People for Education

Public education. Public good.

Technology in schools

A tool and a strategy

Contents

An undeniable reality has emerged in the COVID-19 pandemic: Technology can be a very useful tool in education, but it cannot act as a replacement for the rich learning and human development that happens in the myriad face-to-face settings and relationships that exist in schools.

The pandemic has provided us with a shocking real-life example of how fast things can and do change in today's globalized world. At the same time, it has also provided a chance to examine much more deeply how we are currently using technology in our schools, and to explore the potential in online learning, when used effectively.

However, there is a risk that the need for urgency in school systems' response to the pandemic will push us backward – to a narrow focus on the "3 R's" and education that can be delivered simply, through things like online work sheets and tests.

> **"We live in a world in which the kinds of things that are easy to teach and test have also become easy to digitize and automate. When we could still assume that what we learn in school will last for a lifetime, teaching content knowledge and routine cognitive skills was rightly at the centre of education. Today, the world no longer rewards us just for what we know – Google knows everything – but for what we can do with what we know."**
>
> **Andreas Schleicher, Director for Education and Skills at the OECD, 2018**

In many provinces, distance learning during the pandemic has focused on reading, writing and math in ways that fail to recognize the progress we have made toward understanding education at a much richer, more integrated and complex level (People for Education, 2020).

The pandemic has also amplified inequities that were always there – some connected to students' varied access to technology, but many more connected to the impact of poverty, discrimination, and the wide range in families' capacity to support students.

The sudden closing of schools around the world has made their role as a potential equalizer instantly apparent.

But schools' capacity to mitigate social inequities will require a substantial change to ensure that all students are ready for challenges that were there before the pandemic – the rise of rapidly-advancing technologies, a shift to a knowledge economy, globalization, and the urgency of climate change – as well as being prepared for new challenges on the horizon (UNESCO, 2020). Students need to be *future-ready*.

> **"Online education can do a lot more than be a lesser version of face-to-face schooling. It can help make learning more authentic, more relevant to the real world, more learner-centered. It provides access to resources and expertise beyond the immediate classroom or school. Students can collaborate with peers from around the globe and can learn from, with, and for anyone in the world at any time. If the purpose of moving online is simply to make online education fill in the void created by school closures, it is a tremendous waste of the potentials."**
>
> **Yong Zhao, Foundation Distinguished Professor in the School of Education at the University of Kansas, 2020**

In the wake of the Fourth Industrial Revolution—where the lines between digital, physical and biological spaces are blurred—the "skills economy" is at the forefront of the conversation (OECD, 2018; RBC, 2018). But being future-ready is not solely about equipping students with skills for the labour market. It's also about ensuring that students can fully participate in a democratic society and in all aspects of their lives.

To thrive in this rapidly evolving world, graduates need a wide range of skills beyond the 200-year-old basics: reading, writing, and arithmetic. To succeed, they must also develop a sense of self and society, foster creative and critical thinking skills, learn independently, and be able to collaborate and communicate effectively. As one of the highest performing systems globally, Ontario's schools should be well-positioned to foster these New Basics (CMEC, 2019). However, the reality is that Ontario is lagging behind other provinces in making sure schools are future-ready.

In Ontario, there are modernization efforts taking shape that include a focus on e-learning, STEM, and transferable skills. But recent reductions in funding for the staff, infrastructure and resources that support students to be equipped for the future, call these priorities into question. Our schools need to have the proper resources and policies in place now, for our students to be future-ready.

More than 1,000 principals from across Ontario participated in People for Education's 2020 Annual Ontario School Survey. Their responses, and the challenges emerging from the pandemic, reveal that the future needs of Ontario students will not be met in the current system or with present-day policy thinking.

Quick facts 2020

- An average of 6% of students per secondary school earn credits through online learning.
- Only 66% of Ontario schools have access to wall-to-wall WiFi.
- 77% of elementary schools with high average family incomes offer robotics, technology, or STEM clubs, compared to 57% of schools with low average family incomes.[1]
- 91% of secondary schools report that students taking e-learning courses have access to school laptops or computers during the day, while 43% of schools have devices available for students after school. Only 19% of schools report students have access to these devices on weekends.
- 65% of elementary schools and 18% of secondary schools fundraise to offset the costs of technology.

