UNCHARTED WATERS: TOWARD A WORLD-CLASS CANADIAN E-LEARNING PARADIGM

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Preface:

The Information and Communications Technology Council is a not-for-profit, national centre of expertise for strengthening Canada's digital advantage in a global economy. Through trusted research, practical policy advice, and creative capacity-building programs, ICTC fosters globally competitive Canadian industries enabled by innovative and diverse digital talent. In partnership with an expansive network of industry leaders, academic partners, and policy makers from across Canada, ICTC has empowered a robust and inclusive digital economy for over 25 years.

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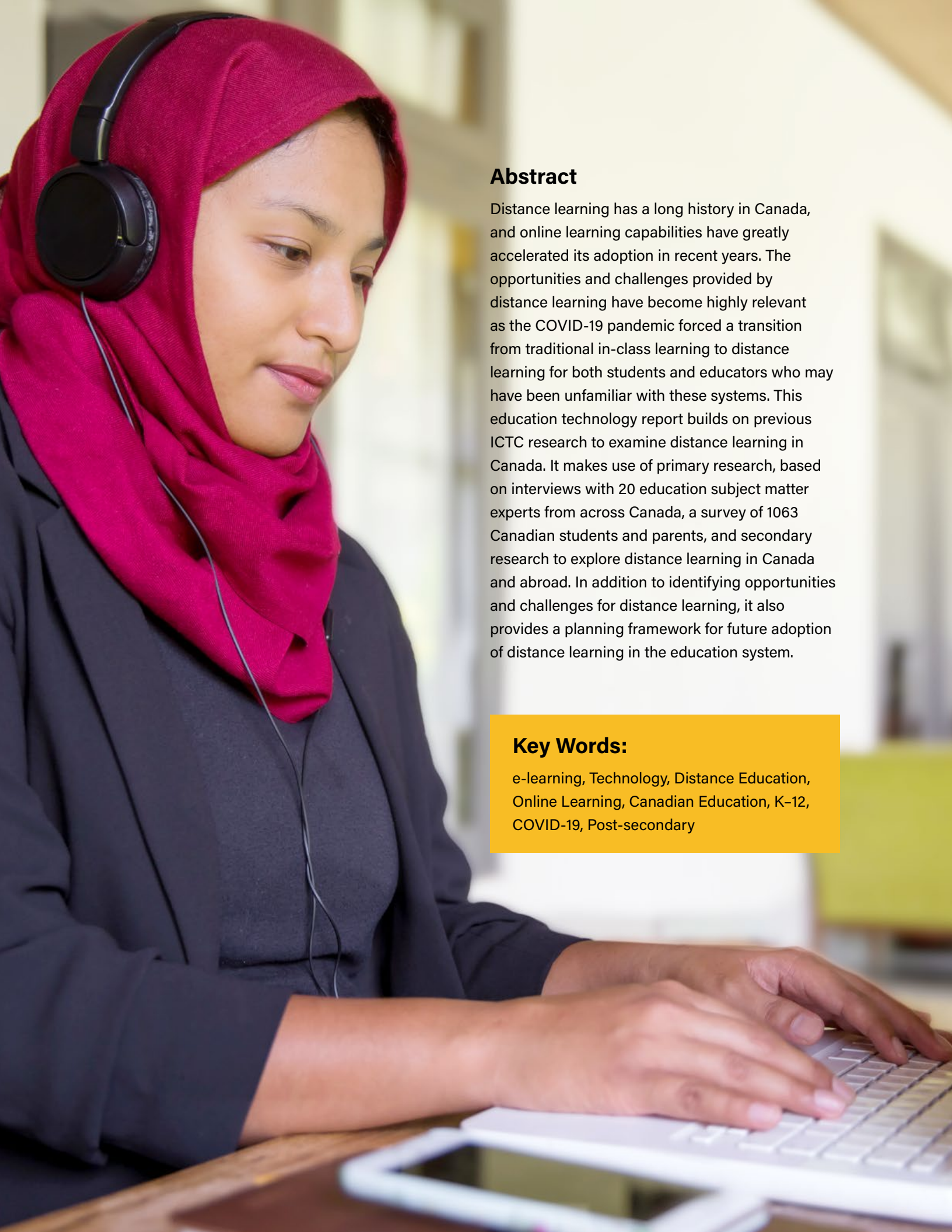

Abstract

Distance learning has a long history in Canada, and online learning capabilities have greatly accelerated its adoption in recent years. The opportunities and challenges provided by distance learning have become highly relevant as the COVID-19 pandemic forced a transition from traditional in-class learning to distance learning for both students and educators who may have been unfamiliar with these systems. This education technology report builds on previous ICTC research to examine distance learning in Canada. It makes use of primary research, based on interviews with 20 education subject matter experts from across Canada, a survey of 1063 Canadian students and parents, and secondary research to explore distance learning in Canada and abroad. In addition to identifying opportunities and challenges for distance learning, it also provides a planning framework for future adoption of distance learning in the education system.

Key Words:

e-learning, Technology, Distance Education, Online Learning, Canadian Education, K–12, COVID-19, Post-secondary

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GLOSSARY OF TERMS

Active Learning: (or engaging students through activities or discussions in class) emphasizes higher-order thinking and is contrasted to passively listening to an expert.[1]

Bimodal Learning: A synchronous form of instruction that includes two or more learning spaces, including physical learning spaces (i.e., classrooms) and virtual learning environments.[2]

Blended Learning: A form of instruction that integrates both face-to-face and online learning in the delivery of course or educational materials.

Digital Fluency: The ability to understand, navigate, and apply digital tools to accomplish a task. Digital fluency is used by some to describe digital literacy in a broader context. For others, digital fluency refers to a comprehensive or complex list of capabilities when navigating digital systems.[3]

Digital Technology: This report defines digital technology broadly through an education lens: digital technology is any technology-based system that can collect, store, process, or share information (i.e., data).

Distance Learning: Education and/or training in which the student or learner is not physically located in the same place as their teacher or trainer.[4]

Distributed Learning: Often used interchangeably with distance learning, distributed learning refers to education that is delivered from a distance. Distributed learning allows instruction and learning to occur independent of space or place. The term originates from a time when materials were "distributed" to students residing off-campus via mail (for example, in the context of correspondence courses). Today, distributed learning is linked to educational activities that employ information technology.[5]

e-learning: Learning that takes place via electronic media, and typically over the internet. e-learning, short for electronic learning, is an umbrella term that refers to all training, education, and instruction that occurs through a digital medium, such as a computer or mobile phone.[6]

Hybrid Learning: An approach to education delivery that combines face-to-face teaching (educator to student) with online instruction. Hybrid learning can involve both synchronous and asynchronous content delivery, addressing barriers related to space or place.[7]

Learning Management System: A system (or engine) used to manage course-related content, course-related communications, and administrative tasks (e.g., performance tracking and reporting). Learning management systems can be web based or locally operated applications.[8]

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[1] Freeman, S. et al., "Active learning increases student performance in science, engineering, and mathematics." PNAS, Volume 111, no. 23, 6/10/2014, https://www.pnas.org/content/pnas/111/23/8410.full.pdf

[2] "Teaching with a Bimodal Approach: A New Option for Fall 2021." University of Ottawa, 2021, https://jolt.merlot.org/vol9no2/irvine_0613.htm

[3] "Connecting to Success: Technology in Ontario Schools." People for Education, 2019, https://peopleforeducation.ca/report/connecting-to-success-technology-in-ontario-schools/

[4] "Distance Learning." Government of Canada, TERMIUM Plus, 2021, https://www.btb.termiumplus.gc.ca/tpv2alpha/alpha-eng.html?lang=eng&i=1&srchtxt=Distance+Learning&codom2nd_wet=1#resultrecs

[5] Rudestam, K., "Distributed learning/distributed education." Encyclopedia of distributed learning & SAGE Publications, Inc., 2012, https://www.doi.org/10.4135/9781412950596.n46

[6] Dhalla, L., "e-learning." Ecampus Ontario, 2019, https://www.ecampusontario.ca/knowledge-base/elearning/

[7] "What is Hybrid Learning?" Penn State University, 2021, https://sites.psu.edu/hybridlearning/what-is-hybrid/

[8] "What is a Learning Management System?" University of Toronto, 11/2020, https://www.utsc.utoronto.ca/technology/what-learning-management-system

GLOSSARY OF TERMS

Multi-Access Learning: Learning that combines face-to-face and online learning as part of the same course or program. Multi-access learning differs from blended learning as it centres its pace and content around the experience of the student, rather than the instructor or institution.[9]

Online Learning: Learning that takes place online. Online learning incorporates features such as modality, pacing, online communication, and online assessment, which are informed by student-instructor relationships, pedagogy, and engagement needs.[10]

Remote Learning: Scheduled online learning that operates in a similar manner to in-class learning. Remote learning take place outside of the classroom using technology and the internet. Learning is facilitated by educators in a synchronous environment where students have access to educators in real-time.[11]

Student-Centred Learning: A teaching method whereby students have a higher degree of autonomy over the subjects that they study, connecting their own interests to the specific curriculum.[12]

A Note on Definitions:

Distributed learning, **multi-access learning**, **blended learning**, **rote learning**, **remote learning**, and **bimodal learning** were all frequently referenced by interviewees. It is essential that readers understand the definitions included for these terms in the glossary, while also noting that interviewees and survey respondents may have alternate interpretations for these terms. **Multi-access learning** was used by interviewees to refer to two or more physical sites that are linked together virtually for synchronous learning. **Blended learning** was discussed in similar terms, but it was noted that blended learning also incorporates in-person and distance learning synchronously (interviewees from post-secondary institutions who shared examples of blended learning). **Bimodal Learning** was considered similar to blended learning, however, it was also only referenced by interviewees in the post-secondary space. Bimodal learning refers to a "synchronous mode of teaching [which] includes two learning spaces, one physical and one in the classroom," similar to multi-access. **Remote learning** was a term used interchangeably with distance learning (at one point cited as "learning at a distance"). Interviewees who cited COVID-19's emergency transition to distance learning referred to the circumstance as a tangible example of **remote learning** in practice. An educational consultant from British Columbia explained, "The difference between distance learning and remote learning is simply a matter of choice," meaning that choice, rather than a mandatory decision, is the key differentiator.

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[9] Irvine, V. et al., "Realigning Higher Education for the 21st Century Learner through Multi-Access Learning." MERLOT Journal of Online Learning and Teaching: Vol. 9, 06/2013, https://jolt.merlot.org/vol9no2/irvine_0613.htm

[10] Hodges, C. et al., "The Difference Between Emergency Remote Teaching and Online Learning", Howard University & Educause Review, 05/06/2020, https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

[11] "Remote Learning." Ottawa-Carleton District School Board, 2020, https://ocdsb.ca/our_schools/novel_coronavirus_information_for_parents/learn_at_home/return_to_school_plan_2020/remote_learning

[12] Richmond, E., "Student-Centred Learning." Stanford: Graduate School of Education, 04/02/2014, https://edpolicy.stanford.edu/news/articles/1193

EXECUTIVE SUMMARY

The COVID-19 pandemic has significantly disrupted education and accelerated digital adoption. It has also brought e-learning to the forefront as a viable mode of educational delivery. The past year and a half have been defined by emergency transitions to online instruction, separated by intermittent periods of in-class education. Amid these fluctuations, it is crucial to examine distance learning and its role in the future of education in Canada. This report builds on ICTC's previous two studies on education technology in Canada, with a particular focus on the online classroom.

Distance learning takes many forms across Canada. It includes mail correspondence, educational content broadcasted via television, and more recently, the adoption of internet-enabled distance learning. Undoubtedly, COVID-19 accelerated the prevalence of distance learning on a global scale. In Canada, prior to the pandemic, tens of thousands of individuals were engaged in distance education, but when schools were closed in 2020 and 2021, most students were exposed to distance learning by necessity. As schools and workplaces reopen, the question remains, how can e-learning be leveraged outside of emergencies and shaped to suit the modern digital world?

This report leverages research from interviews with Canadian educators and subject matter experts as well as a survey of more than 1,000 Canadian students and their parents. While the report mainly focuses on distance learning as an emergency response to the pandemic, there is an entire discipline of distance learning beyond the context of COVID-19. Canada must prepare for a future where e-learning is not just an emergency response but a common practice. Lessons from the shift to online education during the pandemic are critical to guide this transition.

Students in this study were split as to whether they "enjoyed" distance learning during the pandemic. While some felt that it had an adverse impact on their overall academic success, 40% believed that e-learning was roughly equivalent to in-class learning and that the quality of education was not diminished. Parents, on the other hand, showed apprehension about its effectiveness, particularly in the long term. A major concern relayed by parents in this study is the limited socialization offered via online education and its potential impacts on academic success and personal growth. Socialization from an early age is key to developing robust interpersonal skills and building the emotional intelligence that will help today's youth succeed in the workplace. Although "hard skills" like coding, data analytics, or engineering are important, recent research finds that the best leaders come equipped with strong "soft" or "people" skills. Leaders with high levels of empathy, for example, have been proven to yield significant positive impacts on workplace innovation, engagement, and inclusivity.[13] Today's students are tomorrow's leaders, and the educational system must be built to prepare them for this journey. To be successful, future e-learning tools and technologies will need to focus on relaying educational material in a way that fosters collaboration, teamwork, and even facilitates the "accidental collisions" that accompany in-person education and work settings. These collisions have been proven to enable a greater sense of belonging and connection with peers, enhanced innovation, and higher rates of satisfaction.[14]

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[13] Van Bommel, "The Power of Empathy in Times of Crisis and Beyond." Catalyst Research, https://www.catalyst.org/reports/empathy-work-strategy-crisis

[14] De Smet, Aaron; Mysore, Mihir, "Pandemic-style working from home may not translate easily to a 'next normal' mix of on-site and remote working." Mckinsey & Co., July 7, 2020, https://www.mckinsey.com/business-functions/organization/our-insights/reimagining-the-postpandemic-workforce

EXECUTIVE SUMMARY

Educators in this study were undecided about whether distance learning is better suited to older students at secondary school levels or higher: however, they did express that socialization and classroom routine is more critical in early years. For older students, namely those in post-secondary or continuing education, online learning features some previously inaccessible benefits. A sharp reduction in commuting time, enhanced schedule flexibility, and greater opportunities for self-directed learning are all key benefits associated with the shift to online learning, and ones that should be retained and enhanced.

Retaining the benefits of e-learning also means focusing on inclusivity. Uneven digital literacy levels, the ever-present digital divide, and concerns of access and equity need extensive review and action. For example, ICTC's survey found that 21% of parents believed that their children did not have the digital skills required to study online; a quarter did not have their own computer to study independently; and 28% of parents (nearly 40% in rural areas) reported that their internet connection was insufficient to allow their family to work and study online together. The move to all-things-online surfaced pre-existing societal inequalities and made clear the barriers that some Canadians encounter when attempting to participate in these modern modes of learning and working. For e-learning to be successful in the long run, it must be accessible and provide value for all Canadians. Existing inequities and barriers must be broken down for e-learning to be a truly viable option beyond emergency education.

As for educators, while they largely overcame the initial operational challenges of online teaching, the quality of the educational experience varied significantly depending on educator skills and training. For example, interviewees noted that younger and non-tenured instructors tend to have less freedom and flexibility to experiment with new technologies and techniques in distance learning. At the same time, digital competency training is largely left to the discretion of the school and individual. As technology becomes a cornerstone of education, it must be accompanied by regular and standardized teacher training and support. Addressing this gap may include defining minimum digital skills for educators, developing peer-to-peer educator communities and support networks, and exploring new teaching methods such as student-centred learning and active learning.

The mass e-learning experiment experienced by millions of Canadian students and parents over the last 18 months of the pandemic has been paradigm changing. It brought to the forefront new challenges, highlighted existing inequities and shortcomings, and underscored the stark need for extensive consideration and analysis of education models fit for the modern world. This report leverages research and insights to better understand online learning and conceptualize a pathway for its successful design and application beyond a state of emergency. Although the immediate future of e-learning is yet unclear, the COVID-19 pandemic has made evident the need for flexible and up-to-date education that engages and empowers students. Now is the time to lay a robust foundation for this journey and ensure that educators and students are prepared as they navigate the increasingly digital future.

INTRODUCTION

The impact of COVID-19 on the Canadian educational experience has been profound. As a result of nation-wide lockdowns beginning in March 2020, schools have been forced to re-establish their relationships with students and trial new equipment and software to help ensure a seamless learning experience. Educators grappled with challenges like outdated administrative policy, divided public opinion on the effectiveness of online education, uneven digital literacy among educators and students, data privacy, and concerns of digital equity—all of which represented significant barriers to implementation.[15] Some 18 months later, many of these challenges persist. Schools continue to face the possibility of classroom closures, and other obstacles for educators, students, and their parents remain. Yet, these struggles have also underlined opportunities for future educational enhancement and the reconceptualization of education with technology at the centre.

