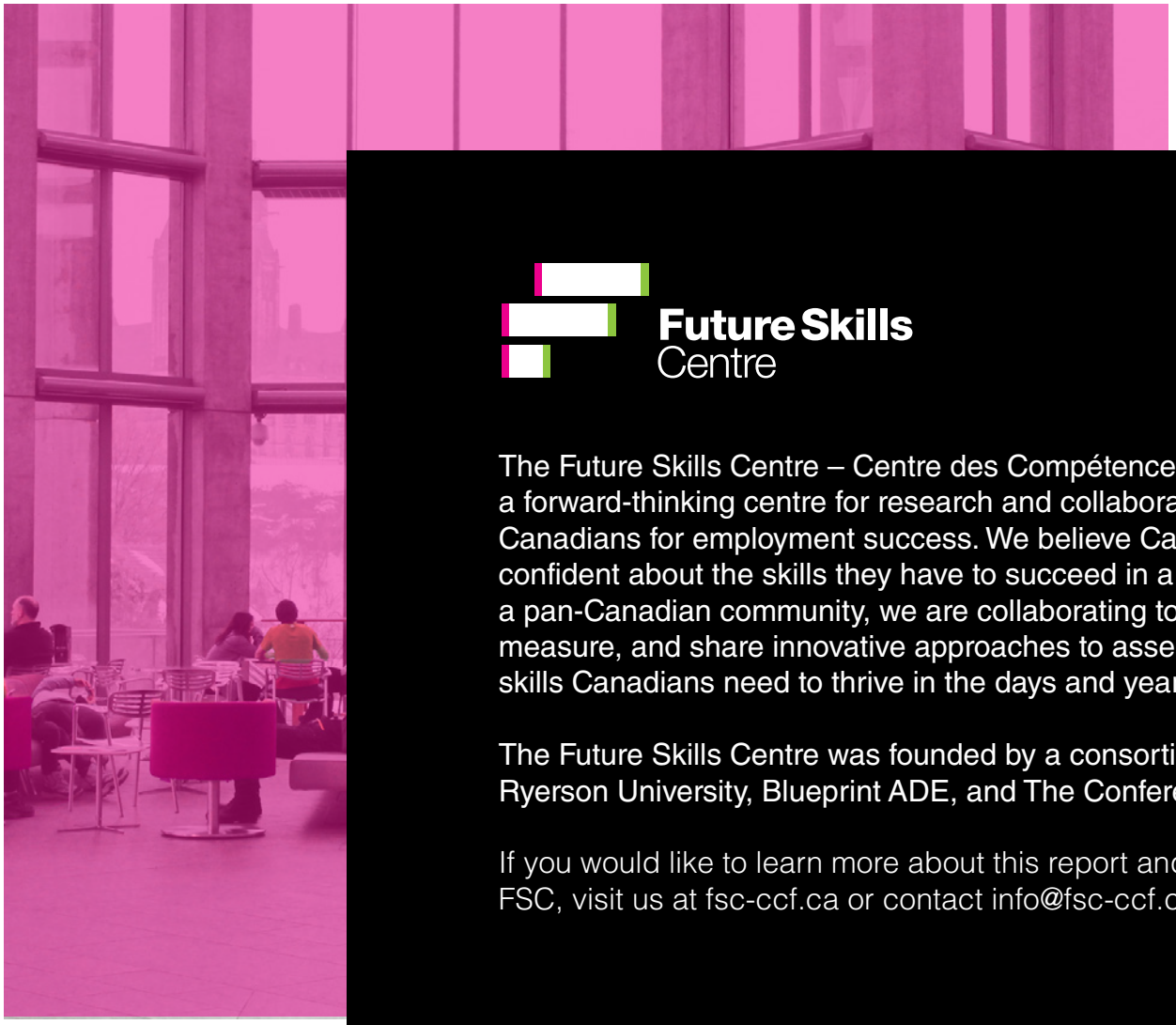
The Conference Board of Canada

In partnership with Future Skills Centre

Indigenous STEM Access Programs

Leading Post-Secondary Inclusion

Issue Briefing | December 9, 2020



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The Future Skills Centre was founded by a consortium whose members are Ryerson University, Blueprint ADE, and The Conference Board of Canada.