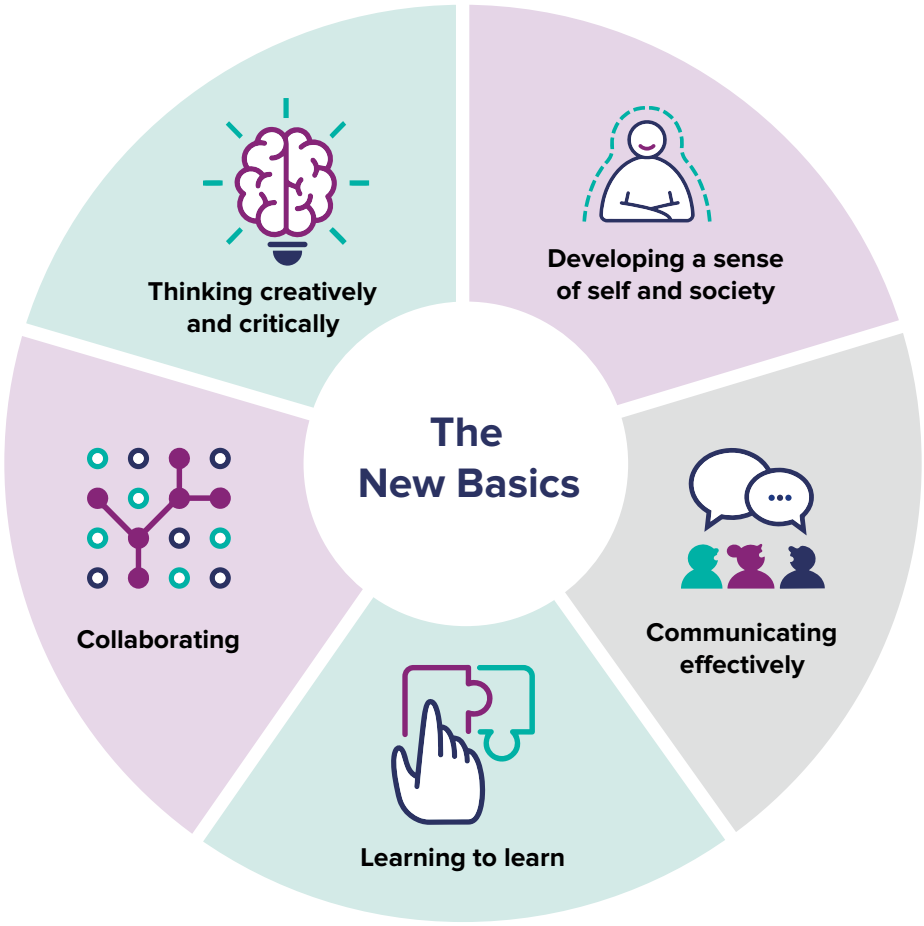
1 All schools in our sample were matched with their weighted median family income based on data prepared by the Ontario Ministry of Education and from Statistics Canada. When sorted by median income, the top 25% of our elementary sample are referred to as "high income" and the bottom 25% are referred to as "low income".

Students need future-ready skills

From self-driving cars to brain implants, we can only imagine what the world will look like in 2030. But for Ontario students, imagining the world in the future is not enough. They need to be ready for it, and they can be.

Ontario needs new generations who can adapt to the changing world, who can make effective use of technological advancements and who can rise to challenges we cannot yet imagine. And students need an education that gives them the tools and opportunities to thrive and participate fully into 2030 and beyond (UNESCO, 2020).

Up to now, future-ready skills and competencies have gone by a variety of labels including soft skills, 21st century skills, transferable skills, and global competencies (British Columbia Ministry of Education, 2017; OECD, 2018; RBC, 2018; Waddell et al., 2018). People for Education refers to them as *The New Basics*.



These skills and competencies are the foundation upon which all other skills can be built, and they have been identified by employers, educators, researchers, and policymakers as skills that will remain salient in the wake of innovation and technological advancement (Abdul Latif J-WEL, 2017; Wadell et al., 2018; CMEC, 2019).

The skills are also recognized in the UN Sustainable Development Goals (SDGs) as key components of a quality education (United Nations, 2015a).

The SDGs, adopted unanimously by Canada and the other 192 members of the UN General Assembly in 2015, are meant to be a "blueprint to achieve a better and more sustainable future for all" (United Nations, 2015a). SDG 4 is focused on quality education and includes specific targets for increasing students' skills that will support "employment, decent jobs and entrepreneurship" and ensuring students acquire skills "needed to promote sustainable development…human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (United Nations, 2015b). Across Canada, provinces and territories have started to formally articulate these skills as part of curriculum and renewed visions for education (British Columbia Ministry of Education, 2017; New Brunswick Ministry of Education, 2019; Saskatchewan Teachers' Federation, 2019).

Up to now in Ontario, the responsibility for future-ready skills has largely fallen to the post-secondary sector (Higher Education Quality Council of Ontario, 2018). Recently, that has begun to change. The 2019 vision for education, *Education that Works for You*, the new Grade 10 *Careers Curriculum*, and the revised elementary health curriculum include references to "transferable skills" including, digital literacy, adaptability, social-emotional skills, critical thinking and collaboration (Government of Ontario, 2019a; Ontario Ministry of Education, 2019b). The province has announced plans to embed these skills across curriculum, but it will take cross-cutting, coherent policy and adequate resources to both support this change, and have Ontario once again take its place as an educational leader in Canada.