Section 1 of this study provides a brief history of distance learning in Canada while offering a snapshot of its constant evolution across provinces. **Section 2** explores Canadian perspectives on distance learning and e-learning infrastructure. This includes a review of over 20 interviews with subject matter experts from education and industry paired with insights gleaned from a national student and parent survey of over 1,000 respondents. **Section 3** explores conceptual frameworks and practical needs of distance learning, including topics such as "age and stage," equity, diversity, inclusion, data privacy, low-to-no technology experiences, and popular education technologies. **Section 4** concludes by showcasing a detailed "e-learning Process Roadmap." This roadmap includes a step-by-step overview of the key considerations for developing policies and processes for the exploration, testing, implementation, and long-term operation of e-learning infrastructure.

[15] Alphonso, C., "The education world has been turned upside down: Online learning may reshape the classroom." The Globe and Mail, 03/20/2020, https://www.theglobeandmail.com/canada/article-as-online-learning-rolls-out-education-may-change-forever/

SECTION I: DISTANCE LEARNING IN CANADA

Understanding Distance Learning

In March 2020, 190 countries faced complete or partial school closures due to the COVID-19 pandemic, a change affecting more than 1.7 billion students around the world.[16] The COVID-19 pandemic forced educators around the world to find alternatives to face-to-face in-class learning and come up with solutions to continue education outside of the classroom. As a result, **online distance learning** (which, prior to the COVID-19 pandemic, only supplemented regular in-class learning) became a core delivery method, creating a paradigm shift that reshaped the education system almost overnight.

According to Oxford Languages, **distance learning** refers to a method of studying in which lectures are broadcast or classes are conducted by correspondence or over the internet, without students needing to be present in school or college.[17] According to Canadian encyclopedia, **distance education or distance learning** refers to formal education offerings where instructor and learner are physically separated and where learners can study appropriately designed materials at a time and pace of their own choosing.[18] According to the Government of Canada's terminology and linguistic data bank, distance learning refers to learning in which educational or training activities take place without the learner being physically in the presence of a teacher or trainer.[19]

Distributed Learning, often used interchangeably with **distance learning**, refers to educational delivery over a distance. Distributed learning enables instruction and learning to occur independent of space or place. The term originates from a time when materials were "distributed" to students residing off-campus via mail (for example, correspondence courses). Today, distributed learning is linked to educational activities that employ information technology.[20]

In this study, preliminary interviews with subject matter experts revealed that, although distance learning became a commonly used term throughout the COVID-19 pandemic, its definition and the understanding of the term differ greatly among educators.

> "*Distance learning has been a huge strength [for educators]. But how you communicate that benefit could be a challenge. If you say [to educators] you must use online services to engage and instruct, then [some feel] they've lost their teaching voice. They've lost their ability to be creative, and you really want to promote those things for educators to take ownership of student learning.*" – Learning Specialist, New Brunswick

To better understand this variance, interviewees were asked, in their own worlds, to define distance learning. In their responses, many used terms like "without," "unable," and "separated." Despite the benefits that distance learning can afford, many interviewees commonly linked it to the idea of "being without."

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[16] "Lessons for Education during the COVID-19 Crisis." The World Bank: Education and Technology, 2020, https://www.worldbank.org/en/topic/edutech/brief/lessons-for-education-during-covid-19-crisis

[17] "Oxford Languages." Oxford University Press, 2021, https://languages.oup.com/

[18] Haughey, M., "Distance Learning." The Canadian Encyclopedia, 2013, https://www.thecanadianencyclopedia.ca/en/article/distance-learning

[19] "Distance Learning." Government of Canada, TERMIUM Plus, 2021, https://www.btb.termiumplus.gc.ca/tpv2alpha/alpha-eng.html?lang=eng&i=1&srchtxt=Distance+Learning&codom2nd_wet=1#resultrecs

[20] Rudestam, K., "Distributed learning/distributed education." Encyclopedia of distributed learning & SAGE Publications, Inc., 2012, https://www.doi.org/10.4135/9781412950596.n46

"*Distance learning is situated in historical tradition that comes out of pandemics and rural areas. It focuses on striving to bring learning to those who can't reach it. The usage of the term is a deficit term. It's a deficit version of learning.*" - Digital Learning Strategist, Ontario

One interviewee, a technology support lead from Manitoba, summarized distance learning as "any time a student is unable to be face-to-face with us [as educators] yet is still engaged in the learning experience." Another interviewee, an educational technology lead from a prominent Canadian university, said that the definition and understanding of distance learning varies between educators, administrators, and support staff—even within the same institution. Specifically, they note that definitions and understandings vary, even between educators, administrators, and support staff within the same institution. This perception of distance learning as a less-than-ideal substitute for in-class learning, paired with varying definitions and perceptions, are key challenges to developing and implementing acceptable and standardized distance learning policies and practices. In a blog post as early as 2008, Dr. Tony Bates, a leading Canadian expert in online and distance learning, highlights this challenge. He states that without a common, cross-applicable lexicon on distance learning that can be shared among users, many in the education and technology sectors are left without a strong and universally shared reference point,[21] and as a result, a challenging pathway for online education policy.

"*Distance learning was something before COVID and it's something different now. After, or post-COVID, it will be something else entirely.*" – University Learning Director, Quebec

To develop standardized distance learning practices, it is paramount that the Canadian education system adopts a singular definition. A clear understanding of what "distance learning" means, and whether it should be classified differently than "emergency distance learning" will impact adoption moving forward. Whether distance learning is considered in a K-12 or post-secondary context, confusion surrounding its relationship to specific technologies (i.e., e-learning/learning management systems (LMS) tools) also makes developing long-term policy difficult. A clear, technology-agnostic understanding of distance learning in Canada stands to benefit students and educators alike. This lays the framework for more advanced considerations around training, support, and infrastructure.

The History of Distance Learning in Canada

Canadian distance learning has its roots in the late 1800s. McGill University began offering distance learning degree programs in 1889 to teachers in rural Quebec. By 1912, the Universities of Saskatchewan and Alberta followed suit. In 1921, a parent wrote to the British Columbia Ministry of Education requesting study materials for his children because they were too far from a school, which marked the beginning of grade school distance education in the province.[22] Other advancements followed suit.

[21] Bates, T., "What do you mean by.....?" Online Learning and Distance Education Resources, 07/07/2008, https://www.tonybates.ca/2008/07/07/what-is-distance-education/

[22] Haughey, M., "Distance Learning." The Canadian Encyclopedia, 05/04/2013, https://www.thecanadianencyclopedia.ca/en/article/distance-learning

HIGHLIGHTS OF DISTANCE LEARNING IN CANADA:

1941	The Canadian Broadcasting Corporation (CBC), Canadian Association for Adult Education, the Federation of Agriculture, and St. Francis Xavier coordinated a series of radio broadcasts and materials for living room study groups.
1972	The province of Alberta instituted Athabasca University, an entirely distance-based school that, at the time, relied on printed course materials and student-tutor interaction via phone.
1978	Quebec established Télé-université, and BC established the Open Learning Institute (OLI) to provide college, adult basic, technical, career, vocational and university education to students throughout the province.
1980s	The BC government established Knowledge Network, which broadcast educational content via satellite. TVOntario, Radio-Québec, the Saskatchewan Communications Network (SCN), Northern Canada Television, and ACCESS Alberta soon followed, using broadcast television for educational content. Contact North/Contact Nord was established by the Ontario government to provide audio learning content to northern residents. Quebec followed with a program called CANAL.[23]
1990s and early 2000s	The arrival of the internet accelerated distance education. Colleges formed consortia to share costs and develop online resources. In 1995, OntarioLearn pooled resources of 24 colleges to become one of the larger college level course providers in North America.[24] Other Canadian consortia included Campus Manitoba (1998), BCcampus (2002), and eCampus Alberta (2003). These organizations often hosted internet services for their participating colleges, offering course development assistance, single source access learning portals, and extensive marketing. In secondary schools across the country, a surge in adoption of online learning management systems (LMS) occurred the early 2000s.

[23] Haughey, M., "Distance Learning." The Canadian Encyclopedia, 05/04/2013, https://www.thecanadianencyclopedia.ca/en/article/distance-learning

[24] "OntarioLearn 2019-2020 Annual Report." https://www.ontariolearn.com/wp-content/uploads/2020/11/OL-Annual-Report-2019-2020-Original-Web-Version.pdf

As a result of these and other advancements, at least one million Canadians were engaged in distance education prior to COVID-19.[25] The proportion of students engaged in K–12 distance learning across Canada has grown steadily for the last several years, and according to the most recent "State of the Nation: K–12 e-learning in Canada" report, which references the 2019-2020 academic year, 310,582 or 6% of K–12 students were enrolled in distance/online learning.[26]

COVID-19

The proportion of K–12 students engaged in distance learning/online learning in 2020 (i.e., during the pandemic) varied by province.

It can be challenging to effectively compare programs across Canada, as distance learning can come in many forms. Nevertheless, the above table suggests that the provinces with the highest prevalence of distance learning are found in western Canada, with Alberta and BC both involving over 10% of K–12 students. Prince Edward Island (PEI) and Nunavut do not offer online learning programs, but students can enroll in programs offered by neighbouring provinces.[27]

In 2020, emergency distance learning was provided in a variety of forms across Canada: hybrid and fully virtual instruction, intermittent in-person learning (i.e., every other day), and fully in-person instruction (for example, in Quebec[28]). As of 2021, more and more provinces resumed full in-class learning, and some provinces, British Columbia for example, are once again viewing online learning as a "classroom alternative." This represents a shift away from emergency distance learning and a return to standard learning.[29]

[25] Haughey, M., "Distance Learning." The Canadian Encyclopedia, 05/04/2013, https://www.thecanadianencyclopedia.ca/en/article/distance-learning

[26] Barbour, M., LaBonte, R., Joelle, N., "State of the Nation: K–12 e-learning in Canada." Canadian eLearning Network, 05/2021, https://k12sotn.ca/wp-content/uploads/2021/05/StateNation20.pdf

[27] Ibid.

[28] Montpetit, J., "Quebec judge rules against expanded access to online learning." CBC News, Montreal, 2020, https://www.cbc.ca/news/canada/montreal/expand-online-learning-quebec-ruling-1.5715935

[29] "Online Learning." Government of British Columbia, Education and Training – Kindergarten to Grade 12, 2021, https://www2.gov.bc.ca/gov/content/education-training/K-12/support/classroom-alternatives/online-learning

	# OF K-12 STUDENTS	# ENROLLED IN DISTANCE/ ONLINE LEARNING	PERCENT INVOLVEMENT
Alberta	741,802	82,857	11.2%
British Columbia	548,702	~59,000	10.8%
Saskatchewan	186,036	12,456	6.7%
Manitoba	208,796	~13,749	6.6%
Ontario	2,056,055	~98,000	4.8%
Yukon	5,456	234	4.2%
New Brunswick	98,906	~3,470	3.5%
Quebec	1,003,322	~35,000	3.5%
Nova Scotia	123,239	2,241	1.8%
Newfoundland	63,722	1,092	1.7%
Northwest Territories	8.700	131	1.5%
Prince Edward Island	20,131	133	0.1%
Nunavut	10,107	19	0.001%
Federal	109,400	~2,200	2%
Total	5,184,374	310,582	6%

Table 1: The proportion of K–12 students engaged in distance/online learning in 2020 by province.

Source: Barbour, M., LaBonte, R., Joelle, N., "State of the Nation: K–12 e-learning in Canada," Canadian e-learning Network, 05/2021.

The Growth of e-learning Tools in Canada

e-learning has been on the rise in Canada for over a decade. Between 2011 to 2015, distance learning activities in higher education, which includes self-paced e-learning programs, saw a 58% increase (approximately 11% annually) in enrolment.[30] Leading into the pandemic, the number of post-secondary institutions in Canada developing e-learning content increased at a rate of 2% per year.[31] Although these developments took place before March 2020, the pandemic expedited rates of adoption out of necessity, making training and proficiency with these tools a paramount issue.

One interviewee, a K–12 educator from Manitoba, noted that opportunities for professional development related to new e-learning technologies were available pre-pandemic, however, they were often viewed as less critical than other upskilling opportunities. Choice in professional development topics and e-learning tool use were often a matter of personal preference for educators, which were also influenced by the level of available support.[32] Interviewees agreed that support and training have a direct impact on an educator's level of preparedness and confidence with e-learning tools and may impact investment. Although K–12 procurement data is scarce, nearly two-thirds of Canadian post-secondary institutions indicate that e-learning technology is now fundamental.[33] Larger post-secondary institutions believe that increasing

[30] Wotto, M., "The Future High Education Distance Learning in Canada, the United States, and France: Insights From Before COVID-19 Secondary Data Analysis." Journal of Educational Technology Systems, 2020, https://journals.sagepub.com/doi/full/10.1177/0047239520940624

[31] Ibid

[32] Inan, Fethi & Lowther, Deborah, "Factors affecting technology integration in K–12 classrooms: A path model." Educational Technology Research and Development, https://www.researchgate.net/publication/225469556_Factors_affecting_technology_integration_in_K-12_classrooms_A_path_model/citation/download

[33] Barrett,p., Treves, A., Shmis, T., Ambasz, D., and Ustinova, M., "The Impact of School Infrastructure on Learning: A Synthesis of the Evidence." World Bank Group, 2019, https://openknowledge.worldbank.org/bitstream/handle/10986/30920/9781464813788.pdf?sequence=2&isAllowed=y

levels of e-learning integration can foster greater innovation, and others believe that these tools enable institutions to better respond to changing government policies.[34]

Interviewees were asked what technologies they were most familiar with as a result of distance learning. Learning management systems (LMS) such as D2L, Moodle, Blackboard, Canvas, PowerSchool, and Seesaw were frequently mentioned. These systems (or engines)—used to manage course-related content, communications, and administrative tasks (e.g., performance tracking and reporting)—can be web-based or locally operated applications. LMS tools have become increasingly sophisticated in their use of big data, creating an opportunity for educators to expand their skills and understanding of basic analytics to better leverage these skills.[35] In interviews, LMS analytic capabilities were said to help educators monitor student engagement and participation levels. Video conferencing services, such as Zoom and Kaltura, were also highlighted and used to help address specific elements of the virtual learning experience. The remaining tools or software suites, which include Adobe Connect, Google for Education, Office 365 for Education, and Articulate 360, are tailored to education as well but were mentioned less frequently. Interestingly, tools such as Adobe Connect 11 were noted as particularly helpful because of their accessibility-focused design to aid students with mobility, vision, and hearing barriers.[36]

[34] Bates, T., "The 2017 national survey of online learning in Canadian post-secondary education: methodology and results." International Journal of Educational Technology in Higher Education, 2018, https://www.researchgate.net/publication/326690553_The_2017_national_survey_of_online_learning_in_Canadian_post-secondary_education_methodology_and_results