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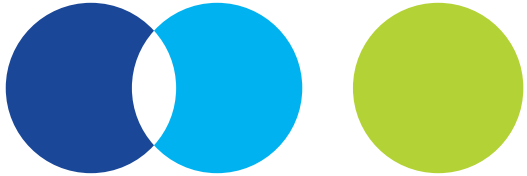


Key findings

- Many Indigenous learners leave high school inadequately prepared to continue in post-secondary science, technology, engineering, and mathematics (STEM) studies. Fixing this problem requires change at all levels of the education system.
- Indigenous students from under-resourced rural and remote schools are less likely to be prepared for post-secondary math and science courses than urban students.
- STEM access and retention programs in Canadian colleges and universities have a good track record of helping individual Indigenous students upgrade their skills to meet mainstream post-secondary education (PSE) requirements. Effective access programs combine personal, social, financial, academic, and career supports.
- STEM access and retention programs have also successfully driven institutional changes that make universities and colleges more inclusive for Indigenous learners. These programs have helped to introduce new admissions requirements, student assessments, teaching methods, and program delivery.
- Despite these programs' effectiveness, Indigenous learners are still constrained by the lack of broader education system reforms in K–12. These reforms are vital to supporting students' STEM pathways into PSE.

Uncertainty in the transition to post-secondary education

The transition from high school to post-secondary education (PSE) is a time of uncertainty for many students. Educational, cultural, and economic challenges make this transition even more complex for Indigenous learners transferring into PSE in science, technology, engineering, and mathematics (STEM). In 2015, Universities Canada found that more than 80 per cent of Canadian universities were trying to address the transition to PSE for Indigenous students. Targeted services include financial aid, financial guidance, social and cultural activities, and designated spaces.[1]

In PSE institutions across Canada, access and retention programs for Indigenous STEM learners aim to increase the number of Indigenous people working in STEM fields. These PSE programs support individual students and promote institutional change. However, the limits of their success demonstrate how change is needed across the broader education system.

Indigenous people make up 4 per cent of adults in Canada. But less than 2 per cent of people working in STEM occupations are Indigenous.[2] STEM-focused access and retention programs in PSE are having an impact on that gap. For example, the Engineering Access Program (ENGAP) at the University of Manitoba has helped 134 Indigenous student engineers to graduate over the past two decades.[3] The Aboriginal Access to Engineering Initiative at Queen's University has helped to increase the number of Indigenous student engineers from four in 2011 to more than 50 in 2020.[4] Since 2004, around 80 per cent of nearly 300 students who attended Lethbridge University's Indigenous Student Success Cohort have continued into their second year of studies and at least half have graduated with a university degree.[5]

Targeted programs to help under-represented students access PSE have been around since the mid-1960s. Their roots go back to the civil rights movement in the United States.[6] Many of today's PSE access and retention programs are based on Tinto's model of student retention. Tinto argued that students are more likely to stay in PSE if they have a tailored program of formal and informal services that integrate them into both academic and social systems at their educational institution.[7] Current Canadian access and retention programs provide a suite of support services that address the personal, financial, academic, career, and social and cultural needs of the student. (See "Access and retention at the University of Saskatchewan.")

1 Universities Canada, *Enhancing Indigenous Student Success at Canada's Universities*.
2 Analysis of 2016 Census data. Statistics Canada, "Data Products, 2016 Census."
3 Interview with the Conference Board, June 25, 2019.
4 Interview with the Conference Board, July 2, 2019.
5 Interview with the Conference Board, August 25, 2020.
6 Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce Pipeline, "Expanding Underrepresented Minority Participation," 93.
7 Ibid., 135.

Access and retention at the University of Saskatchewan

The University of Saskatchewan's Indigenous Student Achievement Pathways (ISAP) program has provided a holistic package of supports since 2012. ISAP offers academic programs, financial advice, emotional support, and cultural activities. Together these services help Indigenous students feel they belong in the university while improving their academic confidence. Students in the ISAP STEM Pathways stream can enroll in a Medicine Wheel Learning Community that brings together a cohort of students with common academic goals. Cohort members take three courses together per term, have a weekly gathering with peer mentors, and get academic advice from Indigenous faculty and alumni. At the beginning of their studies, ISAP STEM Pathways offers preparatory courses in chemistry, physics, biology, and math for those who lack high school prerequisites. ISAP can bridge interested students at the end of their degree into a mentorship network for Indigenous graduate students.[8]

Source: University of Saskatchewan.