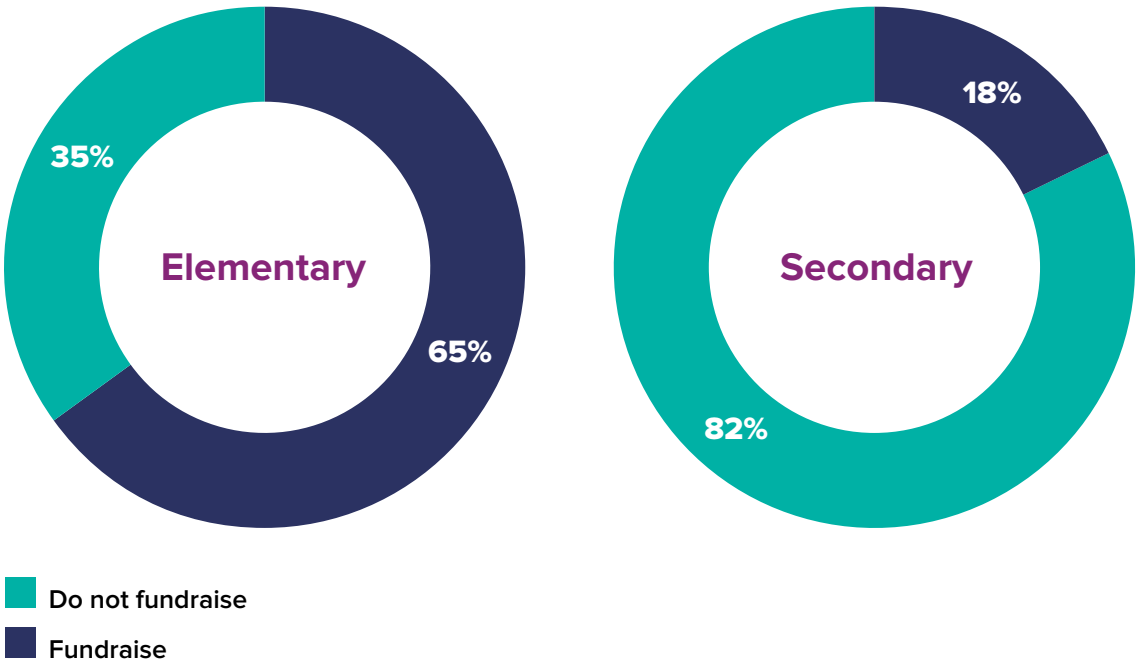
Access to technology

In Ontario, funding to support the hard costs of computers and software in schools has not increased for 10 years.[2] In addition, funding to support technology overall is divided among at least three different grants, and has not kept pace with the rate of technological change education is experiencing. Many schools rely on fundraising to offset the costs of technology, and principals report that it is difficult to ensure that all students have equitable access.

These funding issues are key. Researchers agree that technology can help to support and expand future-readiness by supporting student-centred, collaborative learning environments, but insufficient access to resources and supports can be barriers to successful implementation and integration of technology in schools (Dede, 2014; People for Education, 2019).

FIGURE 1

Percentage of schools that report fundraising for technology



2 The "Classroom Computers" and the "Textbook and Learning Materials" portions of the Pupil Foundation Grant have remained the same since 2009/2010 (Ontario Ministry of Education, 2009, 2019a).

> **An increasing focus on technology-enabled participatory learning leverages the orientation of today's and tomorrow's students, for whom a digital environment is expected.**
>
> **BC's Digital Literacy Framework**

Learning in 21st century classrooms

In Ontario, there are an increasing number of students learning with Chromebooks, smartboards, and robotics kits (Rizk, 2018), and teachers in 21st century classrooms are more and more likely to communicate with parents and students via apps, websites, and email.

> **We are a very fortunate school with 1:1 chrome book use and well trained staff in the area of technology use within the classroom. Hence, we have a rigorous Digital Citizenship Policy as well that is implemented and monitored via classroom teachers and administration.**
>
> **Elementary school, Waterloo Region DSB**

> **All of the students in the school have their own laptops provided by the school board.[3]**
>
> **Secondary school, Conseil scolaire public du Grand Nord de l'Ontario**

When implemented appropriately, technological advances can support a range of instructional strategies that align with developing future-ready skills. It is one of the tools that can support students to become more empowered learners, responsible digital citizens, innovators, communicators, and global collaborators (International Society for Technology in Education, 2020).

However, the mere presence of technology cannot be an end unto itself. Technology is a tool that needs to be supported by teacher training and informed by pedagogy to yield its benefits (Dede, 2014; Rizk, 2018).

3 « Tout les élèves de l'école ont leur propre portable fournit par le conseil scolaire. » – école secondaire, Conseil scolaire public du Grand Nord de l'Ontario

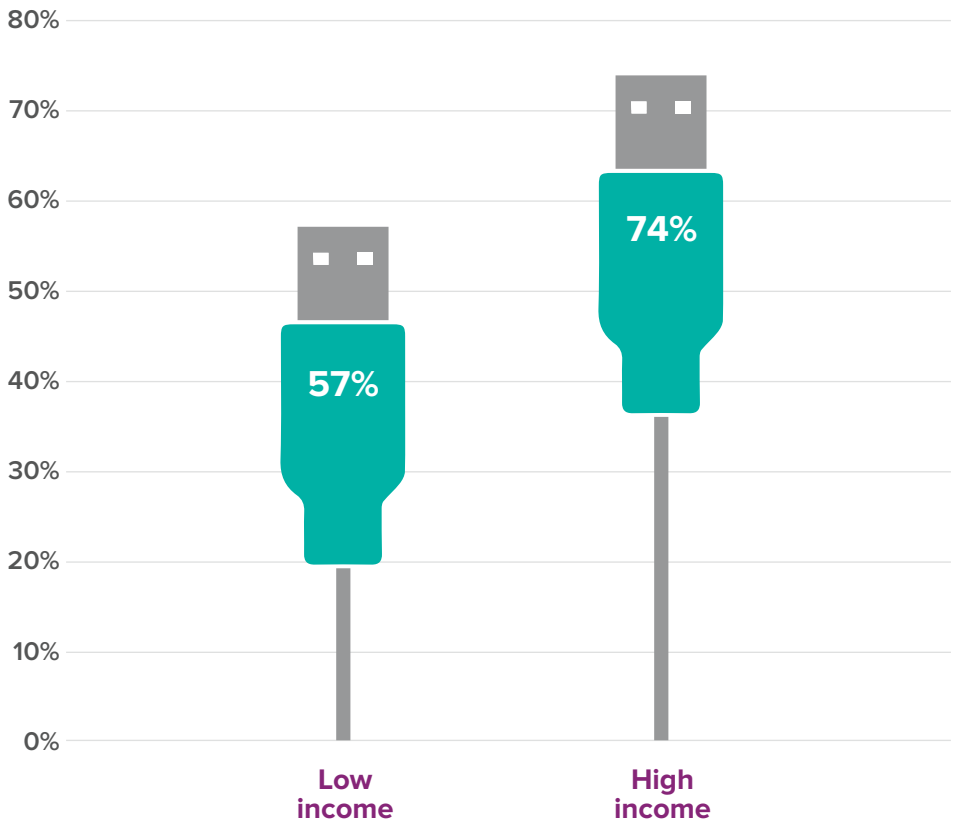
Fundraising for technology

The majority of elementary schools (65%) report fundraising to offset the costs of technology. In secondary schools, only 18% report this type of fundraising. However, data from the Ontario Ministry of Education and Statistics Canada reveal important demographic differences: 74% of elementary schools with high average family incomes fundraise for technology, compared to 57% of schools with low average family incomes.