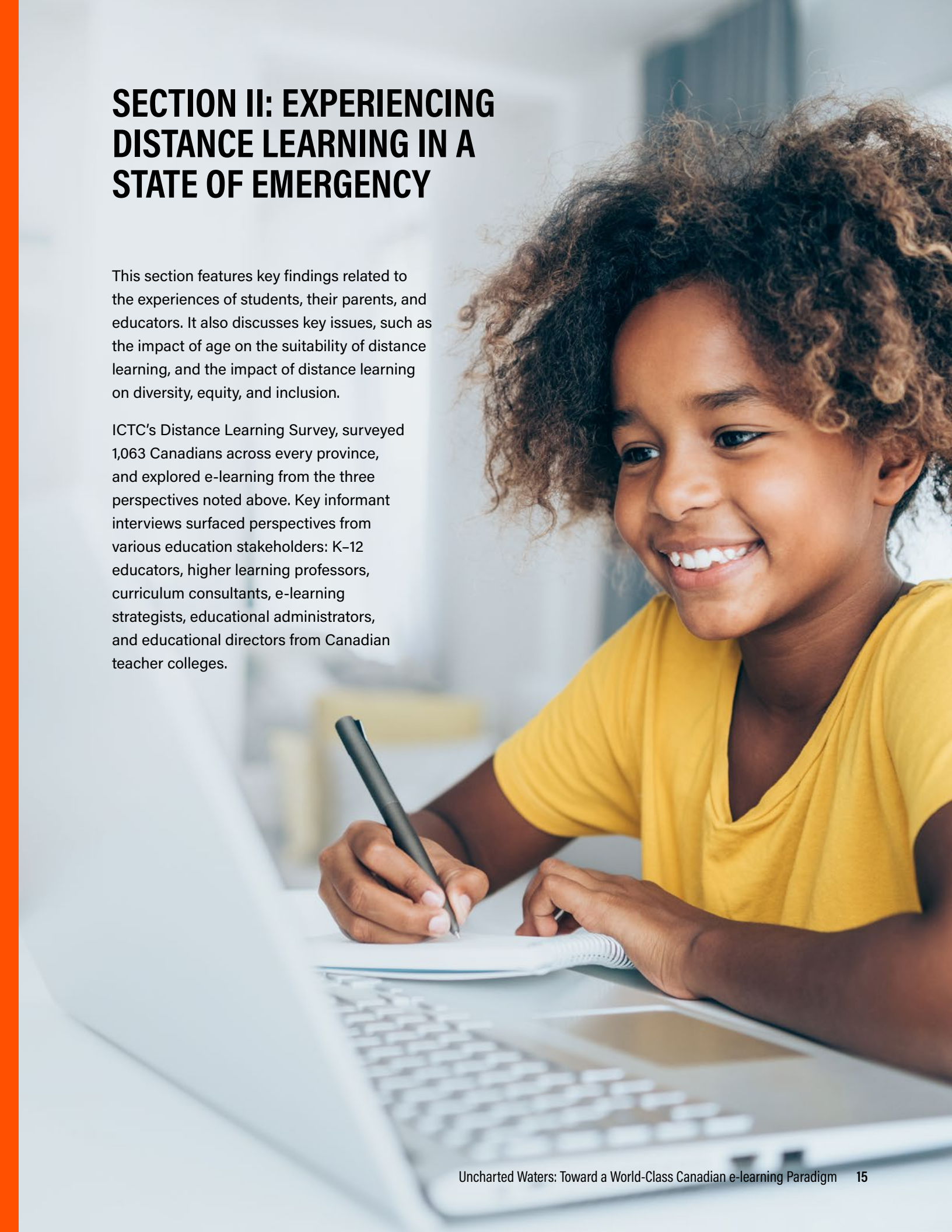
[35] Duin, A., Tham, J., "The Current State of Analytics: Implications for Learning Management System (LMS) Use in Writing Pedagogy." Computers and Composition: Volume 55, 2020, https://www.sciencedirect.com/science/article/abs/pii/S8755461520300050

[36] "What's new in Adobe Connect 11: Better Accessibility." Adobe, 2021, https://www.adobe.com/ca/products/adobeconnect/whats-new.html

SECTION II: EXPERIENCING DISTANCE LEARNING IN A STATE OF EMERGENCY

This section features key findings related to the experiences of students, their parents, and educators. It also discusses key issues, such as the impact of age on the suitability of distance learning, and the impact of distance learning on diversity, equity, and inclusion.

ICTC's Distance Learning Survey, surveyed 1,063 Canadians across every province, and explored e-learning from the three perspectives noted above. Key informant interviews surfaced perspectives from various education stakeholders: K–12 educators, higher learning professors, curriculum consultants, e-learning strategists, educational administrators, and educational directors from Canadian teacher colleges.



K–12 Students and Their Parents: Navigating the Switch to Online

"Providing equity of access means providing equity of opportunity." – Educational Consultant, Quebec

The shift to learning online presented a litany of new and sometimes challenging experiences for students. Those represented in ICTC's student and parent survey expressed positives such as increased flexibility, while others noted systemic barriers resulting from the transition to "emergency e-learning." Emergency e-learning in this case refers to systems that have been operating on limited or overtaxed infrastructure that was not intended to support widespread and sustained usage. This was often the reality of e-learning in Canada early in the pandemic. In fact, some K–12 schools struggled to simply respond to the higher volume of emails they received.[37] During this initial transition, parents had mixed opinions about online education.[38] Many had not interacted with online learning prior to the pandemic, making emergency e-learning their first experience. In a 2020 article, the parent of a K–12 student said, "The tools we have been provided [for learning] allow some continued education during this time but lacks [the] constructive feedback provided in class."[38] As 2020 progressed, support issues continued to plague some parents as some children began to "check out" of learning altogether.[40]

THINKING ABOUT YOUR CHILD(REN)'S/YOUR ONLINE LEARNING EXPERIENCE, TO WHAT EXTENT WOULD YOU SAY THEY HAVE ENJOYED THEIR EXPERIENCE SO FAR...

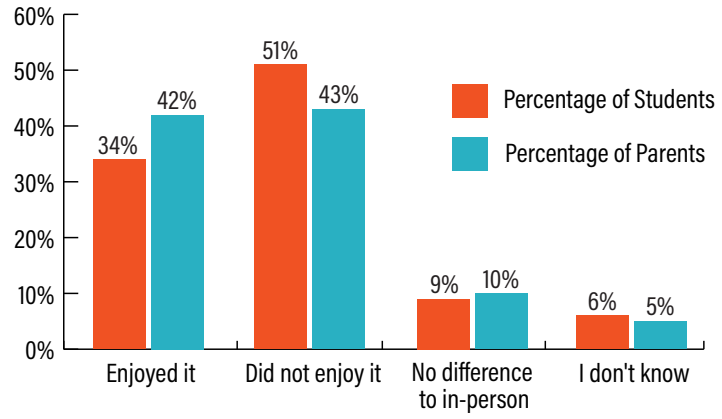


Figure 1: Online learning experience.

Source: ICTC's Canadian Distance Learning Survey 2021, n=1063.

[37] Wong, J., "Virtual schools face rocky start – with delays, confusion and technical problems." CBC News: Canada, 2020, https://www.cbc.ca/news/canada/virtual-school-start-challenge-1.5723638

[38] Wong, J., "Frustrated parents in Ontario pivot from official distance-learning program amid COVID-19." CBC News: Toronto, 2020, https://www.cbc.ca/news/canada/toronto/parents-opt-out-distance-learning-1.5548215

[39] Alphonso, C., "The education world has been turned upside down': Online learning may reshape the classroom." The Globe and Mail, 2020, https://www.theglobeandmail.com/canada/article-as-online-learning-rolls-out-education-may-change-forever/

[40] Wong, J., "Teachers warn that some students have 'checked out' of school, and it will be hard to get them back." CBC News: Canada, 2021, https://www.cbc.ca/news/canada/education-pandemic-missing-students-1.5971911

ICTC's Distance Learning Survey explored this issue, revealing a nearly even split between students who did and did not enjoy their online learning experience throughout COVID-19. About 42% of students reported that they enjoyed online learning to some extent, while 43% reported a varying degree of dislike. Slightly more than half of parents (51%) reported that their children did not enjoy online learning, while 34% said that their children enjoyed online learning to varying degrees. For many, these opinions were formed for the first time during a period of significant disruption.

ICTC's survey and interview feedback suggests that improvements to K-12 online learning would benefit from stronger infrastructure investments. As the emergency transition to distance learning primarily highlighted support and communication challenges for students and their families, permanent e-learning would address these issues by hiring for these roles. Likewise, the added responsibility and pressure faced by educators in troubleshooting technical challenges during class hours could also be mitigated by this additional support. Successful examples noted by interviewees were educator assistants (EAs) with strong digital skills for K-12 educators. EAs were able to address technology and social challenges during virtual learning and greatly improve the overall teaching experience.

> "The main thing that's been working well right now is having a driver and a co-pilot. My EA… operates as my digital moderator while I teach or setup lessons. The EA fields tech questions in the chat and addresses the virtual 'hands up' signals to ensure students understand the content. These are things I couldn't otherwise keep track of in a digital classroom." – Educator, Ontario

CASE STUDY: FINLAND'S EXPERIENCE WITH ONLINE LEARNING

Finland is a recognized leader in K–12 education and was well-prepared for the transition to online learning. In Spring 2020, students were given instruction using "alternative digital methods, including distance learning, digital learning environments and solutions, and, if necessary, through guidance on independent learning."[41] The use of digital tools such as remote conferencing were commonly used prior to the pandemic, and it was an established practice to organize communication between home and schools through online platforms. This includes using online tools to send feedback, communicate learning assignments, test scores, and grades. As a result, "such practices [were] undoubtedly useful in the transition of Finnish schools to distance learning [during the pandemic]."[42]

While Finland uses only average levels of digital technology for teaching and student learning, 80% of students were enrolled in schools that had effective online learning support platforms available (far higher than the OECD average of 54%).[43] Moreover, 94% of Finnish students reported having a computer to use for learning (higher than the OECD average of 89%).[44] Finland's strong foundation for digital education can also be seen in its higher levels of general ICT skills compared to OECD peers, and Finnish teachers have been identified as having greater confidence and more training with digital tools compared to their OECD peers.[45]

Finland successfully navigated the challenges of this disruption through prior preparation as well as active engagement and strong relationships between government, parents, educators, and experts.[46] Efforts to collect online teaching resources were coordinated by both public and private entities, and this was bolstered by financial contributions from Finnish Edtech companies.[47]

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41 Kaarakainen, M., Saikkonen, L., "Multilevel analysis of the educational use of technology: Quantity and versatility of digital technology usage in Finnish basic education schools." Journal of Computer Assisted Learning, 2/16/2021, https://onlinelibrary.wiley.com/doi/full/10.1111/jcal.12534

42 Ibid.

43 "OECD Country Note: School Education During COVID-19: Were Teachers and Students Ready?" OECD, 2020: https://www.oecd.org/education/Finland-coronavirus-education-country-note.pdf

44 Ibid.

45 "Education and Training Monitor 2020- Finland." European Commission, accessed 9/21/2020, https://op.europa.eu/webpub/eac/education-and-training-monitor-2020/countries/finland.html

46 Ibid.

47 Ibid.

K–12: ACADEMIC PERFORMANCE

Questions of online education quality dominated discussions when K–12 and post-secondary students were forced to shift their learning online during the pandemic.[48] Several school boards across Ontario, Quebec, and Alberta reported an overall drop in academic performance during this period, and many people linked this outcome to the emergency shift to online learning. In fact, according to ICTC's survey, nearly half of students and parents expected grades to be adversely impacted by the shift to online education. For many students in ICTC's survey, however, grades were unaffected. In cases where they were, one-quarter of students reported that their grades dropped, while one-fifth reported an improvement in grades.

The correlation between academic performance and e-learning largely relates to the social and geographic circumstances of the individual student and the amount of educator and parent support they receive at home. This also applies for a student's familiarity with, or training on e-learning systems and access to sufficient technology resources. Despite a lack of consensus on how to best address needed supports, student academic success in long-term distance learning environments depends on finding an adequate solution.

HOW WOULD YOU COMPARE YOUR CHILD(REN)'S/YOUR GRADES WHEN STUDYING ONLINE COMPARED TO IN THE CLASSROOM?

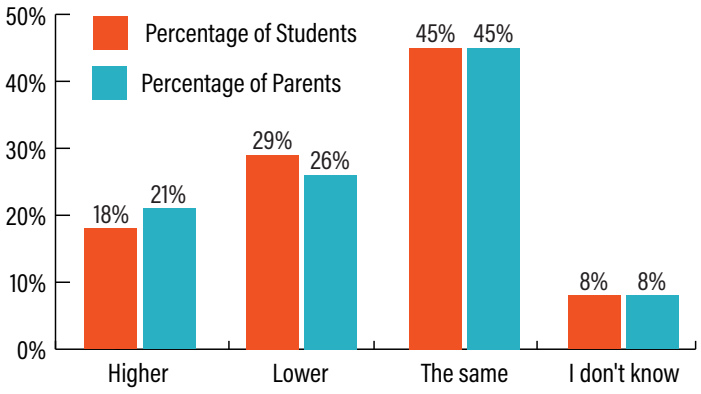

Figure 2: Online learning impact on grades.

Source: ICTC's Canadian Distance Learning Survey 2021, n=1063.

[48] Alphonso, C., "Students' grades are dropping with shift to remote education as coronavirus pandemic takes toll." The Globe and Mail, December 11, 2020, https://www.theglobeandmail.com/canada/article-students-grades-are-dropping-with-shift-to-remote-education-as/

ARE GRADES THE BEST WAY TO MEASURE LEARNING?

Grades are not necessarily the best measure of students' learning.[49, 50] According to a recent GALLUP survey,[51] only 11% of parents and 1% of teachers selected "getting good grades" to be among the most important learning outcomes for students. Critical thinking, curiosity to learn independently, and problem-solving skills were the top three learning outcomes selected by teachers and parents. These, albeit less easily measurable outcomes, are in line with the findings in the Future of Jobs Report 2018 by the World Economic Forum. The report ranks creativity, critical thinking, and problem-solving among the ten most in-demand skills both today and in the future.[52]

K–12: IMPACT ON MENTAL HEALTH

Emergency distance learning spawned significant worry, stress, and anxiety for students.[53] A recent study by the US Center for Disease Control and Prevention suggests that online learning has the potential to pose more risk to the mental health and wellness of children than in-person learning.[54] The report finds "around 25% of parents whose children (aged five–12 years) received virtual instruction or combined in-person and virtual instruction reported a worsened state of mental or emotional health in their children, compared to 16% of parents whose children received only in-person instruction."[55] Despite these findings, research done by UNICEF showed that the impact of screen-time on the mental health and well-being of children is very small.[56] Other factors, including "parental support, family relationships, or adverse childhood experiences" are more impactful than screen-time.

According to ICTC's survey, distance learning during the pandemic impacted the mental health of all student demographics, but particularly older students. Half of surveyed students reported that their mental health had diminished during this period, and that number was as high as 65% and 66% for age groups 17-23 and 24-plus, respectively. More than half of students who studied online due to provincial mandates believed that their mental health had diminished due to distance learning, compared to less than half (43%) of students who were studying online by choice.

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[49] "Grades vs Learning - Shifting Attention to What's Important." The Graide Network, 8/10/2018, https://www.thegraidenetwork.com/blog-all/2018/8/1/retiring-the-red-pen-shifting-attention-from-grades-to-learning/#gradesvslearning

[50] Kruzdlo, M., "Grades: Is there a better way to measure learning?" The Educator's Room, 2/04/2018, https://theeducatorsroom.com/grades-better-way-measure-learning/

[51] "Creativity in Learning." Gallup, 2019, https://www.gallup.com/education/267449/creativity-learning-transformative-technology-gallup-report-2019.aspx

[52] "The Future of Jobs Report 2018." World Economic Forum Centre for the New Economy and Society, 2018, http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

[53] Mheidly, N., Fares, M., and Fares, J., "Coping with Stress and Burnout Associated with Telecommunication and Online Learning." Frontiers in Public Health, 11 November 2020, https://www.frontiersin.org/articles/10.3389/fpubh.2020.574969/full

[54] Verlenden, J. et al, "Association of Children's Mode of School Instruction with Child and Parent Experiences and Well-Being During the COVID-19 Pandemic — COVID Experiences Survey, United States, October 8–November 13, 2020." Centers for Disease Control and Prevention, Weekly / March 19, 2021 / 70(11);369–376, https://www.cdc.gov/mmwr/volumes/70/wr/mm7011a1.htm?s_cid=mm7011a1_w

[55] Ibid.

[56] Kardefelt-Winther, D., "How Does the Time Children Spend Using Digital Technology Impact Their Mental Well-being, Social Relationships and Physical Activity? An Evidence-focused Literature Review." Innocenti Discussion Papers no. 2017-02, UNICEF Office of Research - Innocenti, Florence, 2017, https://www.unicef-irc.org/publications/925-how-does-the-time-children-spend-using-digital-technology-impact-their-mental-well.html

TO WHAT EXTENT DO YOU AGREE OR DISAGREE WITH THE FOLLOWING:

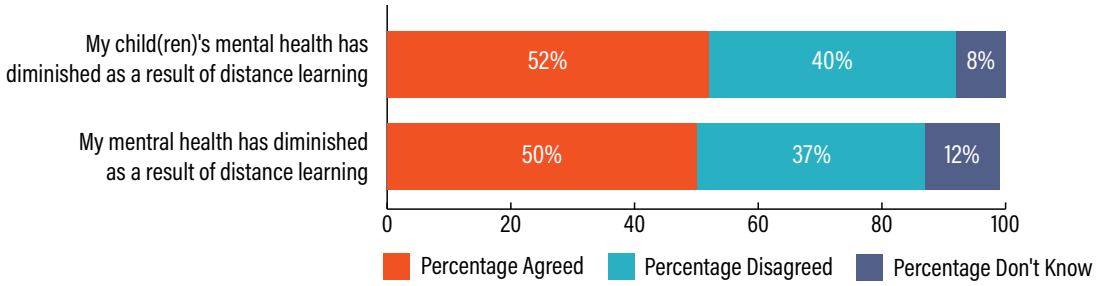

Figure 3: Online learning impact mental health.
Source: ICTC's Canadian Distance Learning Survey 2021, n=1063

At the provincial level, there have been varying responses by the Ministries of Education to address mental health related concerns. During the 2020-2021 period, Ministries of Education had announced multiple funding initiatives to help students whose learning and mental health had been disrupted by COVID-19.[57, 58, 59, 60, 61]

According to School Mental Health Ontario (SMHO), e-learning requires significant modifications at the administrative level to better address mental health conditions for K-12 and post-secondary students. Proposed solutions include co-developed support plans between students, families, and educators; board-level e-learning and mental health support teams for at-risk students; and a greater emphasis on small group work activities leveraging videoconferencing platforms and virtual micro-aggression awareness.[62]

[57] "Ontario Makes Major Investment in Mental Health and Technology to Support Students." Government of Ontario, 2020, https://news.ontario.ca/en/release/57277/ontario-makes-major-investment-in-mental-health-and-technology-to-support-students

[58] Miller, J., "Ontario boosts school funding for COVID-19 safety, mental health support and remedial reading and math." Ottawa Citizen, 2021, https://ottawacitizen.com/news/local-news/ontario-boosts-school-funding-for-covid-19-safety-mental-health-support-and-remedial-reading-and-math

[59] "Increased funding to improve students' mental health." Government of British Columbia: Mental Health and Additions, 2019, https://news.gov.bc.ca/releases/2019MMHA0100-001708#:~:text=Starting%20with%20%242.74%20million%20in,support%20this%20mental%20health%20initiative.&text=The%20agreement%20will%20provide%20%24262,addiction%20services%20in%20British%20Columbia.