8 University of Saskatchewan, "Indigenous Student Achievement Pathways."

Helping individual students transition to PSE

It takes a package of supports

Access and retention programs have a good track record of helping individual Indigenous students adapt to the requirements of their university programs. They do this through tailored supports selected from a menu of services covering personal, social, financial, academic, and career needs. Most programs use a holistic approach that caters to the diverse needs of their students. Students often come from low-income families and/or live in a rural or remote community. They may be the first generation in their family to attend PSE and have parents and grandparents who suffered through the Indian Residential School system. These contextual factors are interconnected and compound each other to greatly impact access and retention. That means supports should also be interconnected.[9] So, access and retention programs coordinate services and often deliver supports at one location to improve uptake and prevent service gaps and overlaps. These supports need to continue throughout the student's time in PSE.[10]

9 Stol, Houwer, and Todd, *Bridging Programs*.
10 Doughtery and Lempa, *Conducting a Scan of Your College Access and Success System*.

Upgrading academic subjects

Many incoming Indigenous students are academically unprepared for post-secondary STEM studies, which poses a nearly insurmountable barrier in the transition to university. For instance, instead of taking grades 11 and 12 core sciences courses that comfortably transition to post-secondary STEM courses, Indigenous students may have chosen, or been streamed into, less rigorous interdisciplinary science classes. Or they may come from Northern or rural high schools that have inadequate staff and resources for teaching higher-level math and science courses.

Access programs provide a suite of supports to address low levels of academic preparedness. Specialized bridging courses to upgrade to university entrance levels—especially in mathematics and sciences—may be offered in the summer or over one to two academic years. For example, students enrolled in Thompson River University's Indigenous Pathways to Health Careers program can access high school-level prerequisite courses and earn end-of-term bursaries when they pass.

Finding enough money

One of the most common reasons that Indigenous learners leave PSE before graduating is financial. The costs of an education can be higher when a student has enrolled for a STEM program that requires multiple upgrading courses and/or a reduced course load. Such programs will take more than four years to complete. Financial aid programs that demand a full course load and a limited number of years to complete are a poor fit for adult Indigenous learners in STEM. Access and retention programs offer specialized financial advice for their students and may negotiate with funders on their behalf.

Supporting the whole person

Indigenous youth are more likely to become a parent at a young age.[11] This can present challenges balancing family responsibilities with education.[12] At the same time, family can be a supportive influence in education.[13] Some mature Indigenous learners report that family is a source of support and a motivation to pursue higher education and complete their degree.[14]

Access and retention programs such as the Red River College Pathway to Engineering Technology offer personal supports like help with daycare and housing.[15] The College of the North Atlantic Aboriginal Bridging Program provides health and wellness training and personal development teachings, including topics such as nutrition, stress management, healthy relationships, parenting, self-determination, and active lifestyles.[16] Many access and retention programs, such as ENGAP, offer counselling to Indigenous students in PSE who experience mental health issues.

11 Cooke, "'And Then I Got Pregnant.'"
12 See, for example, Guèvremont and Kohen, "The Physical and Mental Health of Inuit Children of Teenage Mothers"; Ordolis, "A Story of Their Own."
13 Deer, De Jaeger, and Wilkinson, *Canadian Post-Secondary Education and Aboriginal Peoples of Canada*.
14 Ibid.
15 Red River College, "Pathway to Engineering Technology Programs."
16 College of the North Atlantic, "Aboriginal Bridging Program."

Having Indigenous people guide the learning process can lead to powerful educational outcomes for Indigenous learners and make science courses more relevant and meaningful for all learners.

Integrating Indigenous culture and society

Many Indigenous students have a strong connection with their families and communities, which can make it challenging to relocate for PSE, especially from a rural or remote setting. Moving from a community to an urban setting means a drastic dislocation of culture, language, and social interactions. Students can miss those community connections that provide a sense of belonging and cultural inclusion.

Access and retention programs designed for Indigenous learners integrate social and cultural activities. They aim to create a sense of community and belonging in what can otherwise be a large alienating institution. For example, Thompson Rivers University introduced cultural activities for Indigenous learners by incorporating weekly meetings and educational sessions led by Knowledge Keepers. The University of Manitoba Access Program has a full-time Indigenous Unkan (grandfather)-in-Residence who brings knowledge, culture, and balance to the program.[17] The College of the North Atlantic Aboriginal Bridging Program incorporates Elder and community participation in the classroom.[18]

Moving on to a job

Access and retention programs may offer support with resumé writing, job applications and provide references. They can help students meet employers who have relevant summer jobs and permanent positions. They also connect students with networks of Indigenous professionals such as the Canadian Indigenous Science and Engineering Society (.caISES).