> **The school is technology poor and there is limited funding to equip it with student devices. Fundraisers do not generate lots of cash and the budget is limited.**
>
> **Elementary school, Simcoe Muskoka CDSB**

FIGURE 2

Percentage of elementary schools fundraising for technology, by family income



Online learning

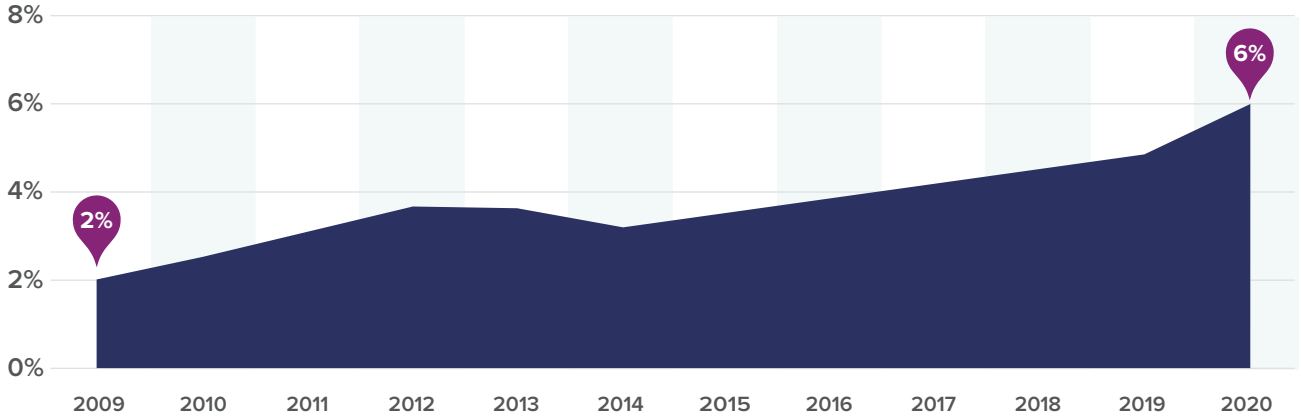
Online learning can involve a range of tools and methods of teaching, and it can be part of nearly all aspects of curriculum. Using online learning, students can collaborate across classrooms, schools, or even countries; they can access expertise beyond the classroom teacher, and teachers can use online resources to personalize learning.

During the pandemic, teachers across Canada have used a wide variety of online tools and techniques. However, many, if not most, have pointed out that online learning cannot replace the learning communities created in classrooms and schools. Teachers and other experts have made it clear that post-pandemic, it will be important to ensure that students are set up with the guidance, time and resources necessary to successfully engage and learn in digital platforms.

E-learning – taking a whole course online – is one form of online learning.

FIGURE 3

Average percentage of secondary students per school enrolled in e-learning



In Ontario, the vast majority (92%) of secondary schools have students enrolled in e-learning courses. But the actual enrolment per school is very small. On average 6% of students per secondary school are taking online courses, a proportion that has increased very gradually from 2% in 2009, when we first began tracking this number. This is a far cry from the

province's target of 100% of students taking at least two e-learning courses before they graduate. And even at this very low enrolment rate, principals are already reporting challenges with e-learning, including a lack of adequate supervision and support for students to help them manage their workload and course expectations.

> **As enrolment increases in e-learning courses, we find it challenging to provide adequate supervision for e-learning students. We cannot afford to assign a teacher to supervise them.**
> **Secondary school, Ottawa-Carleton DSB**

E-learning was introduced in Ontario high schools to create more options for student success (Ontario Ministry of Education, 2006), and students currently take these online courses for a variety of reasons: to fast-track their education, to access courses not offered in their school, or to complete their required credits.

When a student enrols in an online course at school, they are taught by an Ontario certified teacher, usually from within their own school board. These teachers use the same Ontario curriculum as in school-based courses. Students take the course as part of their school timetable, but can access the content anywhere and anytime. The courses are administered by school boards, consortia of school boards, or TVO's Independent Learning Centre (TVO, 2020).

Funding for e-learning is currently provided at the same rate as funding for classroom-based learning, which, up until 2018, was based on an average class size of 22 students.

> **…due to the lack of staffing, we are forced to offer online courses, but sometimes the choices are limited and not all students have the skills to successfully complete online courses. We have no staffing to support them when needed.[4]**
> **Secondary school, Conseil des ecoles publiques de l'Est de l'Ontario**

4 « Encore une fois, dû au manque de dotation, nous sommes obligé d'offrir des cours en ligne, mais parfois les choix sont limités et pas tous les élèves ont les habiletés pour bien réussir des cours en ligne. Nous n'avons pas de dotation pour les soutenir au besoin. » – école secondaire, Conseil des ecoles publiques de l'Est de l'Ontario

While e-learning courses are taught by teachers online, just over half of secondary schools (56%) have designated staff members to support students who are working on e-learning courses during the school day. Of those schools, 55% report that student success teachers perform this role, while 48% report that guidance teachers do so.

Mandatory e-learning

In early 2019, the Ministry of Education announced that all high school students would be required to take four *mandatory* online courses to graduate. However, the government recently rolled back the number to two mandatory e-learning courses, and announced that parents can opt their children out of online courses. (The e-learning policy includes a plan for a large increase in average class sizes for e-learning, so that they will be funded at an average of one teacher per 30 students (K. Rushowy, personal communication, May 4, 2020). This new policy is to be implemented in the fall of 2020 (Government of Ontario, 2020).