[60] Adams, R., "B.C. announces further funding for mental health support in schools." CKPG Today, 2021, https://ckpgtoday.ca/2021/09/01/b-c-announces-further-funding-for-mental-health-support-in-schools/

[61] Balaski, C., "Government of Saskatchewan Increases Funding To Kids Help Phone To Support Student Mental Health." Government of Saskatchewan: News and Media, 2021, https://www.saskatchewan.ca/government/news-and-media/2021/august/31/government-of-saskatchewan-increases-funding-to-kids-help-phone-to-support-student-mental-health

[62] "Supporting The Mental Health and Well-Being of Students Who Will Return To School Remotely." School Mental Health Ontario: Mentally Healthy Return to School Toolkit, 09/2020, https://smho-smso.ca/wp-content/uploads/2020/09/Mental-Health-Return-To-School-Remotely.pdf

K–12: THE WIDENING DIGITAL DIVIDE

The COVID-19 pandemic highlighted the importance of technology, and accessibility to reliable internet.[63] It also accentuated the digital divide. Even though the term "digital divide" is not new to Canada,[64] the COVID-19 pandemic called greater attention to disparities and inequalities arising from internet connectivity and access to technology.[65]

According to ICTC's survey, the majority (83%) of students reported that they had the technology required to study from home, including a computer or a laptop, headset, and access to internet. Those numbers are slightly lower for students in rural locations (79%). Even though most students had access to appropriate technology, around a quarter of parents (28%) reported that their children did not have their own computer (laptop or desktop) to study independently, meaning that learning technology was shared with other members of the family. Students in rural areas and students in low-income families were most likely to be sharing technology with other family members.

Soon after the shift to emergency distance learning in April of 2020, school boards across Canada responded to the digital divide by seeking to bridge the gap for students without the necessary digital devices for distance learning. As an example, several school boards in Ontario purchased iPads with free wireless data plans and distributed them to students from low-income households.[66] Federally, in August 2021, the Government of Canada announced the second phase of the Connecting Families initiative, which supports affordable internet service for low-income families.[67]

CEO PLEDGE

In June 2021, Computers for Success Canada (CFSC-OPEC), a not-for-profit organization supporting the Government of Canada's digital inclusion and economic development programs, together with Microsoft Canada and other leading businesses in Canada, launched the CEO Pledge campaign.[68] The campaign was initiated to encourage businesses across Canada to commit their used technology to the Government of Canada's Computers for Schools Plus (CFS+) program. The CFS+ program refurbishes computers for use by schools, libraries, not-for-profit organizations, Indigenous communities, and low-income individuals.[69] CFS+ is designed to help under-served communities in Canada acquire the skills and training needed in today's digital economy.

[63] Wheeler, T., "COVID-19 has taught us the internet is critical and needs public interest oversight." The Brookings Institution, 2020, https://www.brookings.edu/blog/techtank/2020/04/29/covid-19-has-taught-us-the-internet-is-critical-and-needs-public-interest-oversight/

[64] Camillo, C., Longo, J., "A Tectonic Shift in the Digital Divide: It's now deeper than a technological gap." Johnson Shoyama: Graduate School of Public Policy, 2020, https://www.schoolofpublicpolicy.sk.ca/research/publications/policy-brief/covid-series-tectonic-shift-in-the-digital-divide.php

[65] Stewart, B., "How COVID-19 worsens Canada's digital divide." CBC News, British Columbia, 2020, https://www.cbc.ca/news/canada/british-columbia/covid-19-highlights-urban-rural-digital-divide-1.5734167

[66] DeClerq, K., "Ontario distributing free iPads to kids who cannot access province's online learning tools." CTV News, Toronto, 2020, https://toronto.ctvnews.ca/ontario-distributing-free-ipads-to-kids-who-cannot-access-province-s-online-learning-tools-1.4900317

[67] "Affordable high-speed Internet for low-income seniors and families." Government of Canada: Innovation, Science and Economic Development Canada, 2021, https://www.canada.ca/en/innovation-science-economic-development/news/2021/08/affordable-high-speed-internet-for-low-income-seniors-and-families.html

[68] "CFSC-OPEC launces CEO Pledge campaign initiated by Microsoft Canada to help close digital divides for underserved communities" ,CISION, 2021, https://www.canada.ca/en/innovation-science-economic-development/news/2021/08/affordable-high-speed-internet-for-low-income-seniors-and-families.html

[69] "Computers for Schools Plus." Government of Canada: Innovation, Science and Economic Development Canada, 2019, https://www.ic.gc.ca/eic/site/cfs-ope.nsf/eng/home

To avoid accelerating inequity among underserved groups and those living in rural and remote areas, particular attention should be placed on "offline" distance learning options for students. For software developers looking to modify their platforms, or school administrators looking to adopt a distance learning system, alternative options are needed for students with limited internet connectivity. Common solutions provided by interviewees include hybrid e-learning courses that provide optional printed materials for students; discussion groups facilitated by mobile devices (i.e. WhatsApp); and plain-text email outputs from LMS courses, and (where possible) preloaded audio-in videoconferencing options.

ICTC's survey identified that 28% of all parents and 38% of parents living in rural areas could not support their entire family's working/studying online at home due to poor internet connectivity. This issue was most prevalent in Saskatchewan and Manitoba. The federal government, which aims to address broadband issues through the High-Speed Internet for All of Canada[70] program and the Universal Broadband Fund (UBF),[71] also made multiple funding announcements throughout 2020/21 to bring high-speed internet to rural and Indigenous communities across Canada.[72]

K–12: SOCIALIZATION AND "AGE AND STAGE"

According to survey results, the most frequently mentioned challenge of online learning was social engagement. "Not being able to see friends" was the number one challenge selected by most students and parents surveyed. Moreover, 82% of all students agreed that it was important for them to socialize in person, most strongly felt by younger students. Interviewees tended to echo this sentiment, sharing that the development of social skills is integral for younger students' development.

> "*I don't think that we're doing a good job understanding the value of interpersonal relationships, especially for young people. Right now, as a result of COVID-19, we don't know how much of the online success we're seeing is out of desperation, and how much of it is actually a positive [aspect] of e-learning.*" – Digital Learning Strategist, Ontario

Socialization, generally, is seen by many as a pillar of a student's academic experience. Limited opportunities for peer-to-peer collaboration can impact long-term academic and professional success. According to ICTC's survey, 82% of students stated that socializing with their peers in person is a priority, and 69% believe that in-person relationships with their teacher(s) improved academic success. Likewise, 64% of students found it difficult to develop a connection virtually with teachers.

[70] "High-speed Internet for all of Canada." Government of Canada: Innovation, Science and Economic Development Canada, 2021, https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00006.html

[71] "Universal Broadband Fund." Government of Canada: Innovation, Science and Economic Development Canada, 2021, https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00006.html

[72] "Government of Canada invests over $41 Million to bring improved Internet speeds to 93 communities in rural Manitoba." Government of Canada: Innovation, Science and Economic Development Canada, 2021, https://www.canada.ca/en/innovation-science-economic-development/news/2021/08/government-of-canada-invests-over-41-million-to-bring-improved-internet-speeds-to-93-communities-in-rural-manitoba.html

Interviewees were asked at what "age or stage"[73] of a student's educational experience can, or should, distance learning begin. Opinions varied based on the respondent's profession, experience in working within the K–12 or post-secondary ecosystem, and whether they identified as a parent.

> "*I don't think age is a determining factor. You have to weigh a number of variables to engage in distance learning. Social, economic, lifestyle… it depends on the needs and flexibility of the individual user.*" – Coordinator of Educational Technology, Quebec

Digital literacy has close ties to traditional literacy levels.[74] English studies for instance are only effective if a student is literate, and e-learning platforms are only effective if a participant is a fluent user of technology. ICTC's survey indicates that 21% of all parents and 38% of parents whose children were in kindergarten to Grade 3 reported that their children did not have the digital skills required to successfully study from home. Three-quarters of parents with children in kindergarten to Grade 3 also shared that they themselves do not have the digital skills necessary to help their children study from home. On average, interviewees indicated that if required to choose, an approximate starting date for "effective"[75] online learning in Canada is around Grades 4-5. Several factors influenced this decision, including varying developmental levels of students, the degree of educator and parental support provided at home, and access to adequate technology.

K12, an online learning company, estimates that children younger than Grade 5 require 4 to 6 hours a day of parental supervision, whereas older children require supervision for just 1 to 3 hours.[76] An individual's digital literacy and circumstances at home make it difficult to determine an exact age where online learning begins to be effective, yet ICTC's survey found that online learning was either more or as difficult as in-class learning for K–12 students. Likewise, online learning involves more work for parents with students in kindergarten to Grade 3. From this group, 46% of parents reported online learning to be more difficult when compared to in-class learning. Only 12% of parents with children in kindergarten to Grade 3 mentioned that when it comes to their children's grades, online learning had "much more" or "more" success compared to in-class.

> "*Learning virtually or in a distributed manner is going to be challenging if you've got students of Grade six or below just because of their need for ongoing facilitation and structure. It's going to be harder to do in a virtual environment unless they have support at home to help or provide.*" – Director of Teaching and Learning, Saskatchewan

[73] "Age or stage" is a term often used when discussing the age, developmental level, or needs of a student.

[74] Asino, T., "Literacy in the Digital Age: From traditional to Digital to Mobile Digital Literacies." Oklahoma State University, 2020, https://open.library.okstate.edu/learninginthedigitalage/chapter/literacy_in_the_digital_age/

[75] "Effective" in this instance was shared to mean "learning that is retained and applied effectively."

[76] Casson, J., "How to Make Remote Learning Work for Your Children." Wired, 08/12/2020, https://www.wired.com/story/remote-learning-school-coronavirus-tips/

In cases where few or no barriers exist to online learning, survey respondents believed that e-learning presented greater flexibility and opportunities for critical thinking. One respondent noted that the cognitive ability to "avoid physical distractions and study at one's own pace" greatly impacts conversations about "age and stage."

Policy makers should consider a tiered or grade-based usage framework for e-learning that is specific to age and the unique needs of their region. This K-12 framework would take into consideration a student's age, cognitive ability, and assumed level of reliance on educator and family support. It would also consider issues of internet connectivity, access to equipment, social issues, and the availability of board-level academic and social support resources. Given the distinct challenges and opportunities e-learning provides specific learning levels, a blanketed or one-size-fits-all policy would be largely ineffective. A strategy that considers the distinct strengths of e-learning and evolves with a student throughout their academic journey would accommodate for social, economic, and academic challenges and promote a positive and holistic experience.

Grade-Based e-learning Considerations

Although not comprehensive, the following sections highlight important considerations in the development of a K-12 grade-based usage framework for e-learning. Segmented by clusters, these are the issues identified throughout ICTC's student and parent survey and interviews.

KINDERGARTEN TO GRADE 3

For early elementary school students (kindergarten to Grade 3), many provinces centre learning on play-based activities, socialization, and self-expression.[77] Throughout the 2020-21 academic year, educators were challenged to provide age-appropriate opportunities online while their students continued to develop basic digital literacy skills. Some provinces opted to resume in-class learning for elementary students, conscious of these distinct challenges.[78] In early cases of the pandemic, educators who were required to teach remotely often opted to connect synchronously using videoconferencing technology. This allowed them to interact directly with students, avoiding the use of other tools that required a higher degree of digital skill.[79]

GRADES 4-8

For older children (Grades 4–8), distance learning is found to offer distinct advantages. Interviewees indicate that for this age group, the personalization of digital learning is particularly important. As confidence and exposure to digital tools increases, students can develop their own

[77] Pyle, A., "Play-based Learning." Encyclopedia on Early Childhood Development, 2018, https://www.child-encyclopedia.com/sites/default/files/dossiers-complets/en/play-based-learning.pdf

[78] "Back to school: How provinces are planning for start of school year during pandemic." CBC News: Edmonton, 07/30/2020, https://www.cbc.ca/news/canada/edmonton/provinces-back-to-school-pandemic-1.5669376

[79] "Remote Learning for 2021-22." Upper Canada District School Board: UCDSB Remote Learning, 2021, http://www.ucdsb.on.ca/for_students/ucdsb_remote_learning

learning preferences while software responds to their individual needs. Adaptive Learning Systems (ALSs) for instance provide customized learning experiences for students, adapting educational material to suit their preferences and level of progress. These technologies help foster innovative, analytical, and critical thinking as well as creativity at an accommodating and flexible pace.[80]

GRADES 9-12

For students in senior K–12 years (Grades 9–12), many will already be comfortable using technology in educational settings. Interviewees said that older students find distance learning to be easy to use in terms of the digital literacy skills required as well as the degree of concentration needed to remain fully engaged. In 2020, a US survey of high schools providing distance learning (e-learning specifically) determined that augmented, blended or fully online classes were likely to become the new standard.[81] Students already enrolled in schools that offer e-learning, or an alternative form of distance learning, are likely to encounter decreased levels of disruption as a result of school closures in the event of pandemics, climate related emergencies such as hurricanes and flash floods, as well as labour disruptions.[82]

ADDITIONAL CONSIDERATIONS FOR K-12 STUDENTS

For all K–12 students, ICTC's survey indicates that educator, parent, and student communication during extended periods of distance learning remains as critical, if not more so, than in-class settings. Survey and interview participants highlighted that frequent and clear communication, which includes establishing academic expectations, remains paramount for maintaining a quality distance learning experience. Interviewees suggest supplementing the lack of in-person learning with one-on-one time between educators and students. Likewise, interviewees suggest that the involvement of early childhood educators or teaching aids in K–8 and secondary classrooms helps to foster better learning environments.

[80] Hernandez-de-Menendez, M., Escobar Díaz, C. & Morales-Menendez, R., "Technologies for the future of learning: state of the art." Int J Interact Des Manuf, 2020, https://www.researchgate.net/publication/337288079_Technologies_for_the_future_of_learning_state_of_the_art

[81] Schwartz, H., et al., "Opportunities and Challenges in Using Online Learning to Maintain Continuity of Instruction in K–12 Schools in Emergencies RAND Education and Labor Opportunities and Challenges in Using Online Learning to Maintain Continuity of Instruction in K–12 Schools in Emergencies." Beyond school closures: social distancing in K–12 Schools, 04/2020, https://www.researchgate.net/publication/340915460_Opportunities_and_Challenges_in_Using_Online_Learning_to_Maintain_Continuity_of_Instruction_in_K–12_Schools_in_Emergencies_RAND_Education_and_Labor_Opportunities_and_Challenges_in_Using_Online_Learnin

[82] Ibid.