17 University of Manitoba, "The Access Program."
18 College of the North Atlantic, "Aboriginal Bridging Program."

Driving institutional change

In the process of removing barriers and building supports for individual students, access and retention programs are driving institutional change in colleges and universities.

Demonstrating reconciliation in practice

When access and retention programs work with their college or university to ensure Indigenous student support services are funded, they give the institution the opportunity to make a practical contribution to inclusion and reconciliation.

Enabling cross-cultural learning

When Elders-in-residence are funded, they provide valuable cultural support for individual students. But they also help to introduce Indigenous knowledge into the institution and expand the world view of non-Indigenous students and faculty. Having Indigenous people guide the learning process can lead to powerful educational outcomes for Indigenous learners and make science courses more relevant and meaningful for all learners. Providing meaningful connections between the college or university and the wider Indigenous community can help to attract future Indigenous learners into PSE STEM programs.

Levelling the admissions playing field

In recognition that the high school marks of Indigenous learners may be more a reflection of disadvantaged schools than student abilities, some PSE institutions have changed their entrance requirements for Indigenous learners. Universities like Queen's and The University of British Columbia accept Indigenous students in some programs with a lower average than non-Indigenous students. These policies are complemented by academic support programs to help Indigenous students reach the requisite marks.

Broadening student evaluation

Access and retention programs negotiate with academic faculties to accept their upgrading and bridging courses as an alternative to high school credits for admissions or prerequisites. This can broaden the way those faculties evaluate prospective students. For example, the Engineering Faculty at the University of Manitoba admits students on the basis of physics and math upgrading courses taken through ENGAP. Some adult learners in these courses do not have a high school diploma, and yet they have been accepted—and proved successful—in the university engineering program.

Delivering programs flexibly

STEM programs can be long and inflexible, which can make it difficult for Indigenous learners with family or cultural responsibilities to complete. Students may not even apply if there are no part-time options for mature students with family responsibilities or options for attending funerals and other community cultural events that can pull them away from school for several days.

Nunavut Arctic College introduced flexibility in its Pre-Nursing Program to better accommodate the realities of its Inuit students' family lives. The program is structured to provide study time during the day for "homework," to avoid cutting into family time in the evenings. The college also allocated space for students who need a quiet study space on evenings and weekends.[19]

Another approach to flexibility involves breaking programs into short certificates that students can accumulate toward a more comprehensive diploma. In Australia, for example, the Batchelor Institute of Indigenous Tertiary Education divides multi-year programs into certificate courses, often delivered through a series of one- to two-week workshops. For each course completed the student receives a stand-alone certificate that also contributes toward a program diploma. The diploma in turn may facilitate admission to a degree program.[20] This modular approach is important to Indigenous learners, especially for those with many family responsibilities who cannot commit to a continuous multi-year program.

Creating dedicated spaces

Access and retention programs have spurred their institutions to provide dedicated spaces for their Indigenous students to come together. Having a lounge or centre where Indigenous students can meet informally helps to build a community, and a home away from home. And when students meet based on their Indigenous identity, the advantages go beyond culture. Older students have the opportunity to mentor younger students and contribute to their academic success.

19 Edgecombe and Robertson, "The Nunavut Nursing Program," 91.
20 Batchelor Institute of Indigenous Tertiary Education, "VET Courses."

Applying alternative teaching approaches

While upgrading and bridging courses may follow a standard Western curriculum, some of these courses have introduced alternative teaching approaches into PSE. Michelle Hogue teaches introductory chemistry for the Indigenous Student Success Cohort program at the University of Lethbridge. After years of experimentation, she now teaches the entire chemistry course in the lab. The lab is the environment where her students best engage first in the hands-on learning that helps them see the connection between scientific theory and practice. To foster this learning environment, she had to put aside the standard textbooks and produce her own practical learning materials.[21]