Many have raised concerns about the short timelines for implementation, the large class sizes, and the lack of resources to support such a major change in the system.

However, the greatest objections have been to the mandatory component of the planned policy. A survey from the Ontario Student Trustees' Association found that 92% of students who had taken an e-learning course, and 98% of students who hadn't, did not think that students should have to take an e-learning course to graduate. A government consultation with more than 7,000 parents also revealed concerns about mandatory e-learning. According to reports about the consultation, "a key theme from the respondents [was] that they do not support mandatory online learning" (Rushowy, 2020).

Since those objections were raised, the government has said that parents could opt their children out of the courses, but there are no details as to how that would work, or whether the opt-out would only be for specific reasons, including a child's special needs. Some have raised concerns about using an opt-out system such as this, because it may create further inequity as parents with higher social capital, who tend to be from a higher socioeconomic status, are more likely to avail themselves of things like opt-out strategies (Mitra et al., 2016).

The costs and benefits of online learning

When integrated with the appropriate technology, training and time, e-learning can be helpful in preparing students for the future. Through online courses, schools may be able to access a wider range of content, provide more educational choices for students, and may see improved course outcomes (Gulosino & Miron, 2017; Michigan Virtual University, 2018; Wang et al., 2013). They also provide a space where students can learn at their own pace and have opportunities to become more independent learners (Burdett et al., 2013; Kirby et al., 2010; Sublett & Chang, 2019).

On the other hand, e-learning requires costly infrastructure, and student retention is dependent upon students' level of readiness and familiarity with a range of learning management systems (LMS) (Liu & Cavanaugh, 2011; Wang, Shannon & Ross, 2013). While e-learning has many layers and factors that influence student achievement, if the LMS is not user-friendly or is difficult to use, students may not interact with the coursework as much, which can limit their level of achievement (Liu & Cavanaugh, 2011; Wang et al., 2013).

Inequity is another challenge with e-learning. While the vast majority (91%) of secondary schools report e-learning students have access to school laptops or computers during the school day, only 43% have devices available for students after hours and access on weekends is even more limited. Only 19% of high schools report that students can access school laptops or computers on weekends.

One of the recommendations in the report from the province's consultation on e-learning was that the province phase in e-learning, starting with a pilot of one mandatory online course, and "invite interested boards to apply to be part of the pilot then gather data" (Rushowy, 2020).

COST AND BENEFITS OF E-LEARNING	
BENEFITS	**COSTS**
+ Expand educational access to small, remote communities	− Expensive to upgrade and maintain
+ Create educational choice	− High start-up costs
+ Increase motivation	− Student retention and readiness issues
+ Promote administrative efficiency	− Inequity
+ Improve student outcomes and skills	− Training and capacity issues
+ Prepare students for postsecondary education	− Resources for support and supervision of e-learning

(Barbour, 2010; Gulosino & Miron, 2017; Michigan Virtual University, 2018; Wang et al., 2013)

School libraries as tech hubs

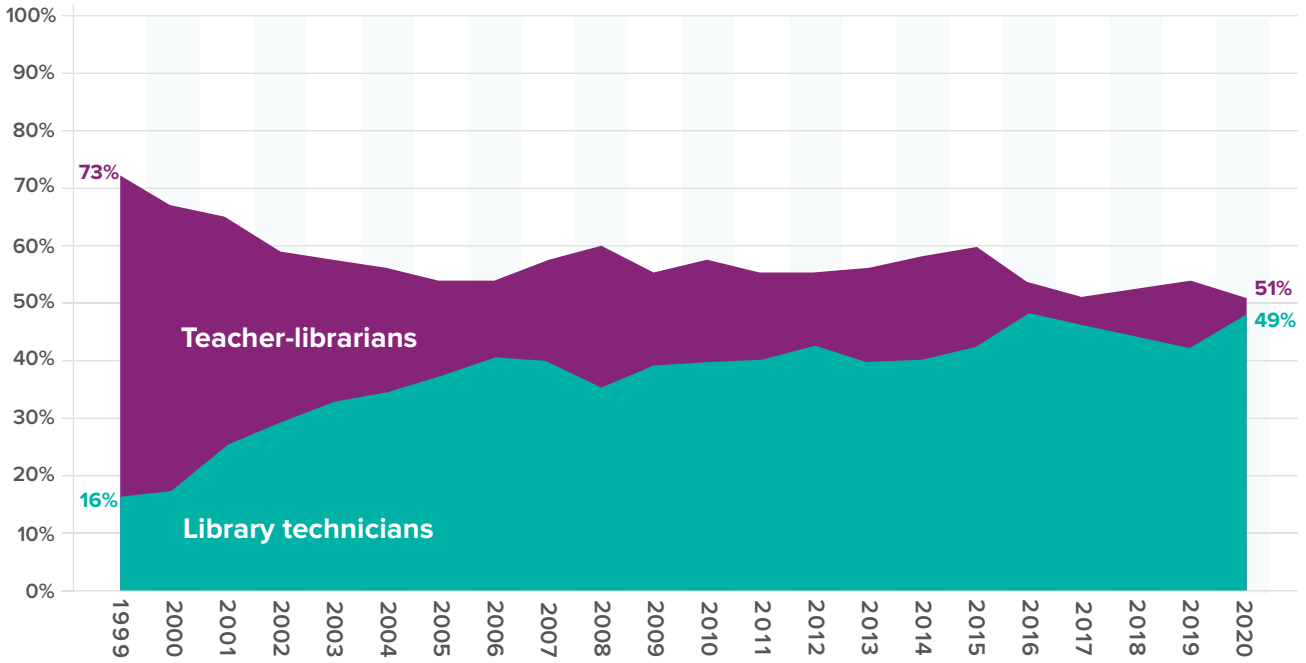
This year, nearly half of Ontario secondary schools (43%) report that students working on e-learning during the school day work primarily in the school library. And of the principals who report informally asking staff to support students with their online learning, 26% say they have asked the teacher-librarian to take up this task.