Post-Secondary Challenges and Opportunities in Distance Learning

Since the onset of the COVID-19 pandemic, post-secondary institutions have also begun to consider the possible long-term role that e-learning will have on Canadian campuses.[83] Although many universities offered some of their academic programming online prior to the pandemic, approximately one-quarter of students had their classes either postponed or cancelled entirely in 2020. According to a recent StatsCan study, students surveyed throughout the pandemic have had some (17%) or all (75%) of their programs transferred online,[84] highlighting varying levels of institutional readiness. Many campuses have also been forced to consider the possibility of continued or renewed school closures in the coming years, questioning how best to address student needs in the long term.[85] Universities are now considering assessing student satisfaction rates for distance learning, alongside employment outcomes, housing, and academic flexibility.[86]

ICTC's survey indicates that half of post-secondary students also viewed in-person learning more positively than their emergency online learning experiences. Over half of this group also reported having more homework assigned during this period, but despite the increase in take-home assignments, a third of students aged 17 to 23 and a quarter of students aged 24-plus felt that their grades had improved. Part of the reason for this improvement may be related to the greater degree of flexibility or the opportunities for self-directed learning via online education.[87]

Interviewees recognized Athabasca University as a model of best practices when it comes to delivering post-secondary material online. Having offered their first distance learning course in 1973, Athabasca University has since provided 850 online undergraduate and graduate level programs,[88] including a Masters of Education in Open, Digital and Distance Education.[89] While Athabasca was well-prepared for the 2020 shift to online learning due to decades of experience in this space, the Ontario College of Art and Design (OCAD) is also a good example of an institution that was able to pivot from in-class and tactile instruction to online education. At the onset of the pandemic, OCAD created teams of faculty and department staff to ensure consistent input throughout the transition. These teams provided critical feedback on technical requirements and matters of student and instructor support. Recorded course materials, peer-led community groups, and hardcopy instructional packages were provided to help overcome challenges related to poor internet connectivity (largely for

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[83] Bennett, P., "Online learning is here to stay in the postpandemic education system." The Globe and Mail, 04/06/2021, https://www.theglobeandmail.com/opinion/article-online-learning-is-here-to-stay-in-the-post-pandemic-education-system/

[84] "COVID-19 Pandemic: Academic impacts on postsecondary students in Canada." Statistics Canada: StatsCan COVID-19 – Data to Insights for a Better Canada, 05/14/2020, https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00015-eng.htm

[85] Thevenot, S., "Canadian universities to return to in-person classes this fall." CIC News, 03/14/2021, https://www.cicnews.com/2021/03/canadian-universities-to-return-to-in-person-classes-this-fall-0317420.html#gs.b9f3c0

[86] Day, T. et al., "The Immediate Impact of COVID-19 on Postsecondary Teaching and Learning." The Professional Geographer: Volume 73, 2021, https://www.tandfonline.com/doi/full/10.1080/00330124.2020.1823864

[87] Gardner, A. et al., "Online Postsecondary Adult Learners: An Analysis of Adult Learner Characteristics and Online Course Taking Preferences." American Journal of Distance Education, 06/06/2021, https://www.tandfonline.com/doi/full/10.1080/08923647.2021.1928434

[88] "About Us." Athabasca University, 2021, https://www.athabascau.ca/aboutau/index.html

[89] "OCC info: Post-Secondary Programs – Master of Education: Open, Digital, and Distance Education." Government of Alberta, 06/25/2021, https://alis.alberta.ca/occinfo/post-secondary-programs/master-of-education/athabasca-university/41254f1d-8449-4182-9388-a12700c5f314/

students attending outside of the Toronto-area), synchronous and asynchronous learning, as well as material art-design (e.g., metal smithing) programs with more hands-on components.[90] OCAD's approach to emergency distance learning also offered an additional unique feature: a prolonged "trial enrolment" period where students could sample their online experience before fully committing to the semester or course.

Post-secondary interviewees from urban centres believe that the digital transition is, to some extent, permanent due to urban sprawl. Brick-and-mortar costs were said to have become unmanageable, and digital infrastructure has been a boon to continued growth of these institutions. Going forward, interviewees believe that academic institutions will prioritize physical space on campus specifically for courses that lend themselves better to tactile, in-person classroom settings. Additionally, post-secondary institutions could consider a permanent transition to hybrid learning environments, where students move interchangeably between online and in-class learning. Leveraging the flexibility benefits that distance learning provides, post-secondary administrators would do well to consider formal e-learning training for educators and an investment into e-learning support resources for students and educators alike.

Fostering Equity, Inclusion, and Digital Literacy in Online Education

"Edtech doesn't [support] all children equally. According to a 2017 [US] census survey, about one child in seven lacks home internet access, and the fraction was twice as high in families with lower incomes and less educated parents."[91]

Equity, diversity, and inclusion present a broad but critical consideration in matters of distance learning. The emergency shift to online learning during the pandemic highlighted existing issues while exacerbating new concerns. Despite this however, opportunities for future improvement are apparent.

Interviewees highlighted COVID-19 as a tipping point in the Canadian education system's fight to acknowledge a worsening digital divide.[92] Disparities and inequality resulting from uneven access to digital information and communication technologies has been acknowledged as an issue since the 1990's, but it has become far more visible with widespread adoption of online learning and remote working.[93] A recent report by CIGI states that "despite decades of warnings by communities and researchers alike… [Canada was] woefully unprepared for this moment."[94] Although the digital divide was discussed in a previous section, it is a challenge directly linked to equity and inclusion.

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[90] "Fabrication Studio: Metal Shop." Ontario College of Arts and Design University, 2021, https://www.ocadu.ca/services/studios/metal

[91] Hippel, P., "How Will the Coronavirus Crisis Affect Children's Learning? Unequally." Education Next, 04/09/2020, https://www.educationnext.org/how-will-coronavirus-crisis-affect-childrens-learning-unequally-covid-19/

[92] Sciadas, G., "The Digital Divide in Canada." Statistics Canada, 06/25/2021, https://www150.statcan.gc.ca/n1/pub/56f0009x/4193608-eng.pdf

[93] Camillo, C., "A Tectonic Shift in the Digital Divide: It's now deeper than a technological gap." Johnson-Shoyama Graduate School of Public Policy, 09/08/2021, https://www.schoolofpublicpolicy.sk.ca/research/publications/policy-brief/covid-series-tectonic-shift-in-the-digital-divide.php

[94] Weeden, A. and Kelly, W., "The Digital Divide Has Become a Chasm: Here's How We Bridge the Gap." Centre for International Governance Innovation, July 26, 2021, https://www.cigionline.org/articles/the-digital-divide-has-become-a-chasm-heres-how-we-bridge-the-gap/

As noted previously, rural and remote broadband connectivity has an acute impact on academic equity,[95] and this challenge is not limited to students. Educators interviewed for this study also shared their personal challenges with e-learning, citing poor internet quality at their homes, outdated personal equipment, and the high cost of internet access in rural areas.

Interviewees in the K–12, post-secondary, and continued learning space felt that their provincial government's emergency distance education policies were insufficient; specifically, many felt they were based on inaccurate assumptions about literacy and digital literacy levels among students.[96] For example, interviewees noted that in Ontario, students in kindergarten and Grade 1 were expected to focus on literacy and mathematics online[97] and assumed the core reading, comprehension, and digital literacy levels of students. According to an analysis of reading ability scores for students in Grades 1 through 3 in Alberta, only 85 of 409 readers showed notable signs of improvement when transitioning to online learning.[98] As K–12 educators from Quebec and PEI also shared, many students had little-to-no exposure to learning management systems prior to COVID-19,[99] making them largely unable to participate effectively in distance learning.[100] A similar trend was also expressed for post-secondary or adult learners: interviewees said that academic institutions misunderstood the average digital literacy level of their students.

STUDENTS WITH DISABILITIES

The rapid switch to e-learning during the COVID-19 crisis presents challenges for students with disabilities. Early in the switch to online learning, research identified that students with disabilities were most vulnerable to feeling disconnected from their peers and insufficiently supported.[101] The change of routine and lack of in-person, dedicated support caused significant challenges and a broader concern that losing access to specialized services will cause regression or delayed learning progress.[102] While some parents were able to make adjustments like adapting assignments, working with programming provided by learning support staff, and advocating for children with disabilities, not all parents were successful.[103] Moreover, this model risks shifting additional responsibility from schools themselves to the families of students with disabilities. However, subsequent technological advancements may also present

[95] Flanagan, R., "Without broadband access, online learning not viable in rural, remote Canada." CTV News, 09/03/2020, https://www.ctvnews.ca/canada/without-broadband-access-online-learning-not-viable-in-rural-remote-canada-1.5090861

[96] King, A., "What you need to know about Ontario's at-home learning program, which launches today." CBC News: Toronto, 04/06/2020, https://www.cbc.ca/news/canada/toronto/ontario-at-home-learning-program-launches-today-1.5522788

[97] Ibid.

[98] Betkowski, B., "Pandemic putting young readers behind the learning curve, says education expert." University of Alberta: Folio, 11/19/2020, https://www.ualberta.ca/folio/2020/11/pandemic-putting-young-readers-behind-the-learning-curve-says-education-expert.html

[99] "State of the Nation: K–12 E-learning in Canada – Prince Edward Island." State of the Nation K–12 E-learning in Canada, 2021, https://k12sotn.ca/pe/

[100] Montpetit, J., "Quebec need not provide online learning to all students, province's Superior Source says." CTV News: Montreal, 02/08/2021, https://www.cbc.ca/news/canada/montreal/quebec-online-learning-court-1.5905944

[101] Wong, J., "Pandemic leaves students with disabilities disconnected from peers and short on support." CBC News, 12/04/2021, https://www.cbc.ca/news/canada/students-with-disabilities-supports-pandemic-1.5825584

[102] Van Dyk, S., "Parents of children with autism call on Quebec for more support during pandemic." CBC News, 4/04/2020, https://www.cbc.ca/news/canada/montreal/parents-of-children-with-autism-call-on-quebec-for-more-support-during-pandemic-1.5519604

[103] Wong, J., "Pandemic leaves students with disabilities disconnected from peers and short on support." CBC News, 12/04/2021, https://www.cbc.ca/news/canada/students-with-disabilities-supports-pandemic-1.5825584

some opportunities. For example, platforms such as Zoom, Brightspace, and TopHat include accessibility features like external text-to-speech software compatibility, screen reader support, closed captioning, and accessibility checkers.[104] The need for online learning has also led to increased adoption of specific technology-based tools to assist students with disabilities. Examples include:

- Dictation/text-to-speech tools (whether web browser extensions such as Read&Write or Voice Control on macOS devices)
- Executive/time management tools (such as Cold Turkey to block websites and applications or Priority Matrix to coordinate project needs)
- Accessible screen readers such as the NVDA, NonVisual Desktop Access (a free, open-source, portable screen reader for Windows)

Although these technologies are not necessarily new, a widespread shift toward e-learning has encouraged increased use and familiarity. Some education technologies show evidence of improving learning outcomes for students with disabilities. For example, a study of 279 high school students indicates that content acquisition podcasts (CAP) significantly improve learning of vocabulary terms for students with learning disabilities.[105] While the transition to emergency distance learning has been particularly challenging for many students with disabilities, there are some situations where it has offered advantages. For example, some students with physical disabilities can avoid physical barriers at school, and those that suffer from social anxiety may feel more comfortable sharing ideas and asking questions online.[106] Students also benefited from the availability of closed captioning and transcripts of recorded lectures.[107]

INDIGENOUS YOUTH EXPERIENCES WITH E-LEARNING

According to Ontario's Auditor General, as of end 2020, only 17% of households on First Nation reserves had access to broadband internet connectivity.[108] According to the CRTC, sufficient broadband coverage necessary (50/10 Mbps) to support in e-learning is only available in 84% of households nationally, often excluding rural and remote communities.[109] The majority of on-reserve First Nation youth in Ontario do not have the connectivity required to participate in e-learning, disproportionately impacting learning and professional development opportunities.[110] e-learning, as one interviewee indicated, disproportionally places barriers on Indigenous families who may be unable to provide support at home due to poor internet connectivity.[111] According to an Indigenous educator from

[104] Peter, E., "How Online Courses are Affecting Students with Disabilities." Accessibility for Ontarians with Disabilities Act, 09/21/2020, https://www.aoda.ca/how-online-courses-are-affecting-students-with-disabilities/

[105] Kennedy, M. et al, "Effects of Multimedia Vocabulary Instruction on Adolescents with Learning Disabilities." Journal of Learning Disabilities, v48 n1 p22-38 Jan-Feb 2015, https://eric.ed.gov/?id=EJ1047703

[106] Wong, T., "Remote Learning for Students with Disabilities." Reach Canada, 1/21/2021, https://www.reach.ca/english/news/remote-learning-for-students-with-disabilities.htm

[107] Ibid.

[108] "Value-for-Money Audit: Indigenous Affairs in Ontario." Office of the Auditor General of Ontario, 12/2020, https://auditor.on.ca/en/content/annualreports/arreports/en20/20VFM_04indigenous.pdf

[109] "High-Speed Access for All: Canada's Connectivity Strategy." Government of Canada: Innovation, Science and Economic Development Canada, 2019, https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html

[110] Ibid.

[111] "Expert Mechanism on the Rights of Indigenous Peoples for its study on the rights of the Indigenous child." Human Rights Watch, 2021, https://www.hrw.org/sites/default/files/media_2021/03/EMRIP%20Submission.pdf

Ontario, "Attendance for Indigenous students is a challenge in ideal circumstances, let alone in the midst of a pandemic. Without the support of family and friends and the required resources [like connectivity,] things will likely get worse."

> *"Non-Indigenous folks don't seem to recognize the severity of [broadband] issues. But when you're in a community and you don't have internet, it's a big problem. Some of these Indigenous communities are already at a disadvantage, and now if we continue to rely on online learning, that gap is only going to increase."* – Dean of Education, Ontario

Comments varied considerably among interviewees regarding the e-learning experiences of Indigenous youth. Interviewees said that despite new opportunities afforded by educational technologies, many educational disparities persist, primarily due to the lack of sufficient broadband infrastructure.[112] While education in Canada is governed by individual provinces and territories, on-reserve First Nation schools are funded by the federal government, which includes funding for infrastructure upgrades.[113]

Interviewee opinions about online education for Indigenous youth also varied in areas where connectivity is available and sufficient. Some cautioned that e-learning risks misconstruing Indigenous culture,[114] while others highlighted its benefits, touching on multi-modal learning opportunities for Indigenous curriculum.[115] For Indigenous educators, a growing reliance on technology[116] coupled with the lack of culturally embedded course content were cause for concern.[117] Fears about digitally sharing, recording, and presenting Indigenous knowledge without the consent of the creators were particularly acute.[118] Recording a community's customs, protocols, or stories with community elders and knowledge keepers without consent is viewed not only as culturally insensitive but also an infringement on Indigenous intellectual property rights in Canada.[119] In matters where consent is granted, however, opportunities for widespread learning about Indigenous content were encouraged. This includes the development and integration of Indigenous e-learning content through online courses, learning tools, and podcasts.[120]

An Indigenous educator interviewed in this study highlighted the cultural limitations of e-learning systems such as LMS tools, sharing the example of morning drum circles. These circles, performed by

[112] "Indigenous communities should dictate how $1 billion infrastructure investment in spent." University of Calgary: UCalgary News, 04/16/2021, https://ucalgary.ca/news/indigenous-communities-should-dictate-how-1-billion-infrastructure-investment-spent

[113] Cherubini, L., "Education in the Post-Pandemic Era: Indigenous Children and Youth." The International Indigenous Policy Journal: Volume 11, 07/2020, https://ojs.lib.uwo.ca/index.php/iipj/article/view/10679

[114] Stranach, M., "Can we really teach 'Indigenizing' courses online?" The Conversation, 04/15/2018, https://theconversation.com/can-we-really-teach-indigenizing-courses-online-94008

[115] O'Connor, K., "The Use of ICTs and E-learning in Indigenous Education." State of the Nation: K–12 E-learning in Canada, 2014, https://k12sotn.ca/papers/the-use-of-icts-and-e-learning-in-indigenous-education/

[116] "Indigenous Land-Based Education and the COVID-19 Pandemic." University of Saskatchewan: Aboriginal Education Research Centre, 05/2021, https://aerc.usask.ca/documents/indigenous-land-based-education-and-the-covid-19-pandemic.pdf

[117] Pulla, S. et al., "Mobile Learning and Indigenous Education in Canada: A Synthesis of New Ways of Learning." International Journal of Mobile and Blended Learning: Volume 9, https://dl.acm.org/doi/abs/10.4018/IJMBL.2017040103

[118] Hogan, S., McCracken, K., "Appropriation vs. Incorporation: Indigenous Content in the Canadian History Classroom." Active History: Beyond the Lecture – Indigenous History, 07/15/2019, https://activehistory.ca/2019/07/appropriation-vs-incorporation-indigenous-content-in-the-canadian-history-classroom/

[119] "Introduction to Intellectual Property Rights and the Protection of Indigenous Knowledge and Cultural Expression in Canada." Government of Canada: Innovation, Science and Economic Development Canada, 07/2020, https://www.ic.gc.ca/eic/site/108.nsf/eng/00007.html

[120] "Indigenous E-learning: Tools and Resources." Government of Canada: Canada School of Public Service, 06/2020, https://www.csps-efpc.gc.ca/tools/jobaids/indig-e-learning-eng.aspx

members the community as well as faculty, notify students that class is commencing. Unfortunately, the drum circle was deemed too difficult to transfer to an online format during the pandemic, resulting in its removal. The exclusion of important cultural traditions such as this, the respondent shared, caused a notable drop in student engagement.

