored for a range of audiences." (Fullan &amp; Scott, 2014, p. 6)</li> <li>4. <b>Critical Thinking</b> – "critically evaluating information and arguments, seeing patterns and connections, constructing meaningful knowledge and applying it in the real world." (Fullan &amp; Scott, 2014, p. 7)</li> <li>5. <b>Collaboration</b> – "the capacity to work interdependently and synergistically in teams with strong interpersonal and team-related skills including effective management of team dynamics, making substantive decisions together, and learning from and contributing to the learning of others." (Fullan &amp; Scott, 2014, p. 6)</li> <li>6. <b>Creativity</b> – "having an 'entrepreneurial eye' for economic and social opportunities, asking the right questions to generate novel ideas, and demonstrating leadership to pursue those ideas into practice." (Fullan &amp; Scott, 2014, p. 7)</li> </ol>

Source: Ontario Ministry of Education (2016), *Towards defining 21st century competencies – Foundation document for discussion, Winter edition 2016*, Page 22

## APPENDIX 3: TECHNOLOGIES USED BY ONTARIO SCHOOL BOARDS, KEY PRACTICES, AND THEIR ROLE IN COMPETENCY DEVELOPMENT

36 ♦ 21st Century Competencies

**Table 2: Connections between digital tools and resources, key transformational learning practices/contexts, and competency development**

Technologies	Key Transformational Learning Practices/Contexts	21st Century Competencies
<p><b>Social and Collaboration</b> Support knowledge building</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Blogs</li> <li>• Online discussions</li> <li>• File sharing</li> </ul>	<ul style="list-style-type: none"> <li>• Authentic audiences</li> <li>• Student voice and choice</li> <li>• Student creation and iteration of knowledge (deeper learning)</li> <li>• New partnerships in learning</li> <li>• Inquiry-based learning (including project- and problem-based learning)</li> <li>• Timely, descriptive feedback</li> </ul>	<ul style="list-style-type: none"> <li>• Communication</li> <li>• Collaboration</li> <li>• Negotiation</li> <li>• Leadership</li> <li>• Intellectual openness</li> <li>• Conscientiousness</li> <li>• Critical thinking</li> <li>• Digital citizenship</li> </ul>
<p><b>Hybrid and Mobile</b> Broaden access to education beyond the school walls</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Tablets</li> <li>• Laptops</li> <li>• Cloud technology</li> </ul>	<ul style="list-style-type: none"> <li>• Student-driven inquiry</li> <li>• Self-directed learning</li> <li>• New partnerships in learning</li> <li>• Equity of access</li> <li>• Authentic, real-world learning tasks</li> </ul>	<ul style="list-style-type: none"> <li>• Responsibility</li> <li>• Productivity</li> <li>• Analysis</li> <li>• Decision making</li> <li>• Information literacy</li> </ul>
<p><b>Visualization</b> Help students to master abstract concepts</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• 3D printers</li> <li>• Interactive maps</li> <li>• Graphing tools</li> <li>• Concept mapping tools</li> </ul>	<ul style="list-style-type: none"> <li>• Differentiated instruction</li> <li>• Student discovery/mastery</li> <li>• Elimination of barriers to higher-order thinking</li> <li>• Learner autonomy</li> <li>• Timely, descriptive feedback</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination</li> <li>• Communication</li> <li>• Metacognition</li> <li>• Analysis</li> <li>• Numeracy</li> <li>• Problem solving and reasoning</li> </ul>
<p><b>Storytelling and Creation</b> Develop students as knowledge creators and communicators</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Video/music production tools</li> <li>• Presentation tools</li> </ul>	<ul style="list-style-type: none"> <li>• Student choice and voice</li> <li>• Student creation and iteration of knowledge (deeper learning)</li> <li>• New partnerships in learning</li> <li>• Authentic, real-world learning tasks and audiences</li> </ul>	<ul style="list-style-type: none"> <li>• Communication</li> <li>• Collaboration</li> <li>• Intellectual interpretation</li> <li>• Creativity</li> <li>• Innovation</li> <li>• Digital literacy</li> <li>• Digital citizenship</li> </ul>
<p><b>Immersive Media and Simulation</b> Situate learning in real-world and augmented realities</p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Virtual worlds</li> <li>• Interactive games</li> </ul>	<ul style="list-style-type: none"> <li>• Authentic, real-world learning tasks</li> <li>• Student creation</li> <li>• Student discovery/mastery</li> <li>• Personalized learning</li> <li>• Timely, descriptive feedback</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Conflict resolution</li> <li>• Curiosity</li> <li>• Grit and perseverance</li> <li>• Self-efficacy, initiative</li> <li>• Problem solving and reasoning</li> <li>• Creativity and innovation</li> <li>• Critical thinking</li> </ul>

Source: Ontario Ministry of Education (2016), *Towards defining 21st century competencies – Foundation document for discussion, Winter edition 2016*, Page 36.