Library staff, in particular teacher-librarians, have a variety of roles and responsibilities that can be directly linked to preparing students for the future, including: promoting 21st century learning approaches; teaching students about their digital rights; promoting the development of students' digital skills; and guiding students in the acquisition of information literacy (CLA, 2014). School libraries are often now viewed as tech hubs or Library Learning Commons – integrated spaces where students can develop critical skills, such as information literacy and collaboration (BCTLA, 2017).

In spite of this potentially expanding role in supporting technology, online learning and digital literacy, there has been a steady decline across the province in the proportion of schools with teacher-librarians.

FIGURE 4

Elementary librarians over time



In 2020:

- 51% of elementary schools report having a teacher-librarian full- or part-time, compared to 65% of schools in 2001, and 73% of elementary schools in 1999.
- 67% of secondary schools report having a teacher-librarian full- or part-time, compared to 78% in 2001.
- The average ratio per school of students to teacher-librarians, is 869 to 1 in elementary schools, and 1068 to 1 in secondary schools.

> **The staffing of the library makes running a 'Learning Commons' difficult. This is a large piece of real estate that could be utilized as a STEAM/Learning Commons area which would benefit ALL students at every grade level in the school.**
>
> **Elementary schools, Simcoe Muskoka CDSB**

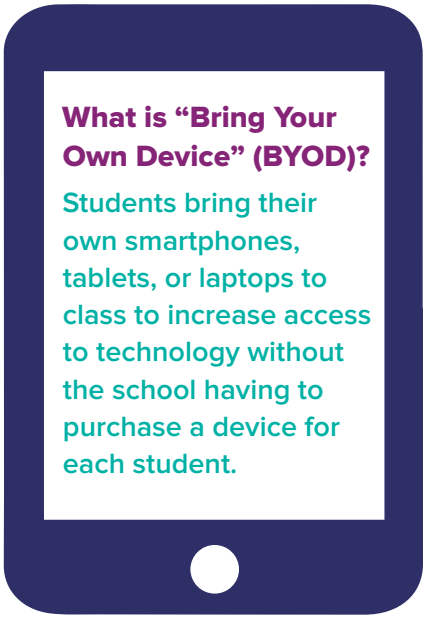
Students' devices in schools

This year 30% of elementary schools report that they always encourage their students to bring their own device (BYOD) to school, compared to 25% who report they never do.

In recent years, district school boards across Ontario have been implementing BYOD policies to increase the availability of devices for each student (Peel District School Board, 2020; People for Education, 2019). Some of the potential benefits of BYOD for students and schools include:

- **Up-to-date technology:** Students' devices may be more up-to-date and students are more familiar with using them.
- **Collaboration:** Students can collaborate with their classmates outside of school hours on school work.
- **Lower costs:** Maintaining and updating devices purchased by the school can be expensive and BYOD may help to lessen some of those costs.

In schools that encourage BYOD, cellphones and other devices can be used in the classroom in a variety of ways: to research information for a lecture; to poll students to see how ready they are for an upcoming test; or to send reminders for assignments and tests (NEA, 2020).



> **Our board has had a BYOD policy at the school for years. Our students know that technology is only to be used for educational purposes and under the direct supervision of a teacher.**
>
> **Elementary schools, Upper Grand District School Board**

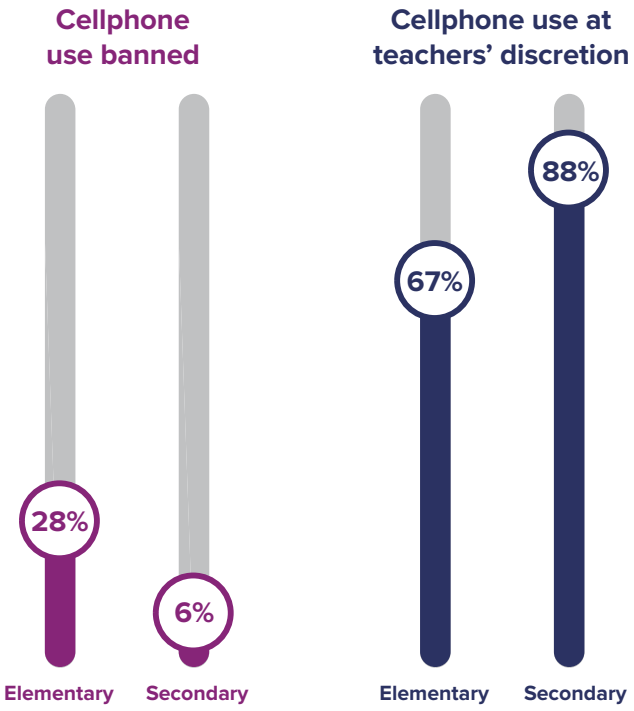
> **BYOD isn't a big issue because of demographics. We have purchased a large amount of tech to ensure our students aren't behind because they lack a device of their own.**
>
> **Elementary school, Peterborough Victoria Northumberland CDSB**

Prohibiting cellphones in schools

In September 2019, the province updated the *Provincial Code of Conduct* to "prohibit cellphone use in schools during instructional time" (Government of Ontario, 2019a).