An Indigenous educator specializing in learning resources and technology for an on-reserve high school highlighted that online education had divergent effects on students: students that were already academically at risk encountered additional challenges to remaining engaged in an online environment, while others excelled, seeing both improved grades and higher levels of engagement. However, more broadly, systemic barriers, such as chronic under funding of schools, poor internet availability, and disproportionately high levels of financial hardship[121] already place many Indigenous students at a disadvantage.[122] Historically and today, formal educational environments have been found to be discriminatory toward Indigenous youth in certain ways: lower expectations of academic success, social isolation, marginalization, and academic indifference have all contributed to poorer outcomes.[123]

When it comes to future impacts, a post-secondary administrator involved with Indigenous recruitment indicated that distance learning stands to reduce the costs of education incurred by communities. As tuition rates in Canada continue to increase,[124] the costs associated with living off-reserve also increase. For smaller Indigenous communities with limited resources, these costs are difficult to sustain.[125] The ability to engage in high-quality education at a distance provides not only financial advantages, but also benefits to the community. For instance, e-learning can help to address growing issues of youth out-migration.[126] In Canada, it is estimated that more than 50% of Indigenous peoples live off-reserve in urban areas, and one of the leading causes of this migration is to access education.[127] Additionally, e-learning also provides non-traditional upskilling and reskilling opportunities for individuals looking for employment pathways. Through micro-credentialing programs, those who have graduated high school can look enter college programs,[128] while those looking to pursue continued education or specialized industry training can also participate at a distance.[129]

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[121] Skudra, M., et al., "Mapping the Landscape: Indigenous Skills Training and Jobs in Canada." Future Skills Centre, 06/2020, https://fsc-ccf.ca/research/mapping-the-landscape-indigenous-skills-training-and-jobs-in-canada/

[122] "Education as a social determinant of First Nations, Inuit and Métis Health." National Collaborating Centre of Aboriginal Health, 2017, https://www.ccnsa-nccah.ca/docs/determinants/FS-Education-SDOH-2017-EN.pdf

[123] "BC Antiracism Research" Government of British Columbia: Ministry of Education, 06/2016, https://www2.gov.bc.ca/assets/gov/education/ways-to-learn/aboriginal-education/abed-antiracism-research.pdf

[124] "Tuition fees for degree programs increase in 2020/2021." Statistics Canada, 09/21/2020, https://www150.statcan.gc.ca/n1/daily-quotidien/200921/dq200921b-eng.htm

[125] Evans, P., "Canada's inflation rate rises to highest levels in a decade, at 3.6%." CBC News, 06/16/2021, https://www.cbc.ca/news/business/inflation-may-canada-1.6067484

[126] Cooke, M., O'Sullivan, E., "The Impact of Migration on the First Nations Community Well-Being Index." University of Waterloo, 07/17/2014, https://uwaterloo.ca/canadian-index-wellbeing/sites/ca.canadian-index-wellbeing/files/uploads/files/the_impact_of_migration_on_the_first_nations_community_well-being_index.pdf

[127] "Urban Indigenous Peoples and Migration: Challenges and Opportunities." United Nations: Indigenous Peoples – Indigenous Voices, 2007, https://www.un.org/esa/socdev/unpfii/documents/6_session_factsheet2.pdf

[128] "Continuing Education: Micro-Credentials." Northern College: Continuing Education, 2021, https://northernc.on.ca/ce/micro-credentials/

[129] "Professional Development Certificates." McGill University: School of Continuing Studies, 2021, https://www.mcgill.ca/continuingstudies/professional-development-certificates

BLACK YOUTH EXPERIENCES WITH E-LEARNING

Canada's digital divide, access to education, and COVID-19 have acutely impacted the lives of Black Canadians. According to a report published by the African-Canadian Civic Engagement Council, Black Canadians have suffered greater financial insecurity as a result of COVID-19 than the rest of the population. Likewise, Black Canadians are more likely to have their household finances negatively impacted by COVID-19, limiting the resources available for education.[130] According to Stats Canada, in January 2021, 33% of Black Canadians were living in households where it was "very difficult" to meet basic financial commitments.[131] Black parents with young children also faced additional hardships related to prolonged school closures, childcare costs,[132] and higher hardware and connectivity fees due to e-learning.[133]

> "*The Black population faces disparate outcomes in health [and] education... These disparities are not neutral, they are part of Canada's ongoing history of settler colonialism.*" - Alicia Boatswain-Kyte, Assistant Professor at the School of Social Work[134]

Black Boys Code, a not-for-profit that provides technology training to Black youth, directed its efforts to address education-access challenges in Black communities, exacerbated by the pandemic. Through its new program Black Boys Code Cares, the organization acquired repurposed equipment, which was then refurbished and redistributed to Black Canadian families in need.

Complementing access to technology, Black youth mentorship programs—like the one offered by the University of Alberta that connects high school students with Black post-secondary students and professors—are also designed to make use of online community building opportunities.[135] Access to technology and mentorship initiatives play critical roles in advancing outcomes for Black communities. Interviewees suggest that distance education uptake and access have a direct relationship to the poor representation of Black leaders in the classroom and at the policy level. Research on educator diversity in the US suggests that minority teachers and mentors can help to create positive academic success and improved engagement of minority students by debunking stereotypes, limiting unconscious implicit biases and fostering greater cultural, academic, and social inclusion.[136] By contrast, a continued lack of representation in these areas risks hindering inclusive decision-making when developing policies for distance learning practices. One respondent noted the following:

[130] Nur, D., Lockhart, J., "Impact of COVID-19 Black Canadian Perspectives." African-Canadian Civic Engagement Council, 09/02/2020, https://innovativeresearch.ca/wp-content/uploads/2020/09/ACCEC01-Release-Deck.pdf

[131] "Study: A labour market snapshot of Black Canadians during the pandemic." Statistics Canada, 02/24/21, https://www150.statcan.gc.ca/n1/daily-quotidien/210224/dq210224b-eng.htm

[132] Ibid.

[133] James, C., "Racial Inequity, COVID-19 And The Education of Black and Other Marginalized Students." York University: Department of Sociology, 11/12/2020, https://rsc-src.ca/en/covid-19/impact-covid-19-in-racialized-communities/racial-inequity-covid-19-and-education-black-and

[134] McDevitt, N., "COVID-19 Q&A: Impact of the pandemic on the Black community and the need for race-based data." McGill Reporter, 02/18/2021, https://reporter.mcgill.ca/covid-19-qa-impact-of-the-pandemic-on-the-black-community-and-the-need-for-race-based-data/

[135] Narvey, R., "New Black youth mentorship program empowers students to aim high" The Gateway, 2/03/2021, https://thegatewayonline.ca/2021/02/new-black-youth-mentorship-program-empowers-students-to-aim-high/

[136] "The State of Teacher Diversity in American Education." The Albert Shanker Institute, 2015, https://www.shankerinstitute.org/resource/teacherdiversity

"If we look at the academic achievement of Black students [online or in person], we come to two conclusions: conclusion 'a' is that there is something inherently inferior with the performance of Black students, making us racist and likely to perpetuate racist outcomes; or conclusion 'b' that there's something inherently wrong with the system and structure that we've established for Black students. We can only go with option 'b,' meaning that we need to be anti-racist and recognize that we've created a system that is perpetuating poor outcomes for Black students, and that we need to challenge, disrupt, and create opportunities where there weren't any before." - Principal, Ontario

In developing long-term distance learning policies, provincial governments are encouraged to work with Black-led organizations at both the national and provincial levels. Collaborative policy development will help ensure that the experiences of Black youth are represented in shaping long-term distance learning decisions. Likewise, interviewees noted that including Black leaders in policy development will ensure better representation of the Black community in Canadian education.

Canadian charity Actua offers distance learning programs to encourage Black youth to get involved in STEM education (science, technology, engineering, and math). One of its Fall 2020 programs involved students from Grades 1–8 exploring chemistry concepts such as rocket building. This program mixed physical hands-on learning kits delivered to students at home with online Zoom meetings with Black instructors (engineering students from Queen's University). [137]

[137] "Celebrating STEM programs paving the way for Black Youth in Canada." Actua, 2/25/2021, https://www.actua.ca/en/black-youth-in-stem-programs/

Educator Experiences and Navigating the Digital Shift.

EDUCATOR EXPERIENCES: GROWING NEED FOR FOUNDATIONAL DIGITAL SKILLS

Training and professional development is a key component of successful technology integration.[138] Under normal circumstances, technology would be integrated slowly over time using a combination of training programs, pilot studies, and IT support. However, during the pandemic, the forced transition to online learning has resulted in large discrepancies: educators, even those from within the same schools, can have varying proficiency with educational technology. The reasons for these discrepancies vary. For one, an educator's proficiency with tools like learning management systems will often depend on their general interest and level of training. Importantly, the choice to implement new technologies is often left to discretion of individual educators. A second reason for these discrepancies is that technology training can differ substantially between local school boards. For example, local policies can determine not only what is included in training programs but also how training is delivered. While some schools provide more formalized and regular training, others offer training on an as-needed basis in the form of professional development sessions. Some interviewees noted that training was considered optional at their school:

> *"We've received no formal training about connecting synchronously. All that was provided was the [directive] from the Ministry about what to follow and how to deliver our program... it was basically 'figure it out and call IT if you have any questions.'"* – Educator, Ontario

Resources for educators are available, but as training is optional, scheduling conflicts arise and place additional burdens on educators. For example, educators may need to find time for training within their existing workload and responsibilities or in their spare time. One interviewee, an educator from Northern Ontario, stated that despite public messaging from provinces about the availability of teacher training and resources, completing it was hardly feasible or practical. Moreover, because digital skills training and digital skills benchmarks are not standardized, the playing field remains uneven.

Interviewees believe that if left unaddressed, these challenges will be exacerbated, and additional issues may arise should online learning become a cornerstone of education. K–12 educators in Atlantic Canada expressed concerns about the readiness of local telecommunications infrastructure that enables online learning. Although the Internet for Nova Scotia initiative pledges significant fibre optic expansion across the province by end of 2023, concerns were most pronounced in areas considered rural or remote, some of which currently areas rely on costly satellite internet.

[138] Ivus, M., Quan, T., Snider, N., "21st Century Digital Skills: Competencies, Innovations and Curriculum in Canada." Information and Communications Technology Council, 03/2021, https://www.ictc-ctic.ca/wp-content/uploads/2021/04/21st-century-digital-skills.pdf

EDUCATOR EXPERIENCES: ACCELERATED DIGITAL SKILL RAMP-UP

Despite existing concerns, there is evidence to suggest that barriers to technology adoption and digital skills training can improve over time. For example, in this study, some interviewees noted that students and instructors who had initially held negative opinions of online learning became more open to it after prolonged exposure. Similarly, an interviewee from higher education in Quebec noted that over a four-month period where remote learning was adopted due to the pandemic, higher education instructors had not only learned to adapt to new digital learning systems but had improved digital literacy skills and confidence. For K–12 educators, some have begun establishing best-practice frameworks and online networks to help support their colleagues and bolster efficacy.[139] The increased adoption of online tools has further stressed the need for educators to possess a standardized, base-level set of digital skills. According to a survey of distance learning educators across Australia, the following foundational skills and concepts are required to facilitate online learning effectively:

- Understanding the distinctive nature of online learning pedagogy
- Developing methods for effective online student engagement
- Focus on relationship building with students
- Humanizing, whenever possible, the online teaching and learning experience
- Possessing the core technical skills required for e-learning[140]

[139] Paccone, P., "15 Lessons Learned From Online Teaching." PBS Education: PBS Teachers Lounge, 09/2020, https://www.pbs.org/education/blog/15-lessons-learned-from-online-teaching

[140] McLouglin, C., Northcote, M., "What Skills Do I Need to Teach Online? Researching Experienced Teacher Views of Essential Knowledge and Skills in Online Pedagogy as a Foundation for Designing Professional Development for Novice Teachers" ,Avondale College: School of Education, 2017, https://research.avondale.edu.au/cgi/viewcontent.cgi?article=1038&context=edu_conferences

Beyond COVID: Drivers of Online Learning in Canada

The pandemic has caused many educators to re-evaluate their traditional teaching practices. As one interviewee noted, educators have "inevitably shifted to think more about processes when trying to match academic outcomes and with online activities originally designed for a classroom." In other words, educators were required to look beyond simply transferring lessons online—and toward transforming their current practice. New technologies, new demands from an expanding "knowledge-based society," future workplace demands, and a broadening scope of student expectations in learning bring different but critical considerations to the forefront.[141] According to TeachOnline.ca and Contact North, which offers technology resources for post-secondary instructors in Ontario, several key components contribute to this pedagogical shift. These include:

1. BLENDED LEARNING

- Blending education to include both in-person and online instruction. This requires a review of several factors, including: classroom layouts, study goals, and interaction between students, educators, parents, and subject matter experts.

2. COLLABORATIVE APPROACHES TO THE CONSTRUCTION OF KNOWLEDGE/BUILDING COMMUNITIES OF INQUIRY AND PRACTICE

- Collaborative and active learning techniques where students share individual experiences and learn from each other in an instructor-facilitated environment.

3. USE OF MULTIMEDIA AND OPEN EDUCATIONAL RESOURCES (OER)

- Open educational resources in various formats that enable students and instructors to access knowledge in different ways. Thousands of stand-alone educational materials can be accessed for free and leveraged to help facilitate new learning opportunities.

4. INCREASED STUDENT CONTROL, CHOICE, AND INDEPENDENCE

- Using this method, educators transition from selecting information for students to digest to guiding students in to locating, analyzing and applying information relevant to certain topics. This offers a degree of autonomy to the learner and encourages them to use the best medium for their learning style.

5. ANYWHERE, ANYTIME, ANY SIZE LEARNING

- The production of educational material in smaller segments and, if needed, produced into stand-alone credentials. These credentials often are designed to accommodate the flexibility needs of students with personal responsibilities outside of the classroom.

6. NEW FORMS OF ASSESSMENT

- A growing consideration of pedagogies designed to suit specific mediums. This includes, but is not limited to, leveraging learning analytics, artificial intelligence, accreditation methods centred on student competencies, peer assessment, and various others for distance learning activities.

[141] "A New Pedagogy is Emerging... and Online Learning Is a Key Contributing Factor." TeachOnline-Contact North, 08/2020, https://teachonline.ca/tools-trends/how-teach-online-student-success/new-pedagogy-emerging-and-online-learning-key-contributing-factor

7. SELF-DIRECTED AND NON-FORMAL ONLINE LEARNING

- Providing OERs and MOOCs as an alternative learning solution enables students to access new interest areas independently, without requiring facilitators. Digitized progress tracking mechanisms and marking techniques can open new opportunities for students to learn at their own pace.[142]

Online learning provides a degree of experimentation for educators, allowing them to push beyond their typical comfort levels with technology. For example, one Ontario-based educator noted that the large-scale emergency distance learning "experiment" presented an opportunity to try "flipped classroom" arrangements.[143] Flipped classrooms are a type of blended learning where students are introduced to content at home while working on activities in class.[144] This is the opposite of the traditional model where teachers introduce new content in the classroom and students work through related exercises at home. Traditional models can be more engaging and allow students to self-direct, however, there are also trade-offs: increased "front-end" work by teachers, the risk that not all students will find this approach to learning engaging, and the reality that not all students have equally supportive home environments to help them work through new content.[145] Interviewees also felt that the pandemic furthered the debate about "process learning" versus "product learning" (where product learning is seen as an end goal or product, whereas process learning envisions learning as an ongoing process). An interviewee in this study elaborates on the process versus product-based learning debate:

> "*There's a pedagogical argument that stems from "process vs product." Traditionally in the Canadian education system, product was all that mattered. For instance, a student would have to read, understand, and regurgitate Shakespeare's "to be or not to be" soliloquy to some degree. Now with technology, the emphasis is placed on formative assessment.*" – Director of Innovative Pedagogy, Ontario

K–12 and post-secondary stakeholders are having meaningful conversations about whether educators are transitioning toward a pedagogy that is receptive to in-class and online learning environments. Product-oriented learning challenges are being investigated, and assumptions about best practices in educational delivery are being challenged. Interestingly, online learning is a useful tool for proponents of both process and product learning, as it can allow for several types of assessment, including discussion-based activities, "ePortfolios," formative peer review, and test or quiz software.[146]

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[142] Ibid.

[143] According to the University of Toronto, a flipped classroom is a pedagogical model where typical educational in-class learning and homework are reversed. Recorded lectures are viewed outside of the classroom, while in-class opportunities are focused on active learning activities.