Systems change is the challenge

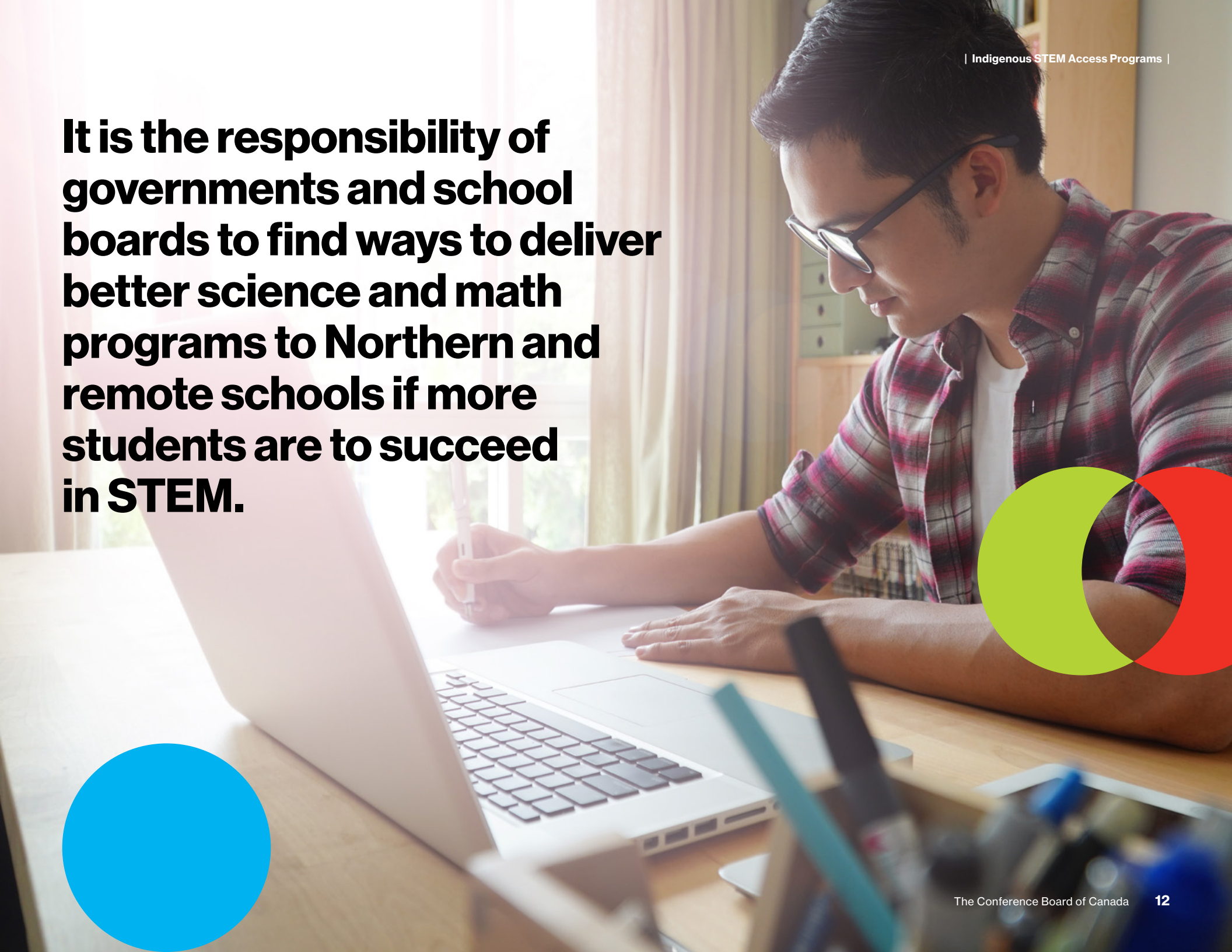
The people who run STEM access and retention programs at the PSE level have a unique window on how poorly K–12 school systems prepare many Indigenous students for higher learning in STEM. They recognize that broader systems changes are required to increase the number of well-prepared Indigenous students coming into PSE. However, they know that such changes are beyond the scope of what they can accomplish through PSE access and retention programs.

Systems change has to reach the root of what children may be experiencing in K–12. For instance, Indigenous STEM teachers continue to be under-represented. This means there are few role models for Indigenous STEM learners, particularly in Northern and remote communities.[22] Role-modelling is a major area that needs to be addressed for more Indigenous learners to participate in STEM.