FIGURE 5

Schools' cellphone policies



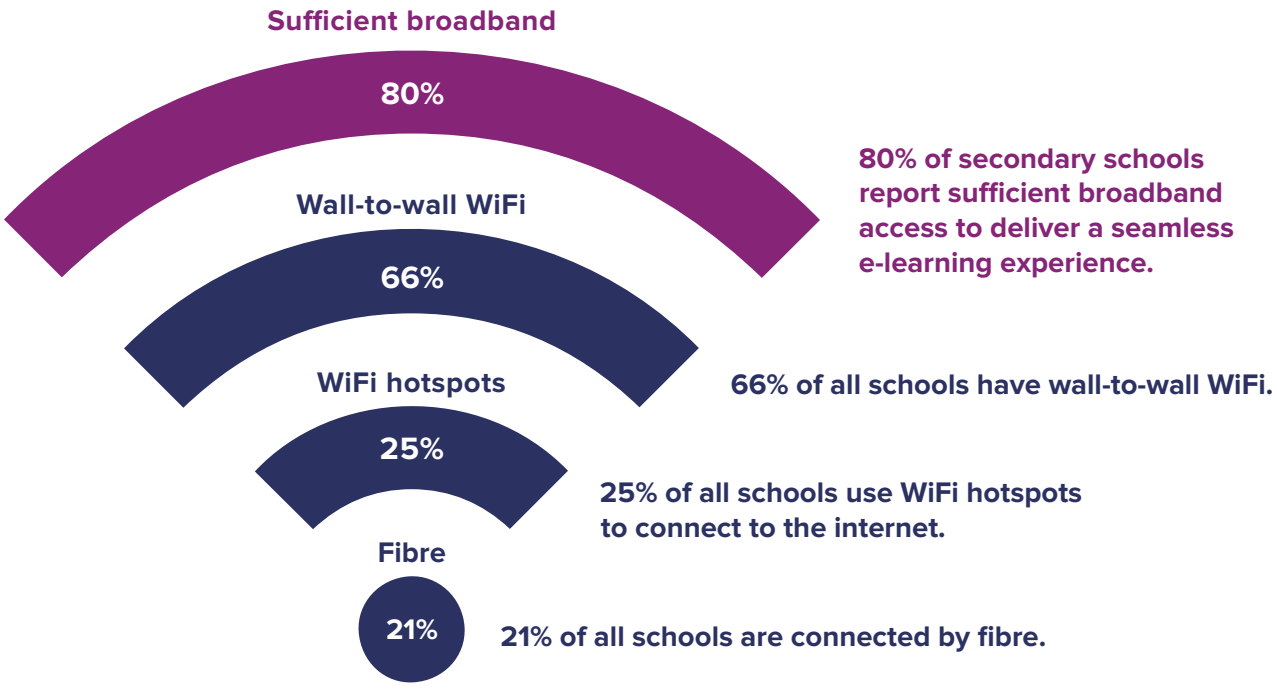
Despite provincial policy, only 28% of elementary schools and 6% of secondary schools report they have banned cellphones. The majority of elementary schools (67%) and secondary schools (88%) report that, instead of being banned, cellphone use is at the discretion of the teachers.

Internet connectivity

What do Mount Everest, the North Pole, and the moon have in common? Besides the cold temperatures, they are all equipped with WiFi (The Independent, 2015). In today's world, we cannot benefit from the technology we have if there is no internet access. And that applies to schools now more than ever as they prepare students for the future.

Before students can learn how to determine which sources to trust on the internet or how to collaborate with their peers online, the appropriate infrastructure needs to be in place. This year People for Education asked principals about the types of internet connectivity they have at their schools.

FIGURE 6



> **Upgrade of fibre has improved use. Addition of wall-to-wall wifi has enabled effective use of portable devices for learning.**
> **Elementary school, Toronto DSB**

While the majority of elementary and secondary schools in Ontario have access to wall-to-wall WiFi, principals noted that the internet is not always reliable and may cut out for periods of time.

Eighty percent of secondary schools report sufficient broadband access to deliver a seamless e-learning experience. There was no difference between urban and small town/rural schools.[5]

In the Ministry's renewed vision for education, *Education that Works for You,* the government committed to ensuring that all schools have access to reliable and fast internet by 2022. As of November 2019, over 30% of northern and rural schools have had upgrades to their broadband access (Government of Ontario, 2019a).

> **Internet goes in and out, rural internet affected by weather. Successes: Access to purchasing technology through rural school grant (definite benefit for our school with a small budget).**
> **Elementary School, Rainbow DSB**

> **The bandwidth is really not enough. Despite the efforts of the IT department, it still remains a challenge to be able to connect our equipment.[5]**
> **Elementary school, Conseil scolaire de district catholique de l'Est ontarien.**

Supporting STEM education

Around the world, and in Ontario, Science, Technology, Engineering, and Mathematics (STEM) education has been a focus of education reforms (OECD, 2019). However, it is important to note that STEM opportunities are not just for students who want to pursue a career as an engineer or as a scientist–they promote real-world problem-solving skills that can prepare students for future social and economic challenges we cannot yet imagine (Jang, 2016).

This year 66% of elementary schools and 74% of secondary schools in Ontario report that they have robotics, technology, or STEM clubs. However, STEM opportunities are not distributed equally and there are disparities between schools along socio-economic and geographic lines.

5 « La bande passante n'est vraiment pas suffisante. Malgré les efforts du service informatique, il demeure toujours un défi de pouvoir brancher notre équipement. » – école elementaire, Conseil scolaire de district catholique de l'Est ontarien.