[144] "The Definition of the Flipped Classroom." Edutopia, accessed September 14, 2021, https://www.teachthought.com/learning/the-definition-of-the-flipped-classroom/

[145] Ibid.

[146] "Tips for Online Assessment." University of Toronto – Centre for Teaching Support and Innovation, accessed 9/20/2021, https://teaching.utoronto.ca/wp-content/uploads/2015/08/Online-Assessment-Tips.pdf

SECTION III: E-LEARNING CONSIDERATIONS FOR CANADIAN EDUCATORS

The following section provides international case studies and information from ICTC interviews on the changing nature of teaching and pedagogy related to distance learning. This section focuses on the current state of e-learning in Canada, issues of academic integrity, data privacy, and pedagogical shifts taking place in distance learning environments.

A Change of Pace: e-learning as Standard Teaching Practice

The long-term impacts of COVID-19 on the Canadian education system remain unknown. What is evident are the short-term implications of the emergency transition to e-learning (and distance learning more broadly) for K–12 and post-secondary institutions, and the additional considerations it has brought to the forefront like the role of educators in long-term distance learning environments; preparation and teaching issues; and the opportunities associated with flexible student learning schedules, and others.

One interviewee, a distance learning consultant from British Columbia, was specifically concerned about the impact of e-learning on "contact hours," which may also be referred to as "seat time." Contact hours are a unit of measurement used to approximate how long a student spends in contact with an educator partaking in unstructured and/or semi-structured learning. Some interviewees cautioned that in the long-term, contact hours may become less suitable as a measurement for student and teacher workload. One interviewee explained that already, instructors have begun advocating for new approaches to measuring workload: for example, "expected hours of effort" measures the number of hours needed to prepare a lesson, rather than time spent delivering the material. Further, administrative scheduling systems may need to allow for more flexible content delivery and student participation; this would represent a shift from current systems, which tend to be grounded in institutional learning models, to those that accept distance learning as commonplace.

> "*Generally, I think people see the benefit of distance learning. I see a lot of people in other provinces who are saying how it's changing the teaching practice overall and teaching with the use of technology. They're recognizing that learning is increasingly independent of time, space, or place. This is something that the general population has grown accustomed to now, whereas it was kind of a foreign idea before the pandemic.*" - Educational Consultant, Quebec

A shift in teaching practices also requires a change in the tools used to measure and assess student learning. Virtual proctoring, for instance, allows an individual to monitor a livestream of a student completing their assessments. This is actively discouraged, however, due to personal privacy concerns. Dalhousie University has published a faculty instructor handbook that reflects its policy, stating that the "use of virtual/remote proctoring is not recommended in most instances."[147] Dalhousie students also have the right to decline consent to have their data used in this regard.[148]

A 2017 research study, however, compared online remote proctoring to onsite examinations and found participants had a overall positive reaction to online remote proctoring and that a change to online proctoring had virtually no impact on test performance.[149] Yet beyond the availability and/or suitability of online proctoring tools, some educators, including one interviewee in

[147] "Academic Integrity Toolkit for Course Instructors." Dalhousie University, 08/2020, https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/online-teaching/ACADEMIC%20INTEGRITY%20TOOLKIT.pdf

[148] Ibid.

[149] Weiner, J. and Hurtz, G., "A Comparative Study of Online Remote Proctored Versus Onsite Proctored High-stakes Exams." Journal of Applied Testing Technology, Volume 18 (1), 2017, http://www.jattjournal.com/index.php/atp/article/view/113061

this study, see a more pressing need for "well-designed learning activities that respond to various curriculum needs." For example, some online educators believe that there are evidence-based, alternative approaches to assessment that eliminate the need for academic surveillance software. In such instances, they argue that a final exam is not necessary, and that it may be more appropriate to use multiple short quizzes scattered throughout the course, presentations, oral exams, portfolios, group projects, and/or open book exams.[150]

PROCTORING SOFTWARE USE

In April 2020, two university professors conducted web scraping[151] to measure the use of online/remote proctoring software at 1,923 US and 232 Canadian colleges and universities. Approximately 39% of the Canadian colleges and universities listed online/remote proctoring tools on their websites, compared to 65.8% in US colleges. Universities in Ontario, British Columbia, and Alberta reflected the greatest use of proctoring software (about 69% to 77% of those colleges and universities list online/remote proctoring tools on their websites—in Quebec, that drops to only 9%). The most common proctoring software was Respondus (32%), followed by Examity (14%), ProctorU (9%), Proctorio (7%), and HonorLock (2%).

Despite recent trends, a shift to e-learning as a commonplace and widely accepted mode of education is likely an uphill climb. Although distance learning has a long-standing history in Quebec,[152] poor perceptions of it prior to COVID-19 were common among educators and students. One interviewee explained the slow moving and complicated relationship Quebec has had with distance education,[153] while suggesting signs of future improvement.

> *"Digital technology influencing our teaching practice has been going on for over 20 years. Likewise, a shift in pedagogy has been taking place for a long time, informed by technology, and then the technology informs us on how to do pedagogy differently—maybe even better...This isn't something we're waking up to suddenly and have to figure out, but for some administrations it is... Certain pedagogy values and what this can tell us about student learning comes about as a result of the technologies made available to us. This enhances our strategies and makes us reflective in a more pronounced way than if we only did face-to-face teaching."* – Director of Innovative Pedagogy, Ontario

[150] Caldwell, J., "Overcoming the Challenges of Online Proctoring." BC Campus, 1/25/2021, https://bccampus.ca/2021/01/25/overcoming-the-challenges-of-online-proctoring/

[151] Kimmons, R. and Veletsianos, G., "Proctoring Software in Higher Ed: Prevalence and Patterns." Educase Review, 2/23/2021, https://er.educause.edu/articles/2021/2/proctoring-software-in-higher-ed-prevalence-and-patterns

[152] Lapierre, M., "In Quebec Schools, the pandemic will put remote learning to the test." Montreal Gazette, 08/10/2020, https://montrealgazette.com/news/quebec/in-quebec-schools-the-pandemic-will-put-remote-learning-to-the-test

[153] "Quebec is spending $20M to make up for time lost by students, especially those with learning disabilities." CBC News: Montreal, 08/17/2020, https://www.cbc.ca/news/canada/montreal/quebec-education-learning-disabilities-1.5689308

e-learning Pedagogies in Practice

STUDENT-CENTRED LEARNING (SCL)

A gradual shift to **student-centred learning** accompanies the transition to digital teaching practices. This is the notion that students have a degree of autonomy over the subjects that they study, connecting their own interests to a specific curriculum.[154] SCL allows greater flexibility for students, which was especially important when schools shifted to emergency distance learning. SCL is a significant shift from the traditional approach to education, and as a result, it comes with benefits and drawbacks, as well as significant debate among educators.[155]

ADVANTAGES OF SCL:[156]

- Students develop **problem-solving skills** by considering multiple potential solutions to a specific situation or challenge
- Students develop **flexibility and critical thinking skills** by continually integrating new knowledge, learning to make connections and associations, and synthesizing multiple sources of information to support their conclusions
- Students develop **communication and social skills** by learning how to clearly articulate their ideas, negotiate, and collaborate on tasks in a group setting
- SCL promotes **intrinsic motivation to learn** by recognizing and accepting the student's point of view (rather than being "wrong" or "right"). This approach helps develop confidence and self esteem, motivating a student to learn and tackle different problems

DISADVANTAGES OF SCL:[157]

- Requires **more time** for students to determine their interests and for teachers to design a course based on those interests. The curriculum cannot be planned in advance
- Requires **special skills and a greater time commitment from the teacher**. The teacher is expected go "the extra mile" to address the needs of every student
- **Is not suitable for all** students

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[154] Richmond, E., "Student-Centred Learning." Stanford: Graduate School of Education, 04/02/2014, https://edpolicy.stanford.edu/news/articles/1193

[155] Schweisfurth, M., "Is learner-centred education 'best practice?'" UNICEF – Cambridge Education, 08/2019, https://www.unicef.org/esa/sites/unicef.org.esa/files/2019-08/ThinkPiece_9_LearnerCentredEducation.pdf

[156] "List of benefits for using a student-centered approach." the Knowledge Network for Innovations in Learning and Teaching (KNILT), https://knilt.arcc.albany.edu/List_of_benefits_for_using_a_student-centered_approach

[157] "Advantages and Disadvantages of Student Centered Learning." Research Journal of English Language and Literature (RJELAL), February 2020, http://www.rjelal.com/8.S1.2020/132-134.pdf

STUDENT-CENTRED APPROACH CASE STUDY

In April 2020, the National Conference of State Legislatures and the Nellie Mae Education Foundation studied 62 US schools that implemented student-centred learning. This research highlighted that student-centred learning produced measurable benefits. Namely, the schools with SCL-based teaching practices "experienced substantial improvements in their students' performance in math and reading."[158] The study also found that "students who understand their learning environment and feel in control of that environment are more likely to be engaged throughout their school day and, as a result, may be better able to improve their overall academic performance."[159]

ACTIVE LEARNING

Active learning (or engaging students through activities or discussions in class) emphasizes higher-order thinking (beyond memorization) and is contrasted to passively listening to an expert.[160] This kind of engagement with educational material is key to building strong interpersonal skills and emotional intelligence. Aided by technology, active learning can take many forms, including the following:

- Online discussion boards
- Online adaptive tutorials or labs
- Zoom breakout rooms to discuss insights from the lessons
- Real-time virtual polling[161]

However, given the range of options available, educators must consider various dimensions and trade-offs when selecting and using different technologies. The following are examples of questions that educators must consider when sourcing, procuring, and implementing technology to aid active learning:

- Does the technology make group work more effective?
- Does the technology support synchronous and asynchronous work?
- Can the technology be accessed from any device/operating system?[162]
- Does the technology help identify students who are struggling and may need extra assistance?[163]
- What are the costs of ongoing design and maintenance with this technology?[164]

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[158] "What is Student-Centered Learning and Why is it Important?" XQ, 08/25/2020, https://xqsuperschool.org/rethinktogether/what-is-student-centered-learning/

[159] Ibid.

[160] Freeman, S. et al., "Active learning increases student performance in science, engineering, and mathematics." PNAS, Volume 111, no. 23, 6/10/2014, https://www.pnas.org/content/pnas/111/23/8410.full.pdf

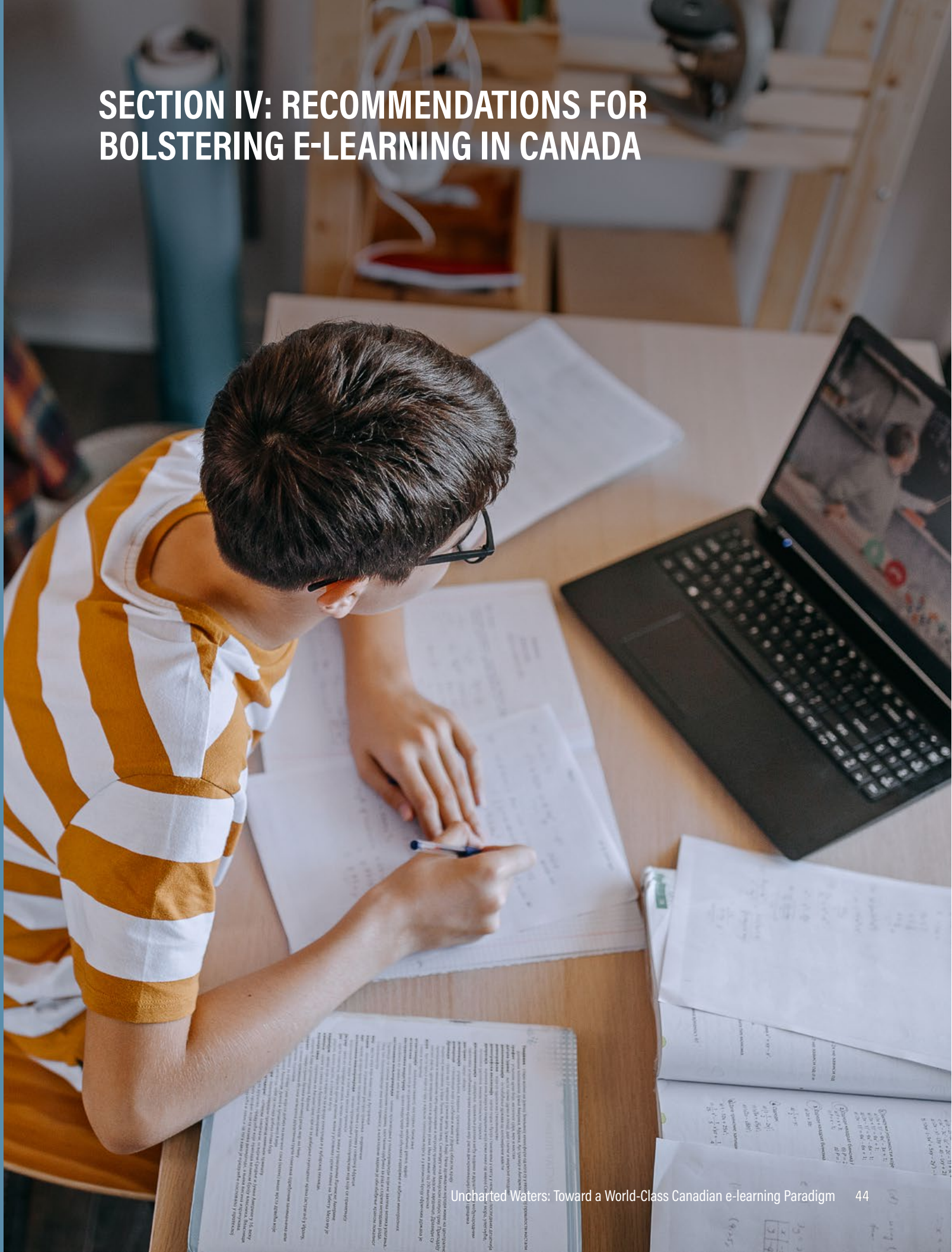
[161] "Active Learning for Your Online Classroom: Five Strategies Using Zoom." Columbia Centre for Teaching and Learning, https://ctl.columbia.edu/resources-and-technology/teaching-with-technology/teaching-online/active-learning/

[162] Whenham, T., "How to choose the best active learning technology for your spaces." Nureva, 11/14/2018, https://www.nureva.com/blog/education/how-to-choose-the-best-active-learning-technology-for-your-spaces

[163] Juanes, J. and Ruisoto, P., "Technological Devices for Enhancing Active Learning." 10/2018, https://www.researchgate.net/publication/328977667_Technological_Devices_for_Enhancing_Active_Learning

[164] Fisher, K., "Technology-enabled active learning environments: an appraisal." OECD, 7/2010, https://www.oecd-ilibrary.org/docserver/5kmbjxzrmc0p-enpdf?expires=1632261828&id=id&accname=guest&checksum=ECD1501658694DEA0598299D599F1806

SECTION IV: RECOMMENDATIONS FOR BOLSTERING E-LEARNING IN CANADA



The past 18 months has been a journey of trial and error for e-learning. While some attempts and interventions have proven fruitful, others have faced challenges and, in all cases, unintended positive and negative consequences. e-learning is a valuable form of education that can expand opportunities for inclusion for all Canadian students, broaden access to different resources and learning styles, and even generate improved learning outcomes. An emergency transition to e-learning during a global pandemic cannot, and should not, serve as the guidepost for the value of e-learning. Best practices and examples of successful online education schemes are found around the world. When appropriately planned for and integrated, Canadian e-learning can be an innovative, powerful, and impactful method of educating.

The following are a set of recommendations that can be leveraged by educators, school administrators, and policymakers to spearhead and/or improve e-learning processes and polices in Canada. While there are significant differences between the K–12 and post-secondary systems, this framework of recommendations can adapted for different groups and needs. An effective e-learning roadmap for Canada would focus on the four pillars identified in this study: **Educator Support and Training, Education System Transitions, Equity and Inclusion, and Flexibility** and **Experimentation.**

A) EDUCATOR SUPPORT, EQUIPMENT AND STUDENT NEEDS

1. Minimum digital skills for educators are required to ensure a guaranteed level of quality in e-learning across Canada. Currently, digital skills and competencies with digital education tools vary between schools and individual educators. Educators should have access to comprehensive courses dedicated to the development of core digital literacy skills and the use of educational technologies. Training will differ by setting (K–12 or post-secondary), but should include any digital tool essential to facilitating online learning.[165]

2. In addition to minimum digital skills, school administrators must also select the most effective educational technology or digital tools that can facilitate the learning journey for students. To do this, administrators must evaluate the unique needs, economic and social circumstances of their student population. While some students may be able to leverage advanced technologies, others may face a steeper learning/access curve and require additional support at school or at home.