PSE programs do try to address the shortcomings of K–12 feeder schools. Many PSE access and retention programs also run STEM outreach programs for elementary and high school students. (See *Learning Together: STEM Outreach With Indigenous Students*.) While the quality of those programs can be high, they reach at most a few hundred of the thousands of students who require upgrading. These short-term activities also cannot replace the high-quality teaching that Indigenous students deserve to help them to graduate from high school at the same level as their urban and non-Indigenous counterparts.

21 Hogue, “Let’s Do It First and Talk About It Later.”

22 Stol, Houwer, and Todd, “Bridging Programs,” 22.



It is the responsibility of governments and school boards to find ways to deliver better science and math programs to Northern and remote schools if more students are to succeed in STEM.

In the middle of the COVID-19 crisis, educators working in access and retention programs are rapidly learning how to provide online support to students, and especially those coming from Northern and remote communities. But the potential for online learning to replace the superior in-person teaching that gets urban students prepared for PSE is very unclear. In the end, it is the responsibility of governments and school boards to find ways to deliver better science and math programs to Northern and remote schools if more students are to have a real chance to succeed in STEM.

PSE access and retention programs provide a critical second chance for many Indigenous learners to succeed at STEM studies. But they address only one small part of a bigger challenge that requires deeper systems changes and reforms. (See *Curriculum and Reconciliation: Introducing Indigenous Perspectives Into K–12 Science*.)

Recommendations for increasing Indigenous PSE STEM graduates

PSE access and retention programs are one approach on a continuum of strategies to increase Indigenous inclusion in the STEM fields that are critical to the future economy. (See *Incorporating Indigenous Cultures and Realities in STEM*.) Access and retention programs come into play at the critical point when Indigenous learners are transitioning from high school to PSE. However, the need for these programs is an indicator of wider failures in the education system.

PSE needs more access and retention programs for STEM fields

Indigenous people continue to be under-represented in STEM occupations. (See How Can More Indigenous People Access STEM Careers.) Almost all PSE institutions in Canada offer general supports for Indigenous learners.[23] However, far fewer offer programs targeted at students in STEM fields. The Canadian Engineering Education Association found only seven PSE institutions offering access programs for engineering in 2020.[24]

23 Universitystudy.ca, “Indigenous Programs and Services Directory.”
24 Cicek and others, “Indigenous Initiatives in Engineering Education In Canada.”

Our research found a similar number offering programs for general sciences, and fewer than 15 in the health sciences.[25] All PSE institutions should offer supports for Indigenous learners in STEM subjects.

PSE institutions should continue to fund access and retention programs

There is no quick fix for the poor preparation that many Indigenous students get in high school mathematics and sciences. Many Indigenous learners will need support to transition into PSE STEM studies in the coming years. Steady funding for access and retention programs in mainstream PSE can help to ease this transition. Government funding could play a role here.

Governments must eliminate disparities between remote rural and urban schools

Governments, school boards, and other education authorities must also tackle the staffing and resourcing issues that affect how rural, Northern, and remote schools deliver STEM subjects in K–12. In addition, they must ensure that streaming is not creating systemic racism. Many Indigenous students in rural and urban schools are streamed out of the core sciences and mathematics they need to follow STEM studies in PSE. Until there are more well-qualified Indigenous students graduating from high school, access and retention programs will remain a necessary part of mainstream PSE.

25 Conference Board web scan of PSE access and retention programs at Canadian PSE institutions.

Appendix A

Methodology

The findings presented in this briefing flow from:

- an environmental scan of access and retention programs across Canada;
- an interjurisdictional review of 50 academic and grey literature sources on minority access and retention in post-secondary education;
- interviews with 10 Canadian professionals with experience in access and retention programs in Canadian universities (10 hours total), working in British Columbia, Saskatchewan, Nova Scotia, Quebec, and Ontario – all interviews were recorded, transcribed, and coded using qualitative data analysis software;
- interview participants were associated with:
    - Indigenous Student Achievement Pathways STEM, University of Saskatchewan
    - Engineering Access Program, University of Manitoba
    - Aboriginal Access to Engineering, Queen's University
    - Indigenous Student Success Cohort, University of Lethbridge
    - Science and Land and Food Systems Indigenous Student Initiative, The University of British Columbia
    - Indigenous Pathways for Health Careers, Thompson Rivers University
    - Aboriginal Student Centre, Mount Saint Vincent University
    - Nunavut Sivuniksavut.

Appendix B

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