FIGURE 7

Availability of robotics, technology, or STEM clubs

Elementary schools by income

Elementary schools by region

Secondary schools by region

In 2020:

- 77% of elementary schools with high average family incomes have access to broader opportunities for STEM compared to only 57% of schools with low average family incomes.
- In urban communities, 70% of elementary and 78% of secondary schools have robotics, technology, or STEM clubs.
- In small-town/rural communities, 60% of elementary and 68% of secondary schools have robotics, technology, or STEM clubs.

Ensuring equity of opportunity in STEM for all students is important, as achievement in science, technology, engineering, and mathematics in K-12 has implications that extend to post-secondary education and the labour market (SSHRC, 2016).

Recommendations to make schools future-ready

Ontario has the opportunity to be a national leader in ensuring that students are future-ready. It will be vitally important that policy-makers use the knowledge gained during the pandemic to help shape future policy around technology, online learning and access to enrichment. The pandemic has exposed both possibilities and problems.

Teachers, principals, school board directors, and the staff who work directly with students across Ontario should be consulted, and we should use the knowledge in our faculties of education to ensure that any new policy – including e-learning – is based on evidence, knowledge, and experience. There is no doubt that technology can be a ground-breaking tool in education, but to be effective, it must be accompanied by an informed, coherent, and comprehensive strategy.

People for Education recommends that the provincial government:

- Develop a coherent plan and consistent language that integrates The New Basics and transferable skills across the curriculum and report cards from Kindergarten to Grade 12.
- Develop one comprehensive grant within the Grants for Student Needs to support technology and the implementation of e-learning in schools including funding for staff support at the board and school level, a range of resources, infrastructure, and professional development. Funding for secondary school e-learning teachers should be provided at a rate of funding for 1 teacher per 23 students – the same as regular classroom teachers.
- Delay the implementation of e-learning policy until the fall of 2021, and conduct extensive consultation and engagement with experts, educators, board staff, parents, and students to ensure e-learning is appropriately supported and delivered, and its benefits understood. This will encourage more students to take online courses and remove the need for making it a mandatory qualification for graduation.
- Provide funding and policy for staff, and designated places in schools so that students enrolled in e-learning have supervised space with the appropriate infrastructure, equipment, and pedagogical support.

Methods

PFE's Annual Ontario School Survey

Every year, People for Education surveys Ontario's publicly funded elementary and secondary schools. This report is based on data from the 1,159 schools that participated in the Annual Ontario School Survey this year. Unless cited from other sources, the statistics and quoted material in this report originate from People for Education's Annual Ontario School Survey, the 23rd annual survey of elementary schools and 20th annual survey of secondary schools in Ontario. The surveys were sent to schools in the fall of 2019, and could be completed online via SurveyMonkey, in both English and French.

This year, we received 1,159 responses from elementary and secondary schools in 71 of Ontario's 72 publicly funded school boards, representing 24% of the province's publicly funded schools. Survey responses are also disaggregated to examine survey representation across provincial regions (see Figure 8). Regional representation in this year's survey corresponds relatively well with the regional distribution of Ontario's schools.

FIGURE 8

Survey representation by region

Region (by postal code)	Schools in sample	Schools in Ontario
Eastern Ontario	18%	18%
Central Ontario	13%	17%
Southwestern Ontario	20%	20%
Northern Ontario	13%	11%
Greater Toronto Area	35%	34%

Other provincial data

Data collected from the survey was matched with the Average Weighted Median Census Family Income by School, 2017-2018, provided by the Ontario Ministry of Education. The Median Census Family Income information are derived from the 2016 Census for all the dissemination areas associated to a school based on the weighted enrolment by residential postal code of its students. Schools were then sorted from highest to lowest income based on this measure. In this report, the top 25% of elementary schools based on Weighted Census Family Income are considered "high income" (n = 237; average income = $115,382) and the bottom 25% are considered "low-income" (n = 237; average income = $57,998), unless otherwise specified.

In order to analyze a school's geographical circumstances, each school's address was used to identify the population of the town or city in which the school is located, based on the most recently available Census data. Statistics Canada uses population size to classify a population centre as small, medium, or large urban. The population breakdown is as follows: small population centres have a population between 1,000 and 29,999, medium population centres have a population between 30,000 and 99,999 and large urban population centres have a population of 100,000 or more. While Statistics Canada has various definitions of a rural area, for the purposes of this analysis, a rural area has a population under 1,000. In this report, elementary schools in rural, small, and medium areas are considered "small town/rural" (n = 459) and those in large urban areas were considered "urban" (n = 494), unless otherwise specified.

Data analysis

Qualitative data analysis was conducted using inductive analysis. Researchers read responses and coded emergent themes in each set of data (i.e. the responses to each of the survey's open-ended questions).

The quantitative analyses in this report are based on descriptive statistics. The chief objective of the descriptive analyses is to present numerical information in an illuminating format that is accessible to a broad public readership. All data were analyzed using Microsoft Excel.

Calculations have been rounded to the nearest whole number and may not amount to 100% in displays of disaggregated categories. All survey responses and data are kept confidential and stored in conjunction with Tri-Council recommendations for the safeguarding of data.

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Appendix A

Adapted from the International Society of Technology in Education

Standard	Description
Empowered Learner	Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals.
Digital Citizen	Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world.
Knowledge Constructor	Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
Innovative Designer	Students use a variety of technologies within a design process to identify and solve problems.
Computational Thinker	Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
Creative Communicator	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
Global Collaborator	Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

(ISTE) Student Standards (2019)

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Data from the survey
Specific research data from the survey can be provided for a fee. Elementary school data have been collected since 1997, and secondary school data have been collected since 2000. For more information, please contact info@peopleforeducation.ca.

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