3. Beyond digital skills, learners need to collaborate with one another, engage in meaningful discussion, and build their "soft" or "people" skills. To do so, educators must be able to access technologies that can help them build a sense of community for students and connect with their peers. Leveraging and receiving training on core technologies that encourage socialization and offer safe spaces for student interaction is critical.

[165] "Foundational Knowledge." University of North Carolina Wilmington, accessed 9/20/2021, https://uncw.edu/irp/ie/assessment/foundational-knowledge.pdf

B) EDUCATION SYSTEM TRANSITIONS

1. Regional school boards and post-secondary school administrators will benefit from developing mandatory and standardized educator training suited to their learning management systems. This training will ensure a baseline competency across all educators, while granting those with existing competencies an opportunity for added specialization.

2. One of the unintended outcomes of the transition to e-learning during the pandemic was the added pressures placed on caregivers in the student's home. Caregivers find themselves balancing work, homelife, and the educational needs of their children. Well planned, coordinated, and executed e-learning strategies can help alleviate this pressure. Ministries of Education and district school boards should consider the development of support services designed for parents and caregivers of students enrolled in e-learning. These supports may include resources for one-on-one troubleshooting related to digital tools, individual lesson plans, and equipment resources for those with limited access to digital tools.

C) EQUITY AND INCLUSION

1. To effectively teach, engage, and empower all students, e-learning must be rooted in achieving equity and inclusion. The first step in this process is understanding access. School boards and schools must consider what access students have to the hardware needed to participate in online learning. Where access is insufficient, schools need to provide accommodations. The average level of internet access in their region is another important consideration, recognizing that in cases of insufficient connectivity, schools can consider lending data-enabled devices or provide access to portable internet hotspots.

2. Fostering improved equity and inclusion in online education means also understanding and acknowledging the different circumstances and needs of students from different socioeconomic backgrounds, cultures, and ability levels. Curriculum should be developed with consultation from parents and organizations that understand and support underserved students. Students from Indigenous communities may have unique cultural education needs compared to Black students, and students with disabilities may require accommodations to succeed in learning online.

D) FLEXIBILITY AND EXPERIMENTATION

1. In addition to digital skills training, educators must be able to engage in active learning and student-centric learning activities with their students. To facilitate this, educators require the opportunity to customize and adapt curriculum outcomes for students when learning online. While a standard framework for content development should be provided, it is important to ensure that educators have freedom to tailor content based on the individual needs of their students.

2. To enable continuous feedback loops, troubleshooting, and digital competency development, an invite-only online community of educators and IT professionals should be developed. This group can be designed to work collaboratively toward the goal of ensuring that IT support for educators is timely and accessible.

3. For schools and school districts interested in testing a more robust digital environment, technology sandboxes can be implemented to trial technological tools, instruction styles, and new teaching methods. As a safe and controlled environment, digital sandboxes also allow educators to experiment with new programs and features. Successful trials can be further evaluated, scaled, and permanently adopted.

Conclusion

Although the future of distance learning remains uncertain, COVID-19 has highlighted the need for flexible and engaging online learning opportunities for students. Preparing for the role of technology in a post-COVID Canada is paramount for classrooms and crucial to the future success of students of all ages. For K–12 education, access to critical resources, a comprehensive understanding of existing student skills and levels of academic and social readiness is required. In post-secondary classrooms, greater autonomy, flexibility, and accessibility are becoming increasingly important.

ICTC's research on education technology has continues to show the crucial need for both accessibility (in devices and broadband internet) as well as digital literacy skills to allow students and teachers to fully participate in these new ways of learning. All of this is rooted in issues of connectivity, adequate training and support, and the importance of a general understanding of the benefits and opportunities that e-learning can provide. While previous ICTC reports on education discuss the need for educator training and competencies, this research notes the importance of individual educators being comfortable and capable with the technology to fully embrace distant learning. Indeed, technological competence was identified as one of the most significant predictors of success amid the highly varied environments of emergency distance learning.

In the absence of easy answers, a growing awareness of the challenges and benefits of e-learning provides the first step toward long-term success. While parents and students noted benefits such as flexibility of scheduling and ability to learn at their own pace, there are also concerns. As 96% of student respondents noted the importance of social interactions in the context of e-learning (a lack of social interaction and the time spent at home have proven to be significant challenges during the pandemic), consideration is required around how best to integrate student social interaction in the long-term. The experience of Black Canadians, Indigenous youth, and people with disabilities also requires additional research and consideration, as these communities are disproportionately impacted by the challenges related to distance learning. If the Canadian K–12 and post-secondary education system is to move forward in an equitable manner, inclusive e-learning and distance learning strategies must be considered. While distance learning is not necessarily ideal for all students and circumstances, it does provide a very promising opportunity for Canada's educational future.

APPENDIX A: RESEARCH METHODOLOGY

The research methodology used in the development of this report consisted of a combination of primary and secondary research.

Primary Research:

KEY INFORMANT INTERVIEWS

Primary research for this study consisted of a series of 20 key informant interviews (KIIs) and were held with a variety of subject matter experts from across Canada. This includes representation from Indigenous populations along with other members who self-identify as being part of Canada's various communities: Black, and other people of colour (BIPOC). Representation included K–12 educators, higher learning professors, curriculum consultants, e-learning strategists, educational administrators, and educational directors from prominent Canadian teacher colleges. Interviewees were asked a series of questions regarding public perceptions surrounding distance learning. Challenges related to issues of interpretation surrounding commonly used terms were acknowledged early on. Although the same line of questioning was asked of each respondent, their regions, institutions, and professions were said to influence a different understanding of the terms. As one respondent indicated, post-secondary institutions adopt and implement an understanding of a term such as distance learning, which by wider provincial standards may not share the same understanding. This often is the root of confusion at larger events such as conferences. Questions were then noted to have a higher degree of interpretation and responses varied significantly between interviewees.

KIIs played an important role in gathering insights on trends, specifically as they related to general perceptions, personal experiences, and first-hand accounts related to challenges and new opportunities. Candidates were selected based on their location (urban and rural areas, francophone, as well as Indigenous communities), role or responsibility, relationship to technology, administrative leadership, teaching audience (i.e., K–12, post-secondary or mature learners) and/or influence on teacher training and equipment use.

DISTANCE LEARNING SURVEY

Between February and March of 2021, ICTC conducted a survey on distance learning to understand the perspectives of both students and parents. This involved 1063 residents of Canada (including children 4 years old and older), surveyed online or by phone. The results of the survey informed issues of public perception, the strengths and challenges related to distance learning (and related technology) as well as issues of equity, academic integrity, and efficacy. This survey was divided in two sections, with 556 parent respondents, and 507 student respondents primarily from the same families. The ages of the children were broken down into four age categories, including mature learners (with no parent respondent).

APPENDICES

A total of 507 students participated in the survey. Some 300 out of those 507 were children whose parents agreed to call them to participate in the survey, and the remaining 207 students were over 17 years old who were eligible to participate in the survey without parental permission. Student participants were evenly distributed across different stage/age groups: 100 students in kindergarten to Grade 3, 100 students in Grade 4 to 8, 102 students in Grade 9 to 12, 105 students in the 17 to 23 age group, and 102 students over 24 years old.

The vast majority of students (Kindergarten and over), or 81%, were studying online full time or in a blended learning environment. Specifically, 36% of students were studying online full time because health or school authorities mandated school closures, 17% were studying online full time by choice, 28% of children were studying in a blended learning environment, and only 18% of children did not study at all online. About 39% of students who did not study online at all were in the "kindergarten to Grade 3" age group.

STUDENTS' AGE/GRADE

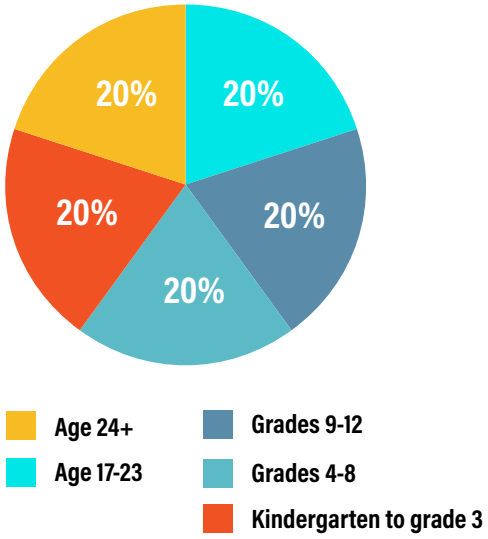


Figure 4: ICTC's Canadian Distance Learning Survey 2021 – Student respondents by age/grade.

STUDENTS' REGION

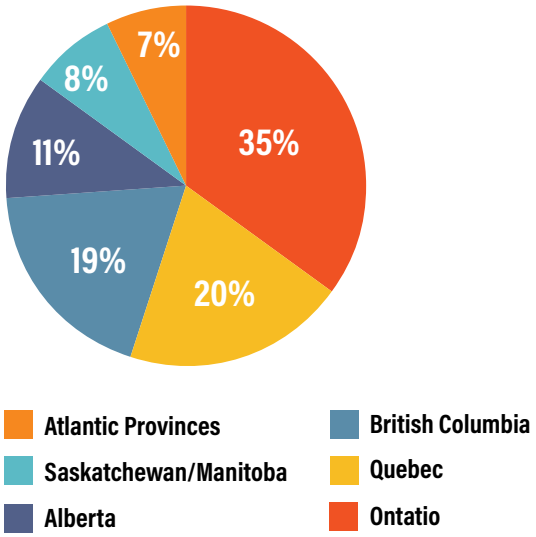


Figure 5: ICTC's Canadian Distance Learning Survey 2021 – Students respondents by province.

APPENDICES

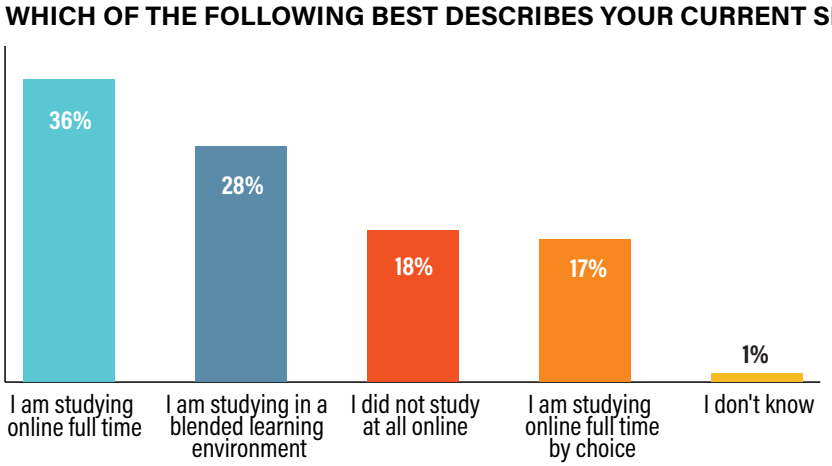


Figure 6: ICTC's Canadian Distance Learning Survey 2021 – Students respondents by type of enrolment at school.

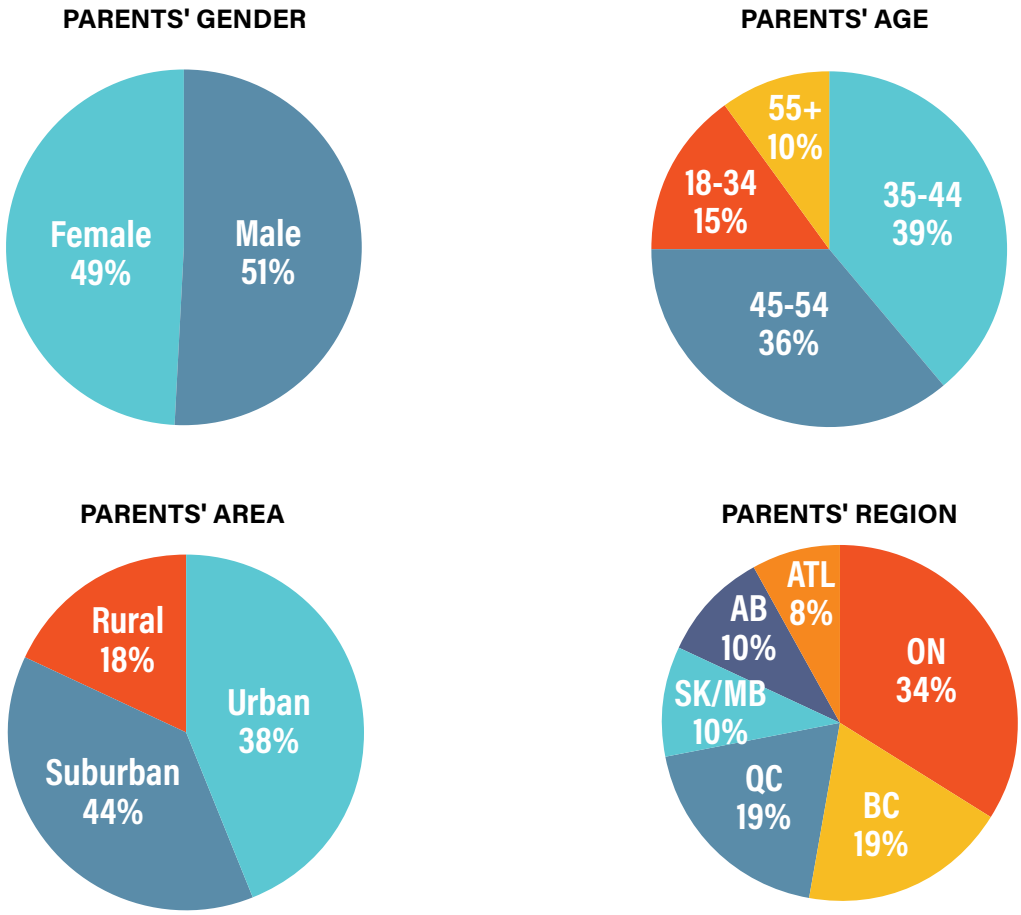


Figure 7: ICTC's Canadian Distance Learning Survey 2021 – Parents respondents by gender, age, area, region.

APPENDICES

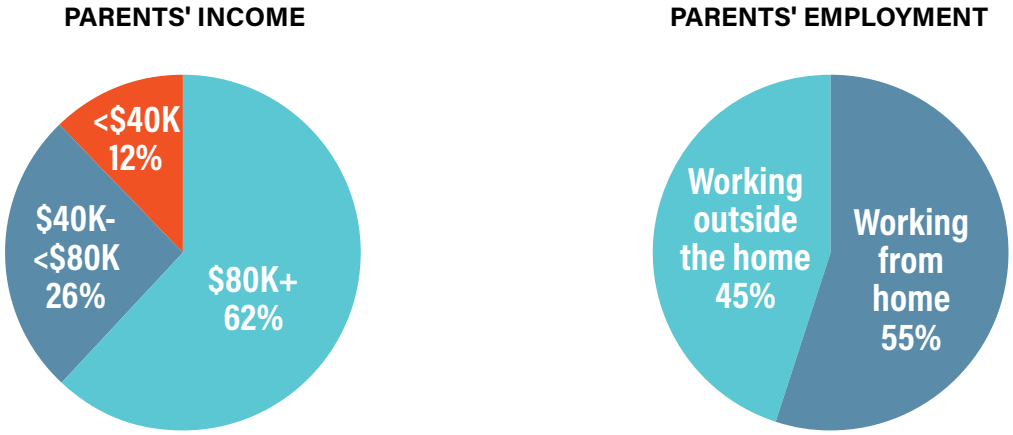


Figure 8: ICTC's Canadian Distance Learning Survey 2021 – Parents respondents by income and employment.

Secondary Research:

The secondary research for this study focused on an analysis of existing literature for Canadian and international settings. A robust literature review was leveraged to highlight or clarify key themes, trends, and emerging issues.

Limitations of Research:

While ICTC attempted to ensure that the research process for this study was as exhaustive as possible, there are inherent limitations to sample size and the qualitative nature of the interviews. Likewise, given the scope of this assignment, the lines between K–12 institutions, post-secondary, and continued learning often blur.

ICTC conducted 20 KIIs, which is a modest sample pool of interviewees. This means that these responses must be regarded as insights and cannot necessarily be taken as objective "trends" that represent the Canadian experience. While efforts were made to ensure the samplings of the survey was representative of the Canadian population and regional diversity, there may be inherent biases in who responds to surveys.

Efforts were taken to ensure that the language used is in accordance with the UN Convention on the "Rights of Persons with Disabilities," however, it is recognized that language and terminology used may become out-of-date. ICTC aimed to use the most respectful words possible when writing these reports (while acknowledging that the most appropriate terminology may change over time) and has conducted this research with the intent to respect the dignity and inherent rights of all individuals.